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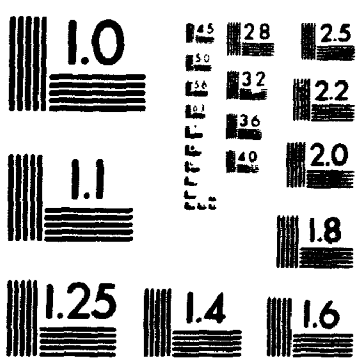

UNCHARTED WATERS: THE DEVELOPMENT OF THE HELICOPTER CARRYING DESTROYER IN THE POST-WAR ROYAL CANADIAN NAVY, 1943-1964

by

MICHAEL SHAWN CAFFERKY, B.A., M.A.

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The undersigned hereby recommend to the Faculty of Graduate Studies and Research acceptance of the thesis

"UNCHARTED WATERS: THE DEVELOPMENT OF THE HELICOPTER CARRYING DESTROYER IN THE POST-WAR ROYAL CANADIAN NAVY, 1943-1964"

submitted by

Michael Shawn Cafferky, B.A., M.A.,

in partial fulfilment of the requirements for the degree of Doctor of Philosophy

G. J. Gordon
Chair, Department of History

Thesis Co-Supervisor

Thesis Co-Supervisor

External Examiner

Carleton University

19 April 1996

ABSTRACT

Canadian naval aviation during the Second World War and post-war period has, for the most part, been ignored in the scholarship. This is especially true in the case of the helicopters. This dissertation is an examination of the origins of rotary-wing aircraft and the development of the helicopter carrying destroyer escort from the Canadian perspective.

The emergence of the helicopter carrying destroyer (DDH) can be traced to the fortunes of the Royal Canadian Navy in its battle for the convoys during 1942, and in its drive to obtain a balanced fleet. Bringing the helicopter/destroyer escort concept to fruition, however, was a lengthy and sometimes acrimonious process which was further complicated by competing national and service interests, and limited budgets. In the end, the navy was able to convince both the government and the Royal Canadian Air Force of the merits of helicopters for anti-submarine operations, the navy's raison d'être in post-war era.

ACKNOWLEDGEMENTS

I am indebted to several individuals, without whose encouragement and support this dissertation would not have been written. I am especially grateful to my co-supervisor, and Senior Historian at the Directorate of History, Department of National Defence (DND), Dr. Roger Sarty for his support of the original concept. Dr. Sarty read the draft chapters and kept me on course with my research. His comments were crucial to the successful completion of this dissertation. Dr. Norman Hillmer, co-supervisor, and former Senior Historian at DND, provided constant encouragement and, more importantly, critical editorial comments which forced me to become a better writer. I would also like to take this opportunity to thank the Department of National Defence, which defrayed the costs of my travel and the production of this thesis with a Military and Strategic Studies grant. This funding allowed me to travel to London, England, and Washington, D.C.

Since a considerable portion of the research for this dissertation was carried out at the Directorate of History, National Defence Headquarters, Ottawa, I would like to salute my colleagues, who through their interest and support greatly assisted my research. Mr. Michael Whitby provided constant encouragement, shared his research, and located several key documents. Because of his expertise in the field of naval aviation, he provided invaluable insight. Mr. Donald E. Graves was instrumental in my development as an historian at the Directorate.

To the Chief Historical Archivist, Mr. O.A. Cooke and his staff, Isabel Campbell (Archivist), and Donna Porter (Naval Team Archivist), I would like to extend my thanks for your speed and efficiency in retrieving and declassifying the documents. The two librarians at the Directorate of History, Mr. Real Laurin and Mr. Jean Durocher, also deserve much credit.

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ABBREVIATIONS

A/A	Anti-Aircraft
ACNS	Assistant Chief of the Naval Staff
ACNTS	Assistant Chief of Naval Technical Services
ADM	Assistant Deputy Minister
AEW	Airborne Early Warning
A/M	Air Marshal
ANTAC	Air Navigation and Tactical Air Control
A/S	Anti-Submarine
ASROC	Anti-Submarine Rocket
ASW	Anti-Submarine Warfare
ASWTNS	Anti-Submarine Warfare Tactical Navigation System
A/V/M	Air Vice-Marshal
BAD	British Admiralty Delegation
BuAer	U.S. Bureau of Aeronautics
CANAVHED	Canadian Naval Headquarters
CANAVUS	Canadian Joint Staff, Washington
CANCOMCORTRON	Canadian Commander Escort Squadron (Destroyers or Frigates)
CANCOMFLT	Commander Canadian Fleet
CANLANT	Canadian Atlantic Sub Area
CAS	Chief of the Air Staff
CDC	Cabinet Defence Committee
CEPE	Central Experimental and Proving Establishment
CINCWESTLANT	NATO SACLANT's Commander Western Atlantic
CJATC	Canadian Joint Air Training Centre
CNMO	Canadian Naval Mission Overseas
CNO	U.S. Navy Chief of Naval Operations
CNP	Chief of Naval Personnel
CNS	Chief of the Naval Staff
CNTS	Chief of Naval Technical Services
CO	Commanding Officer

COAC	Commanding Officer Atlantic Coast
COMOPVAL	Commander Operational Evaluation Organization
COSC	Chiefs of Staff Committee
CUSRPG	Canada United States Regional Planning Group
CVE	Aircraft Carrier - Escort
CVL	Aircraft Carrier - Light
CWC	Cabinet War Committee
DAE	Director Air Engineering
DAO	RCAF Director Air Operations
DASH	Drone Anti-Submarine Helicopters
DAT	Drone Assisted Torpedo
DAV	Director Avionics Design and Production
DCNA (P)	Deputy Chief of Naval Aviation (Plans)
DD	Destroyer
DE	Destroyer Escort
DDH	Destroyer Helicopter
DDP	Department of Defence Production
DG (Ships)	Director General Ships
DGA	Director General Aircraft
DM	Deputy Minister
DNAR	Director Naval Aircraft Requirements
DND	Department of National Defence
DNPO	Director Naval Plans and Operations
DNA	Director Naval Aviation
D/DNA	Deputy Director Naval Aviation
DNP&I	Director of Naval Plans & Intelligence
DOD	Director of Operations Division
DOP	Director of Plans
DOR	Director Operational Research
DSS	Director Scientific Services
DRB	Defence Research Board
DTASW	Director Tactics Anti-Submarine Warfare
DTSD	Director Tactics and Staff Duties
DUSW	Director Undersea Warfare
DWT	Director of Weapons and Tactics
EASTLANT	NATO SACLANT's CinC Eastern Atlantic
ECP	Emergency Conning Position

EER	Explosive Echo Ranging
FFE	Frigate
FOAC	Flag Officer Atlantic Coast
G-I-UK Gap	Greenland-Iceland-United Kingdom Gap
HMCS	Her Majesty's Canadian Ship
HMS	Her Majesty's Ship
HUK	Hunter-Killier Operations
JASAP	Julie Attack Search and Plotter
JMWS	Joint Maritime Warfare School
JPC	Joint Planning Committee of the MCC
LAW	Land/Air Warfare Committee
LOFAR	Low Frequency Analysis and Recording
LSO	Landing Signals Officer
MAC	Merchant Aircraft Carriers
MAD	Magnetic Anomaly Detection
MCC	Canadian/U.S Military Coordinating Committee of the Permanent Joint Board on Defence
M/S	Minesweeper
NADC	Naval Air Development Center
NAE	National Aeronautical Establishment
NAORPG	North Atlantic Area Regional Planning Group
NAS	Naval Air Station
NATO	North Atlantic Treaty Organization
NCC	Naval Constructor-in-Chief
NHQ	Naval Headquarters
NMCJS	Naval Member Canadian Joint Staff
NORAD	North American Air Defence Command
NRC	National Research Council
NRE	Naval Research Establishment
NSHQ	Naval Service Headquarters
OPEC	Operational Evaluation Organization
PJBD	Permanent Joint Board on Defence
PPCC	Policy and Projects Coordinating Committee
RAF	Royal Air Force
RAST	Recovery, Assist, Secure and Traverse RAT Rocket Assisted Torpedo
RCAF	Royal Canadian Air Force
RCN	Royal Canadian Navy
RCNAS	Royal Canadian Naval Air Service

RCNVR	Royal Canadian Naval Volunteer Reserve
R&D	Research and Development
RN	Royal Navy
RNAS	Royal Naval Air Station
ROK	Republic of Korea
SACLANT	NATO Supreme Allied Commander, Atlantic
SADD	USN Surface Anti-Submarine Development Detection Unit
SAR	Search and Rescue
SAWC	Sea/Air Warfare Committee
SCNO	Senior Canadian Naval Officer (London)
SDHQ	Seaward Defence Headquarters
SHAPE	Supreme Headquarters, Allied Powers Europe
SLOC	Sea Lines of Communication
SOAC	Senior Canadian Officer Afloat, Atlantic
SO (Helicopters)	Staff Officer (Helicopters)
SOSUS	Sound Surveillance System
SS	Submarine
SSA	Short Service Appointment
SSK	Anti-Submarine Submarine
STEW	Ship Tethered Early Warning
STRIKEFLEETLANT	NATO Striking Force Atlantic
UN	United Nations
USAF	United States Air Force
USCG	United States Coast Guard
USN	United States Navy
USNR	United States Naval Reserve
VCNS	Vice Chief of the Naval Staff
VCOSC	Vice Chiefs of Staff Committee
VDS	Variable Depth Sonar
WEE	Winter Experimental Establishment
WESTLANT	NATO SACLANT's CinC Western Atlantic Area

THE HISTORICAL CONTEXT

This thesis is about a major, Canadian innovation, the operation of heavy helicopters from small warships. This breakthrough tremendously increased the effectiveness of moderate-sized navies, not only in combatting increasingly powerful submarines, its original purpose, but in the whole range of maritime activities from search and rescue to the prevention of smuggling, and, as was demonstrated in the war in the Persian Gulf, enforcement of economic sanctions. The helicopter-carrying destroyer (DDH) has become a standard type in all ocean-going navies of the world.

In most western nations ambitious official war histories have acted as a stimulus for scholarship by `mapping' complex documentation, making available information from classified files, and providing essential accounts of specialized organizations and technology. The best official military histories also include comprehensive treatment of pre-war conditions and preparations that serve to stimulate study of armed forces in peacetime.

In Canada, the navy made a promising start during the Second World War when the naval staff established an historical section and engaged a professional historian, Dr. Gilbert N. Tucker, as its head. Tucker presided over the production of two first-class volumes.[1] The first dealt quite frankly for the times with the difficult story of the service from its founding, amid bitter political controversy in 1910 through to the outbreak of the Second World War

[1] See, Gilbert N. Tucker, The Naval Service of Canada: Origins and Early Years, vol. I, (Ottawa: King's Printer, 1952) and The Naval Service of Canada: Activities on Shore During the Second World War, (Ottawa: King's Printer, 1952).

in 1939. The second volume, subtitled Activities on Shore During the Second World War, treated fleet development, training, personnel policies, base development and other technical subjects. When these two volumes were nearing completion in 1948, Brooke Claxton, the minister of National Defence, severely cut back the official histories programme and virtually abolished the naval section. The planned, key volume on operations in the Second World War was rushed out as a popular history, based on little more than the very preliminary accounts junior officers had hastily assembled during the war.[2] It was the weakest and most unanalytical account produced by any substantial western navy, including those of Australia and New Zealand, despite the fact that the RCN had become by 1944-1945 the third largest Allied navy following the United States Navy (USN) and the Royal Navy (RN).[3] The naval staff re-established a small historical section in the early 1950's, but did not hire professionally trained staff, and used the section primarily as a public information office.

The decisions of the late 1940's and early 1950's effectively shut down scholarship on the Canadian navy for thirty years. The re-established section did produce two volumes in the mid-1960's, one on the Korean War and the other, significantly, on Canadian naval

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[2] See, Joseph Schull, The Far Distant Ships, (Ottawa: Queen's Printer, 1952).

[3] See, Stephen W. Roskill, The War at Sea, 1939-1945, 3 vols. (London: HMSO, 1954 to 1961); Admiralty Historical Section, Naval Staff History, The Development of Naval Aviation, 1919-1945, vols. I-II, B.R. 1736 (53) (London: July 1954 and December 1956). Samuel Eliot Morison, History of the US Naval Operations in World War II, vols. 1-15 (Boston: Little Brown, 1947 to 1956); G. Hermon Gill, Royal Australian Navy, 1939-1945, vols. 1-2 (Canberra: Australian War Memorial, 1957 and 1969); Ian C. McGibbon, Blue Water Rationale: The Naval Defence of New Zealand, 1914-1942, (Wellington: P.D. Hasselberg Government Printer, 1981).

aviation, an indication of the importance the navy attached to the subject.[4] Both volumes, although based on important documentation and replete with fundamental information, are unanalytical. When in 1965 the naval section was combined with other service historical sections into the unified 'Directorate of History,' priority went to the Royal Canadian Air Force, whose historical programme had been far behind that of the army and navy.

Serious historical study of the RCN began again only in the late 1970's and early 1980's. This was largely the result of a new generation of scholars beginning to take a fresh look at Canadian military history in the era of the World Wars at a time when the archives were just opening up.[5] Some of the scholars were service or ex-service personnel, both young men and women seeking to understand their profession more fully and, in a number of cases, veterans of the Second World War or first decades of the Cold War who in retirement or second careers - some of them in academic fields - wanted to know more about the events in which they had participated.

Conferences in 1980 and 1985 that commemorated the seventieth and seventy-fifth anniversaries of the Canadian navy were benchmarks in the revival of historical study. The proceedings, The RCN in Retrospect, 1910-1968, and The RCN in Transition, 1910-1985,

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[4] See, Thor Thorgrimsson and E.C. Russell, Canadian Naval Operations in Korean Waters, 1950-1955, (Ottawa: Queen's Printer, 1965), and J.D.F. Kealy and E.C. Russell, A History of Canadian Naval Aviation, 1918-1962, (Ottawa: Queen's Printer, 1965).

[5] See, W.A.B. Douglas, "Canadian Naval Historiography," Mariner's Mirror, vol. 70 no. 4, (November 1984), pp. 349-362 and Marc Milner, "The Historiography of the Canadian Navy: The State of the Art," Ubi Sumus, (Newport, Rhode Island: Naval War College Press, 1994), pp. 79-92.

included papers on all periods of the service's history.[6] They highlighted the number and breadth of gaps in the published literature, and demonstrated the extent to which scholarship about the Canadian navy had fallen behind other naval services, but they also suggested how the growing flood of open Canadian archival material could be used in naval historical studies in general and helped to stimulate work in Britain, Australia, Germany and the United States.

Much of the work in Canada - and elsewhere - since the late 1970's has been on the period of the two world wars, and especially 1939-1945. This has reflected the weight of archival material available, and the fact that releases of intelligence and personal materials have opened the way for reinterpretations of key events and developments during the Second World War.[7]

These Second World War studies have provided a vital backdrop for the present work. It was only during the Second World War that the RCN, previously so underfunded

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[6] James A. Boutilier, ed., The RCN in Retrospect, 1910-1968, (Vancouver: UBC Press, 1982), and W.A.B. Douglas, ed., The RCN in Transition, 1910-1985, (Vancouver: UBC Press, 1988).

[7] See, Marc Milner, North Atlantic Run: The Royal Canadian Navy and the Battle for the Convoys, (Toronto: University of Toronto Press, 1985), and The U-Boat Hunters: The Royal Canadian Navy and the Offensive against Germany's Submarines, (Toronto: University of Toronto Press, 1994); David Zimmerman, The Great Naval Battle of Ottawa, (Toronto: University of Toronto Press, 1989); Michael Hadley, U-Boats Against Canada: German Submarines in Canadian Waters, (Kingston and Montreal: McGill-Queen's University Press, 1985); Michael Whitby, "Instruments of Security: The Royal Canadian Navy's Procurement of the Tribal-Class Destroyers, 1938-1943," The Northern Mariner, vol. II, no. 3 (July 1992), pp. 1-15; Donald E. Graves, "'Hell Boats' of the RCN: The Canadian Navy and the Motor Torpedo Boats, 1936-1941," The Northern Mariner, vol. II, no. 3 (July 1992), pp. 31-45; Shawn Cafferky, "'A Useful Lot, These Canadian Ships': The Royal Canadian Navy and Operation Torch, 1942-1943," The Northern Mariner, vol. III, no. 4 (October 1993), pp. 1-17, and; Doug McLean, "The Battle of Convoy BX-141," The Northern Mariner, vol III, no. 4 (October 1993), pp. 19-35;

it was capable of little more than coast guard duties, became a true fighting service. Throughout the six-year conflict, the RCN underwent an expansion in terms of personnel and ships which, proportionally, far outstripped the growth of the Royal Navy and the United States Navy. Indeed, the rate of expansion was "fifty to one, compared with eight to one for the Royal Navy, fourteen to one for the Royal Australian Navy, and twenty to one for the United States Navy."[8] The RCN had grown to some one hundred and four thousand men and women and consisted of approximately nine hundred vessels, including 375 warships.[9] During the war the RCN acquired gifted officers who provided, the thesis will argue, stable effective leadership into the post-war years.

The RCN was deeply involved in anti-submarine warfare (ASW), and although this was, in 1939, regarded as a secondary role suitable for an inexperienced navy, during the war the submarine proved to be a powerful strategic weapon. Anti-submarine warfare became a very sophisticated highly-technological art, but by 1945 the German navy gained the upper hand in the battle, but it was too late to effect the outcome of the war, thanks to the latest submarine technology which left the Allies scrambling to find new countermeasures to the fast German submarines. The Russians acquired German submarine technology at the end of the war, thus creating an important continuity between the Second World War and the Cold War.

As has been well documented, the novice RCN had tremendous difficulties, especially in training and technology, in keeping up with the fast development of ASW in 1939-1945,

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[8] Marc Milner, North Atlantic Run: The Royal Canadian Navy and the Battle for the Convoys, (Toronto: University of Toronto Press, 1985), p. ix.

[9] Gilbert Norman Tucker, The Naval Service of Canada, vol. I (Ottawa: King's Printer, 1952), p. 21.

but in this struggle it developed much more effective liaison with its traditional mentor, the RN, and fostered a new relationship with the USN[10]. These links are vital to the present story.

The Second World War also provided the backdrop of the fundamental ideas and policies that shaped the reaction of the navy to post-1945 events. During the war, when ASW was seen as a second-class role, with small, second-class ships, the RCN had attempted to use wartime expansion to achieve its long-held dream of a balanced fleet. Post-war realities and Canadian government policy forced the navy to focus, once again, on anti-submarine (A/S) operations. This, in turn, led to the navy's acquisition of small specialized warships to carry out that role. Nevertheless, the RCN never waivered from its original goal of acquiring and maintaining a naval air component within the fleet.

Recent scholarship has focused primarily on A/S operations of the RCN, but little has been published on the links between the navy's A/S operations and the emergence of aviation, and almost nothing on the admittedly small part of the helicopter in these beginnings.

The acquisition of both fixed-wing and rotary-wing aircraft in the RCN must be viewed in the context of the war, and more importantly can be traced to the fortunes of the navy in its battle for the convoys in 1942. The German U-boat menace in the western Atlantic served as the catalyst for the RCN to enter naval aviation. Not surprisingly, the Canadian navy focused almost exclusively upon fixed-wing aircraft, a proven technology, as a counter to the submarine. The helicopter was a new and highly speculative technology.

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[10] See Marc Milner, North Atlantic Run: The Royal Canadian Navy and the Battle for the Convoys, (Toronto: University of Toronto Press, 1985); David Zimmerman, The Great Naval Battle of Ottawa, (Toronto: University of Toronto Press, 1989).

even at a time when military crisis had dramatically accelerated the pace of innovation in maritime warfare.

The Americans and British began experimenting with helicopters, flying them off the stern of merchant ships in 1942-1943. When the RCN learned of this it approached the Admiralty to train Canadian pilots in the use of the new machines, and eventually five Canadian naval airmen did receive this training. Developmental problems with the early helicopters, however, prevented their operational use during the war.

By the late 1940's helicopters had overcome many of their earlier limitations and several navies, including the RCN, believed they warranted serious consideration. The Canadian service embarked upon a lengthy and detailed evaluation of the helicopter's capabilities to perform a number of missions. Convincing the government and other services of the merits of the helicopter, however, proved to be another matter altogether.

For the government the issue, as always, was the budget. The Royal Canadian Air Force's (RCAF) opposition to the navy's plans, on the other hand, was firmly rooted in doctrine. The debate over what service should have control over maritime aviation is a familiar one, especially in the Royal Navy, and the United States Navy.[11] Less well known is the Canadian story.

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[11] See, Stephen W. Roskill, British Naval Policy Between the Wars, 1919-1939, vols. 1-2, (London: Collins Press, 1968 and 1976); Stephen W. Roskill, Documents Relating to the Naval Air Service, 1908-1918, (London: Navy Records Society, 1969); Michael S. Sherry, The Rise of American Air Power: The Creation of Armageddon, (London: Yale University Press, 1987), and Jeffrey G. Barlow, Revolt of the Admirals: The Fight for Naval Aviation, 1945-1950, (Washington, DC: Naval Historical Center, 1994).

The value of naval aviation to naval warfare has long been recognized by naval theorists and academics alike, particularly in Great Britain and the United States. Indeed, literature on the subject is vast.[12] As one surveys the Canadian naval aviation record, one is struck by the paucity of material available.

The literature relating to the development of the helicopter/destroyer can be divided into three categories: popular history, academic studies, and works of both types by service personnel with specialist knowledge and, in some cases, particular interests. Traditionally, British accounts of naval aviation have tended to focus almost exclusively on technical issues, tactical doctrine, the bomb-versus-battleship debate, the highly contentious issue of dual navy-air force control of the Royal Navy air arm, and the operational history of the Fleet Air Arm (FAA). A post-war examination of the FAA has yet to be written.[13]

A number of works provide essential pa..s of the backdrop for the present dissertation. Willem Hackmann's Seek and Strike: Sonar, anti-submarine warfare and the Royal Navy, 1914-1954, is the best treatment of several key aspects - particularly underwater acoustics - of anti-submarine (A/S) operations.[14] Conspicuous by its absence, however, is any

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[12] Sir Arthur Hezlett, Aircraft and Sea Power, (London: Peter Daniels, 1970); Clark G. Reynolds, The Fast Carriers: The Forging of an Air Navy, (Annapolis: Naval Institute Press, 1992); Clark G. Reynolds, Command of the Sea: The History and Strategy of Maritime Empires, (New York: William Morrow and Company, 1974).

[13] See, David Wragg, Wings over the Sea: A History of Naval Aviation, (London: David and Charles, 1979); Robert Jackson, Strike from the Sea: A Survey of British Naval Air Operations, 1909-1969, (London: Arthur Barker Limited, 1970), and; Hugh Popham, Into Wind: A History of British Naval Flying, (London: Hamish Hamilton, 1969).

[14] Willem Hackmann, Seek and Strike: Sonar, anti-submarine warfare and the Royal Navy, 1914-1954, (London: HMSO, 1984).

detailed discussion of the RCN's role in developing long-range variable depth sonar (VDS). or the helicopter equipped with dunking sonar. To be fair, those issues were beyond the scope of Hackmann's book, as he focused primarily upon hull-mounted sonar. For a number of reasons, he chose to end the story in 1954. First, in 1954 the United States launched the world's first nuclear submarine, which rendered existing hull-mounted sonars obsolete. Second, and perhaps more important, the record stops, at least in Britain, in 1954. The "thirty year rule" meant that at the time of writing he was denied access to the primary documents beyond 1954. This book was the first scholarly examination of the RN's involvement in underwater acoustic research and still dominates the field.

Eric Grove's detailed and ground-breaking survey, Vanguard to Trident: British Naval Policy since World War II, suffers from the same source limitations as Hackmann's book.[15] Grove has examined the period after 1954, but he had to rely upon published books, journals, newspaper articles and unclassified documents. Unlike Hackmann, Grove treats policy at the highest levels, paying particular attention to budgetary issues, the impact of technology on fleet composition, and the role of alliances in determining British defence policy.

Anti-submarine warfare and naval aviation, especially fixed-wing, figures prominently in Grove's work. This focus, however, is closely restricted to RN developments. British academics, like the Americans, moreover, tend to focus on large warships and fixed-wing aviation, to the exclusion of helicopters and destroyers. This is explained, in part, because both the RN and USN approached anti-submarine warfare primarily from the strategic

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[15] See, Eric Grove, Vanguard to Trident: British Naval Policy since World War Two, (Annapolis: Naval Institute Press, 1987).

perspective - carrier task forces operating against the submarine bases as opposed to convoy escort - and were somewhat reluctant to devote resources to tactical ASW.

American scholarship as it relates to anti-submarine warfare and naval aviation in the post-war period is dominated by academic historians. Most of the literature comprises biographies, detailed ships' histories, and examinations of U.S. maritime and defence policy. The scholarship can be further divided into those works which variously concentrate on technology, inter-service rivalry, carrier task forces, and nuclear submarines. Obviously, there is some overlap within these broadly defined subjects. There is only a handful of books which relate specifically to tactical anti-submarine warfare.

The most important work is Norman Friedman's seminal book, The Postwar Naval Revolution.[16] This account concentrates on the USN and the Royal Navy because, as the largest navies of the West, they led and, to a considerable extent, defined the technological revolution. Like all scholars working in the post-war period Friedman was subject to constraints, not the least of which was access to primary documents. This explains his concentration on the decade following the Second World War.

Friedman examines the United States' changing naval mission and fleet composition against the background of fundamental changes in world politics since 1945, and America's failure in Vietnam. He approaches the subject from a policy and technological perspective, concentrating on the USN's major surface and sub-surface combatants. Two chapters are devoted to an examination of defence policy, strategy, budgets, and fleet composition. He

[16] See, Norman Friedman, The Postwar Naval Revolution, (Annapolis: Naval Institute Press, 1986).

then provides a detailed account of the principal combatants: carriers and fixed-wing aircraft, destroyers, and submarines. Not surprisingly, he focuses primarily on the strategic mission of the aircraft carriers. The role of helicopters in anti-submarine warfare is hardly mentioncd. To be fair, rotary-wing aircraft were in the developmental stages during the decade he discusses, and were considered by many as experimental aircraft.

Jeffrey G. Barlow's monograph, Revolt of the Admirals: The Fight for Naval Aviation, is a detailed examination of naval aviation, but it is even more narrowly focused than Friedman's work.[17] He approaches his subject from a policy and doctrinal perspective, describing the fight between the air force and the navy over the role of aviation in the nucleai age. Between 1945 and 1950 the USN fought to carve out an autonomous strategic role. Obviously, the aircraft carriers were the only warships that could carry out this mis.ion. There are no helicopters in his story. Nevertheless, Barlow's book is important for other reasons. His account of the confrontation between the United States Air Force and USN over control of maritime aviation offers insights into similar inter-service disputes in Canada.

The core of Canadian scholarship consists of four books, several graduate theses, and numerous articles. Common to all four books is the tendency to concentrate on fixed-wing naval aviation to the exclusion of rotary-wing aircraft, although there are some exceptions. Three of the books are surveys, intended for a very general readership.

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[17] See, Jeffrey G. Barlow, Revolt of the Admirals: The Fight for Naval Aviation, 1945-1950, (Washington, DC: Naval Historical Center, 1994).

Tony German's book, The Sea is at Our Gates: The History of the Canadian Navy was the first of the three books on the wartime and post-war navy to be published.[18] German's purpose in writing this book was twofold. First and foremost, he has an axe to grind. He certainly laments the demise, as he sees it, of the once proud and capable Canadian navy. The present situation arose, according to German, because the "country was so bereft of policy in peace that its navy had next to nothing on which to build in war". Second, he wants to record for posterity the record of the RCN. According to German, "if Canada were to heed her history, she could hardly keep her back turned to the sea, as she most often has in this century".

The book is divided into two sections of equal length. The first half deals with the RCN's contribution to the Second World War, because as he notes, "as a result of the failure to write the real history after World War Two, British and American accounts give only passing, and sometimes scornful, mention of Canada's key part in the all-crucial Battle of the Atlantic". As a career naval officer who enrolled during the war, German wanted to set the record straight. The second half of the book is an all-too brief examination of the major events and accomplishments in the navy's post-war history. The helicopter/destroyer - a revolutionary idea - receives a cursory glance in a page-and-a-half of text. While he recognizes the significance of the concept, he does not place it in its proper context.

Stuart E. Soward's book, Hands to Flying Stations: A Recollective History of Canadian Naval Aviation, 1945-1954, suffers from some the same limitations as those of

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[18] See, Commander Tony German, The Sea is at Our Gates: The History of the Canadian Navy, (Toronto: McClelland and Stewart, 1990).

German's book.[19] Soward, a former fixed-wing pilot in the RCN, also has an axe to grind. He views the demise of carrier-borne aviation in 1970 as a miscalculation of the highest order. Although helicopters appear in his narrative they are secondary to his main story. That is understandable as the story ends in 1954 when helicopters were only beginning to make their mark in the RCN, primarily in a utility role. His promised second volume may cover the topic in greater detail.

In the first volume, Soward's examination of the helicopters in the RCN offers little new information. He relied primarily upon interviews and secondary sources and cannot, therefore, furnish a detailed account of their history from a policy or technical perspective. In fact, much of what does appear can also be found in Kealy and Russell's book, A History of Canadian Naval Aviation, 1918-1962, which was published nearly thirty years earlier.

Peter Charleton's. Certified Serviceable: Swordfish to Sea King continues the Canadian aviation story, albeit from a different perspective. Charleton, a naval officer who was a member of VX-10, the navy's test and development squadron, examines naval aviation from a technical viewpoint.[20] Charleton relies on his own prodigious experience, interviews, secondary sources and a select number of primary documents.

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[19] See, Stuart E. Soward, Hands to Flying Stations: A Recollective History of Canadian Naval Aviation, 1945-1954, vol. 1, (Victoria: Neptune Developments, 1993).

[20] See, Peter Charleton and Michael Whitby, eds., Certified Serviceable: Swordfish to Sea King - The Technical Story of Canadian Naval Aviation by Those Who Made it So, (Ottawa: CNATH, 1995). Charleton's other book, Nobody Told Us it Couldn't Be Done: The VX-10 Story, (Ottawa: Published Privately, 1993), is very similar and the two books will be treated as one.

An entire chapter is devoted to the helicopter/destroyer. Charleton, who played a key role in testing the concept, provides a detailed technical account of the equipment and how it functions. The chapter is not as strong on the policy side of the story. This is not surprising, given his technical background, and lack of primary research. There are omissions as well as contextual errors, but it is an important work.

J.D.F. Kealy and E.C. Russell's book, A History of Canadian Naval Aviation, 1918-1962, unlike the previous books, is a study based on the primary documents.[21] As a result, the authors are able to place Canadian naval aviation and the development of the DDH in its proper context. That does not mean to say that Kealy and Russell have adequately examined the topic.

Their examination of the helicopter/destroyer is sketchy to say the least. Very little appears about the important developments before the Buckingham trials in 1956. Even less follows. The conversion of the St. Laurent class destroyers receives less than a paragraph. At first glance, even more curious is the omission of any account of the RCN's fight with the RCAF over control of maritime aviation. The other glaring oversight is the failure to discuss in a detailed manner defence policy and the impact of diminishing budgets on naval aviation. Leaving aside the fact that this book is a survey, a second glance reveals that the main purpose of the book was to record the accomplishments of Canadian naval aviators. The book is particularly strong in that regard. For that reason alone this monograph will remain, for some time to come, a standard reference work.

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[21] See, J.D.F. Kealy and E.C. Russell, A History of Canadian Naval Aviation, 1918-1962, (Ottawa: Queen's Printer, 1965).

Two graduate theses were particularly useful for my own study because they gave much needed background in an otherwise barren landscape. Michael Hennessy's, "The Rise and Fall of a Canadian Maritime Policy, 1939-1965: A Study of Industry, Navalism and the State," is the most recent examination of post-war Canadian maritime history.[22] As the title suggests, this dissertation is a detailed examination of the wider issue of Canadian maritime policy - commercial as well as naval. As such, there is little on the development of the helicopter/destroyer. The strength of this dissertation, for our purposses, is its examination of the roots of Canadian naval policy in the post-war period which traces the shift away from the balanced fleet to the highly specialized ASW fleet.

Sean Maloney's thesis, "'To Secure the Command of the Sea': NATO Command Organization and Naval Planning for the Cold War at Sea, 1945-1954," expands upon that theme.[23] Maloney's work is especially good on NATO plans and structure. More important, he situates the RCN and its role within the larger alliance. To date, very little exists on the RCN in this period. Most scholars of the post-war Canadian military tend to discuss the role of either the army or air force in Europe.

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[22] Michael A. Hennessy, "The Rise and Fall of a Canadian Maritime Policy, 1939-1965: A Study of Industry, Navalism and the State," (Fredericton: University of New Brunswick, Ph.D. Dissertation, 1995). Hennessy's dissertation should be read in conjunction with his article "Fleet Replacement and the Crisis of Identity".

[23] Sean Maloney, "'To Secure the Command of the Sea': NATO Command Organization and Naval Planning for the Cold War at Sea, 1945-1954." (Fredericton: University of New Brunswick, M.A. Thesis, 1992). Maloney's thesis is being published by United States Naval Institute Press. His thesis should be read together with his article, "Parry and Thrust: Canadian Maritime Forces and the Defence of North America, 1954-1962." A Paper Presented to the Conference on Cuban Missile Crisis-era navies, Moscow, 6-8 September 1994.

One article was especially important to an understanding of the development of the helicopter/destroyer. Mathwin S. Davis's, piece entitled, "The `St. Laurent' Decision: Genesis of a Canadian Fleet," examines the decision-making processes by which the RCN in 1947-1953 moved toward a specialization in anti-submarine warfare with modern and sophisticated vessels in the context of the early Cold War.[24] Davis, a distinguished "sailor-scholar", approaches his subject from a unique perspective, his education in public administration greatly influencing his methodology. Although his personal experience in the St. Laurent destroyer-escort project informs his work, he is more concerned with how the navy as an organization came to make the decisions that it did. Not surprisingly, he concentrated on the small circle of officers and civilians who set policy. Davis, employing an organizational decision-making model, outlines the five steps in the process: preliminaries, approach to decision, initiation, implementation, and fulfilment. Obviously, there are other factors at work as well, including extra-rational processes that involve intuitive judgement.[25]

Davis's article is important for two reasons. It is one of the first studies on the post-war navy to be based on wide-ranging primary research. More important, perhaps, he offers students of the Canadian navy a different way to view the decision-making process, other than the traditional top-down narrative approach. It will be interesting to see if, after a detailed

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[24] See, Mathwin S. Davis, "The `St. Laurent' Decision: Genesis of a Canadian Fleet," in The RCN in Transition, 1910-1985, (Vancouver: UBC Press, 1988), pp. 187-208.

[25] Douglas Bland, soldier academic, uses a similar model for his examination of Canadian defence policy in the post-war period. See, Douglas Bland, The Administration of Defence Policy in Canada, 1947 to 1985, (Kingston, Ontario: Ronald P. Frye and Company, 1987).

examination of the naval records, his type of analysis applies to this study on the development of the helicopter/destroyer escort in the post-war Canadian navy.

The purpose of this dissertation is to trace, in narrative form, a major theme through a sustained time period in the post-war history of the Royal Canadian Navy (RCN). More specifically, this thesis will describe, and then assess, the various internal and external forces, such as inter-service rivalries, the budget, the role of alliances, and the onset of the Cold War, which underpin and explain the development of the helicopter/destroyer escort in the post-war Canadian navy. This is the first study to undertake such a detailed examination of these issues in the post-war era based on extensive primary sources.

Most of the documents for this study were culled from the National Archives of Canada, and the Directorate of History, Department of National Defence. In fact, this thesis is based almost exclusively upon those records, because of problems with access to the documents elsewhere and because of the paucity of secondary sources. The Royal Navy and the United States Navy played a role in this story. but the documents held in the British and American archives are, for the most part, still closed beyond 1954. The present dissertation was possible because of the vast archival sources now available in Canada. Having said that, materials for the period after 1964 are generally still closed. For that reason, I have chosen to end the story in that year. 1964 was an appropriate end date for another reason. By the summer of that year, the trials had proved beyond a shadow of a doubt that the DDH concept was feasible. All that remained was to resolve certain technical problems which had shown up in the trials.

The first chapter provides an overview of anti-submarine operations during the Second World war, paying particular attention to the role of naval aviation. The second and third chapters examine RCN policy and plans as they relate to fleet composition and the naval air branch in the post-war period up to the outbreak of the Korean War. Chapter four is a detailed examination of how the navy viewed helicopters - a new and experimental technology - in that conflict. This was a particularly important period in the RCN's history, especially considering the changing international enviroment and the technological revolution that was taking place, especially in anti-submarine warfare. The fifth chapter then turns to a discussion of the role of the North Atlantic Treaty organization (NATO) in determining Canadian naval policy and fleet composition. Chapter six, traces the early days of the RCN's experimental helicopter squadron as the navy struggled to come to terms with the new technology. Chapter seven continues that story, describing the first helicopter trials, which were designed to test the feasibility of the helicopter/destroyer concept. Chapter eight, provides a detailed account of the navy's bitter struggle with the air force over control of maritime aviation, and specifically helicopters. The next part of the study, chapter nine, examines the navy's various ASW helicopter procurement plans and the integration of rotary-wing aircraft into the fleet. Chapter ten provides an overview of the Sea King helicopter procurement programme, and describes the last of the helicopter trials aboard a St. Laurent class destroyer. The conclusion and epilogue summarize and assess the impact of the helicopter/destroyer concept on navies around the world since 1964.

CHAPTER ONE

`WHIRLYBIRDS', MERCHANT SHIPS AND ASW: THE EARLY YEARS

Canada, with the longest coast-line of any country, and vital ocean interests, has nevertheless been most reluctant to acquire naval power. That tradition is deeply ingrained. In the words of a recent survey of the subject, Canada, as a colony of Great Britain, "...was safe against any but minor harassing raids in wartime. That slight danger, and the immediate peacetime need to police territorial waters - a task to which Canadian governments attached much greater importance - required only modest coastal vessels".[1]

This advantageous situation came to an end in 1904 when British naval forces were withdrawn from the western hemisphere. The Canadian government came under pressure from Britain and influential groups within the nation to provide large warships to reinforce the Royal Navy (RN) in either European waters or the western Pacific. Canada was thus placed in the difficult position of trying to balance limited national requirements for maritime forces against larger alliance commitments. The government's difficulties were exacerbated by the fact that large warships were expensive and, traditionally, Canada had never been willing to spend large amounts on defence, instead preferring to rely on either Britain or the United States for protection. The experience of two world wars was to teach Canada that

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[1] Roger Sarty and Donald M. Schurman, "Canada's Client Navy, 1867-1945," Argonauta: The Newsletter of The Canadian Nautical Research Society, vol. 4, (31 March 1987), p. 1.

this confidence was misplaced and her allies could not be depended upon to solve the nation's defence problems.

At the outset of the First World War, Canada was ill-equipped and unprepared for the type of maritime war it was forced to wage. In the years before the conflict, heated political debate over the size of the navy and the type of ships it was to man resulted in a deadlock that left the Canadian naval service in 1914 incapable of assuming an active seagoing role. Instead, it was forced to focus on coastal defence activities, such as minesweeping in harbour approaches, the examination of merchant vessels in support of Britain's blockade of the central powers and the occasional observation patrols along the Atlantic coast. This was adequate back-up for the British cruisers that returned to Canadian waters on the outbreak of war. Unfortunately, aggressive German use of the torpedo-firing submarine, a weapon system that had been in the earliest stages of development only a decade before the war, posed a new threat against which the cruisers were powerless.[2]

In 1915, German successes against major allied warships and merchant shipping in European waters and rumours that U-boats would shortly be deployed against the Atlantic coast caused a near panic in Canadian naval circles. To combat the dreaded underwater menace, Admiral Charles E. Kingsmill, the director of the Canadian naval service, pleaded

[2] The RCN had only two obsolescent cruisers, two submarines and a handful of auxiliary vessels to meet the German surface threat. British cruisers returned to Canadian waters for defence against German surface raiders. As Roger Sarty has shown, "the Admiralty sharply discouraged expansion of the RCN so that Canada could devote all of her resources to the Empire's most urgent need land forces for Europe...." See, Roger Sarty, "Hard Luck Flotilla: The RCN's Atlantic Coast Patrol, 1914-1918," in The RCN in Transition, 1910-1985, W.A.B. Douglas, ed., (Vancouver: UBC Press, 1988), p. 105, and; Roger Sarty, "The Origins of Canada's Second World War Maritime Forces, 1918-1940," (DHist), pp. 2-3.

with the Admiralty for torpedo boat destroyers. These fast manoeuvrable ships had proved to be the best anti-submarine vessels in European waters and Kingsmill wanted them for his command. His appeal fell on deaf ears as the "Admiralty, quite properly in view of the shortage of destroyers in the main combat theatre, refused requests for assistance in 1915 and again in 1916, but also denounced the RCN's effort as excessive because the threat was `potential not actual'".[3] Two years later, after sound intelligence correctly warned that the Germans would shortly be using new classes of large U-boats for transatlantic operations, the Canadian navy turned to the United States Navy (USN) for assistance, only to be told that that service had committed its meagre destroyer resources to the Royal Navy. Consequently, the tiny Canadian navy was left to fend for itself.

By the end of the war, the RCN had amassed a substantial fleet of small craft to meet the German U-boat threat to Canada's shores, but they could hardly be considered effective submarine hunters. The RCN's inability to locate and sink the three U-boats that operated off Nova Scotia during the latter stages of the war was to profoundly influence Canadian naval planning over the next two decades.

During the interwar period, the RCN chose to pursue the acquisition of destroyers, a type cheap enough to win the support of the politicians, but which had proved its power and flexibility in 1914-1918. During the 1920's and 1930's, the worry of the Canadian staff was that Great Britain's diminished fleet would not again supply cruisers to protect Canada's shores against the powerful new cruisers - raiders the Germans and especially the Japanese

[3] Roger Sarty, "Canada and Submarine Warfare, 1909-1950," A Paper Presented at the Centre for Foreign Policy Studies Conference "Undersea Dimension of Maritime Security," Halifax, June 1990, p. 9.

were building. It was the RCN's view that these destroyers, with their torpedoes and comparatively heavy guns, had a chance of driving off enemy cruisers from coastal waters. Although the submarine had seemed a secondary threat until Hitler proclaimed expansion of the re-born U-boat fleet in late 1938, there is no doubt that Canadian policy also "reflected the bitter experience of 1918, when both the United States and Britain had failed to supply destroyers to counter the U-boat offensive off Nova Scotia".[4] By the late 1930's the RCN possessed a small but modern fleet consisting of six destroyers, five minesweepers and two auxiliary vessels. Unfortunately, the Royal Canadian Navy was ill-equipped and unprepared not only for the dimensions of the coming struggle, but for the type of naval war that service would have to wage when the U-boat arm again seized the initiative through technical and tactical innovation.

Established naval doctrine in the world's navies still clung to the cherished traditions of a major battle fleet confrontation. The Royal Navy, for example, was "obsessed by the lessons learnt from this indecisive clash with the German High Seas Fleet in May 1916."[5] The Jutland fixation manifested itself in the argument that a decision could only be achieved at sea through two fleets in line-ahead formation bombarding each other, on parallel courses and at very long range. German, Japanese and American admirals thought much the same way. Although it possessed no capital ships nor had plans to procure such vessels, the RCN was not immune to such thinking. But given the size of its fleet, it could only plan to provide its

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[4] Roger Sarty, "The Origins of Canada's Second World Maritime Forces, 1918-1940," p. 5.

[5] Stephen Roskill, Naval Policy Between the Wars, vol. I, (London: Collins Press, 1968), p. 533.

destroyers as screens for battleship and cruiser task forces that the RN might have to despatch to the eastern Pacific, western Atlantic or Caribbean to hunt heavy Japanese or German raiders.

Anti-submarine warfare was not ignored completely during the 1930's. However, the RCN, like the British and American services, thought of A/S operations in very narrow terms, such as sweeps of the approaches off Halifax and local convoy operations, a concept that reflected First World War experience when the U-boat had limited success in coastal "focal areas" where shipping was concentrated and easy to find.[6] Prior to the war the Royal Canadian Navy and Admiral P.W. Nelles, Chief of the Naval Staff (CNS), in particular, failed to recognize the potential of the submarine and the serious threat it posed to mercantile shipping. Writing in 1937, the CNS reasoned that:

> If international law is complied with, submarine attacks [on] merchant shipping should not prove serious. And in the event of unrestricted warfare ... the means of combating submarines are considered to have so advanced that the telling system of convoys and combined air/sea operations would wreak a heavy toll of U-boats and likely compel the enemy to give up this form of attack.[7]

Nelles was sadly mistaken in his appreciation of the situation. In all fairness, however, his analysis reflected an essentially British view, based upon the existence of the underwater detection device Asdic (later known by the American term sonar) that had been developed

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[6] By March 1940, the RCN obtained government approval to build fifty-four corvettes and twenty-eight Bangor-class fleet minesweepers, primarily for in-shore anti-submarine and escort duties. See, Michael J. Whitby, "Instruments of Security: The Royal Canadian Navy's Procurement of the Tribal-Class Destroyers, 1938-1943," The Northern Mariner, vol. II, no. 3, July 1992, pp. 2-4.

[7] "Defence of Trade," N.A.C., MG 27, III, B5, N. 37, file D-26, as cited in Michael L. Hadley, U-Boats Against Canada: German Submarines in Canadian Waters, (Kingston and Montreal: McGill-Queen's University Press, 1985), p. 11.

at the very end of the First World War. That aside, Germany seemed unlikely again to flaunt international law with all-out submarine warfare, when in 1917 that policy had sealed the defeat of the Central Powers by bringing the U.S. into the war on the Allied side. No one foresaw that Hitler would be willing to run that risk, nor that the little-understood and complex ocean environment would seriously limit the performance of asdic. Moreover, German tactical innovation -through use of massed U-boat "packs" in fast surface night strikes on shipping - would render asdic useless in many critical battles.[8] As it was, the Admiralty were so confident about asdic's ability to detect submarines that they reported to the Shipping Defence Advisory Committee in 1937 that, "the submarine should never again be able to present us with the problem we were faced with in 1917."[9]

Still, the Admiralty did make significant preparations. The single most important step taken during the first days of the Second World War, and one which would have a profound impact on the RCN, was the decision to implement a transatlantic convoy system, the measure belatedly taken in 1917 that had very nearly stopped the U-boats in their tracks. Convoys were hard to find, and even when located had to be approached with extreme caution because of the armed escorts. During the first six months of the war, the German U-boat campaign was concentrated in British coastal waters and achieved only limited success in the face of

[8] Admiral Doenitz, Ten Years and Twenty Days, (London: Weidenfeld and Nicolson, 1959), p. 14. Doenitz did not think that asdic had proved itself operationally.

[9] Stephen Roskill, The War at Sea, 1939-1945: The Defensive, vol. I, (London: Her Majesty's Stationary Office, 1954), p. 34. It must be understood, however, that although the asdic gave the direction of the submerged target and its distance it did not give its depth. The depth at which to explode the depth charges could therefore only be guessed.

convoy and stronger defence measures, notably patrols over the sea by land-based aircraft whose appearance drove submarines from the shipping lanes.

It was not until the fall of France and the capture of the Biscay ports that a sustained mid-ocean campaign, out beyond the main British defences, became feasible. The acquisition of the French ports meant that the U-boats no longer had to make the long and dangerous passage from the Baltic through the North Sea to operate in the North Atlantic. The increased effectiveness of the German U-boat fleet and the fact that the submarines began to operate in 'wolfpacks' that by spreading out in search formation could find convoys and then close at night for rapid surface strikes spelled potential disaster for the RN and the Commonwealth navies.[10] So short was the RN of A/S vessels that they could supply screens to convoys only to about 350 miles out from the British Isles. Fortunately, on the basis of First World War experience, the Canadian government had in early 1940 begun to mass produce a new British designed coastal A/S escort, the corvette, to complete the Canadian coast defences and also to provide a surplus to assist the British. These ships were rudimentary - especially the ones produced by Canada's shipbuilders who had little or no experience of naval construction - but they were adequate, although hardly, for open ocean operations. Thus, when merchant ship losses at mid-ocean mounted through late 1940 and early 1941 and the British called for end-to-end convoy protection, Canada was able to take a leading part in the creation of the Newfoundland Escort Force (later Mid-Ocean Escort

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[10] See, Marc Milner, North Atlantic Run: The Royal Canadian Navy and the Battle for the Convoys, (Toronto: University of Toronto Press, 1985).

Force) which supplied an A/S screen for convoys between Newfoundland and Iceland (later Northern Ireland).

The emergence, largely by accident, in 1941-1945 of the transatlantic escort of trade against submarines - the defence of the `lifeline to Britain -was an extremely useful alliance role for Canada. It was a function that could be carried out by a modestly equipped navy of moderate size. Moreover, the mid-ocean escort role was domestically appealing because it meant that Canada maintained its traditional links with Great Britain to balance growing American influence, while minimizing potential casualties. The government of Mackenzie King preferred supplying relatively small ship's crews who stood a fair chance of survival to the provision of mass armies for Europe. At the same time, Canada's participation in the vital Battle of Atlantic was sufficiently prominent enough to give her a meaningful voice within the alliance.

The success of the convoy system was dependent on adequate air and surface escort, and this requirement forced all the Allied navies, including the RCN, to shift their focus from fleet operations to escort duties. One lesson that had to be relearned from the First World War was the full value of air power in ASW, and it proved a costly refresher course for the Allies.[11] As merchant and warship losses mounted, the Allies employed new weapons to the

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[11] Aviation as a component of sea power was considered of secondary importance in 1914, but under the pressure of war it very soon began to improve technically and exert a profound influence on the whole concept of naval warfare. Experience in European waters had shown that a submarine immediately dived upon sighting an aircraft which allowed the merchant ships to pass unmolested. The RCN was not immune to those developments. By late war the RCN was actively pursuing the creation of its own naval air arm. In September 1918, the Royal Canadian Naval Air Service was formally created, but it never got off the ground. Post-war retrenchment soon sealed the fate of the nascent service.

counter the U-boat menace. The use of increasingly long-range - ultimately transatlantic - shore-based aircraft and the development of small escort aircraft carriers have been well documented. Less well-known is the introduction of the helicopter as an anti-submarine warfare (ASW) platform, which can be traced to the crisis years, 1942-1943, of the Battle of the Atlantic.

During the course of the naval war, the Allies would employ a myriad of weapons against the submarine. They included improved types of asdic; long-wave and then centimetric radar to enable escorts and aircraft to detect surfaced submarines in conditions of poor visibility; depth charges of increasing varieties and lethality; and more accurate ahead-throwing weapons like Hedgehog and later Squid. Corvettes were extensively re-built to make them longer range, more seaworthy and carry this new equipment; they were replaced by purpose-built ocean escorts, especially the frigate, which was half again as large - the size of pre-war fleet destroyers. Many pre-war fleet destroyers themselves were stripped of their elaborate guns and torpedo armament to carry more fuel, depth charges and electronic equipment. Anti-submarine warships in fact had been transformed within the space of a very few years from minor auxiliary vessels to substantial warships.

The intelligence side of the struggle involved no fewer personnel, and scientific efforts that were at least as sophisticated. The great weakness of German U-boat operators was the need for constant radio communication for coordination and homing. Initially, the British with substantial Canadian and then American help, developed shore-based H/F D/F stations on both sides of the Atlantic to provide bearings on U-boat transmissions. That was of some help in directing A/S forces against them and, more importantly, routing convoys clear of danger. Then, in an extraordinary breakthrough, British scientists, intelligence personnel, and a wide range of academics, students and other civilians with language and puzzle-solving skills, supported by a huge effort by industry to produce machines for manipulating data, began to decipher the German navy's machine-scrambled codes. This gave, in the last half of 1941, and then in 1943-1945, clear information as to U-boat locations and intentions.[12]

Allied tactical innovations included the creation of support groups, which operated some distance from a convoy and moved in against the submarines which were attempting to concentrate against it.[13] It might be set down as an axiom that, "in a pursuit as complex as is the waging of war; no one factor, and certainly no one weapon can be exclusively decisive."[14] Having said that, continuous air support, both shore-based aircraft and aircraft carriers working as part of the escort groups, was required to defeat the U-boats. The advent of the helicopter as an ASW weapon must be viewed in this context.

There is some question as to when the RCN first recognized the importance of naval air forces for the successful prosecution of the war at sea. J.D.F. Kealy and E.C. Russell have

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[12] See, F.H. Hinsley, British Intelligence in the Second World War, vols. 1-3 (London: HMSO, 1979-1983); Patrick Beesly, Very Special Intelligence, (London: Hamish Hamilton, 1977).

[13] Rear-Admiral J.R. Hill, Anti-Submarine Warfare, (London: Ian Allan Ltd., 1984), pp. 12-13.

[14] Bernard Brodie, A Guide to Naval Strategy, (New York: Frederick A. Praeger Publishers, 1965), p. 192.

identified 1942 as the crucial year, whereas Stuart Soward argued that 1943 was more important.[15] In a sense they are both correct.

Acting-Captain H. Nelson Lay, Director of Operations Division (DOD), singled out 1941 as the year in which "it became quite clear that we had to have a great deal more help from the air" to counter the U-boats.[16] Lay based this statement on the fact that mercantile shipping losses were increasing and the number of surface escorts available was limited, which made it difficult to ensure adequate protection for the convoys. Moreover, shore-based aircraft operated by the Royal Canadian Air Force (RCAF) from bases in Nova Scotia and Newfoundland were of marginal value owing to their limited range; they could not get very far out to sea, and once on the scene could provide protection only for a few hours before having to return to base. More important, poor weather conditions in the Maritimes frequently curtailed even these limited missions, or forced them to be cancelled. In light of these facts, Lay turned his attention to the first auxiliary aircraft carriers (escort carriers) which were then being built in the United States and Britain.

In December 1940 the Admiralty had ordered the conversion of the 6,000 ton Hannover, a captured German blockade-running cargo ship, to an escort carrier. Re-named

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[15] J.D.F. Kealy and E.C. Russell, A History of Canadian Naval Aviation, 1918-1962, (Ottawa: Department of National Defence, 1965), p. 21; Stuart Soward, "Canadian Naval Aviation, 1915-1969," in The RCN in Retrospect, 1910-1968, ed. James A. Boutilier, (Vancouver: University of British Columbia Press, 1982), p. 273.

[16] Interview conducted with Rear-Admiral H.N. Lay, RCN, on 14 January 1974, Directorate of History, Department of National Defence, 74/653 (DHist). Lay is concerned here primarily with anti-submarine warfare and the defence of convoys, although, he does make mention of other aspects of naval aviation. In his memoirs he refers specifically to Fleet Air Arm operations against the Italian base at Taranto in 1941. See Rear-Admiral H.N. Lay, Memoirs of a Mariner, (Ottawa: Lowe-Martin Company, 1982), p. 142.

Audacity, she was fitted with a small flight deck, arrester wires and a barrier, but no hangar. She was capable of operating six naval fighters for use against German long-range aircraft which were then operating in the eastern Atlantic. Audacity was commissioned in June 1941, and sailed in September escorting convoy OG 74 to Gibraltar. During the passage, her aircraft were able to destroy one Focke Wulf 200 long-range reconnaissance bomber and assist in damaging a U-boat.[17] HMS Audacity escorted three more convoys before she met her end at the hands of U-751. In the four operations in which Audacity took part, her aircraft sighted nine U-boats forcing them to submerge and thereby drop out of action, shot down five Focke Wulf 200's and damaged three others. This success led directly to the release of five more merchant ships for conversion to escort carriers.[18]

Acting-Captain Lay later claimed that "it was about the first month in 1942 that [he] started putting his own ideas on paper for naval aviation, or more precisely carrier borne aviation which would be able to stay with the convoy throughout its entire passage across the

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[17] Kenneth Poolman, Escort Carrier, 1941-1945: An Account of British Escort Carriers in Trade Protection, (London: Ian Allen, 1972), pp. 17-20.

[18] Naval Staff History, The Development of British Naval Aviation, 1919-1945, vol. II, (Historical Section Admiralty, 1956), pp. 88-89. One of the many interim measures introduced by the Admiralty to counter the U-boat and to close the "air gap" was the introduction of Catapult Aircraft Merchant Ships (commonly referred to as the CAM ships). The RN decided to fit out 35 merchant ships as CAM ships with rocket type catapults capable of launching a Hurricane I aircraft. The main drawback to this type of vessel was the fact that once the aircraft was launched it could not land back on. The pilot was forced to return to base if it was within reach, parachute into the sea, or ditch his aircraft. The advent of the CAM ship was at best an extempore measure taken to meet as expeditiously as possible the threat of increased shipping losses through air attack. The fighter catapult ship was another interim measure taken by the Admiralty to deal with long-range Focke-Wulf aircraft operating against convoys. Fighter catapult ships could carry up to three fighters as opposed to the single fighter carried on the foc'sle of CAM ships. Similarly, they were never more that a "stop-gap" measure, as they suffered from the same limitations as the CAM ships.

Atlantic."[19] At this time, Lay's observations never went much beyond a tacit recognition of the value of naval aviation. Nevertheless, his interest in naval aviation was profound. He had applied for the Fleet Air Arm (FAA) course with the Royal Navy in 1927 and again in 1928, but was rejected both times.[20]

In 1941, Naval Service Headquarters (NSHQ) had agreed to an Admiralty request for a limited number of Royal Canadian Naval Volunteer Reserve (RCNVR) officers to be trained for Fleet Air Arm duties. In May 1942, Naval Service Headquarters received another request from the RN for Canadian assistance in the manning of its ships, including aircraft carriers. The Naval Board responded later that month, noting that there was no objection to Canadian personnel on loan to the Royal Navy being transferred to the FAA as the RCN did not intend to establish a Canadian Fleet Air Arm at this time. It remains unclear, however, how many Canadian personnel were affected by the Naval Board's decision.

The literature suggests that there were only a few informal discussions during the autumn of 1942 amongst a small number of officers at NSHQ regarding the possibility of establishing a Royal Canadian Naval Air Service (RCNAS). The documents indicate, however, that a good deal more was taking place at headquarters. In the fall of 1942, Lay received an unsolicited memorandum from Commander C. Thompson, RN. - Commanding

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[19] Interview conducted with Rear-Admiral H.N. Lay, DHist 74/653. No evidence exists regarding Lay's claim that he put his ideas down on paper, although it is quite plausible given his interest in naval aviation.

[20] Ibid. In an attempt to get into the course in 1928 Lay used the argument that both the Royal Navy and the United States Navy had naval aviation and therefore it would be very useful to have one or two officers in the Canadian navy who were trained in this form of naval warfare.

Officer (CO) of HMS Witherington, a British destroyer serving with the RCN's Western Atlantic Local Escort Force - dealing ostensibly with the need for naval pilots and observers in RCAF squadrons employed on naval cooperation duties.[21] Commander Thompson emphasized that air operations over the sea were carried out far more efficiently by naval officers who had received air training than their counterparts in the air force. Using this as the basis of his argument, he stated that:

> It follows from this that some form of Royal Canadian Naval Air Service must be created, and/or naval pilots and observers trained in order to carry out the various air cooperation duties that are required by the RCN.[22]

It remains unclear what impact this memorandum had on the Naval Staff. What is known, however, is that NSHQ approached Thompson for additional information on naval aviation.

By late 1942 the Admiralty had devised a scheme in which Canadian officers would receive training as pilots or observers with the FAA while retaining their status in the Royal Canadian Naval Volunteer Reserve (RCNVR). In late December 1942, they sent a signal to sound out NSHQ's views. The Naval Staff in Ottawa was slow to reply because serious consideration was now being given to the creation of a Canadian naval air arm. The RN's escort carriers' successes in confrontations with the U-boats on the UK-Gibraltar run, coupled with the poor showing, and subsequent temporary withdrawal, of Canadian escort groups

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[21] Memorandum by Commander C. Thompson, RN, "The Necessity for Naval Pilots and Observers in Royal Canadian Air Force Squadrons Employed on Naval Cooperation Duties," 25 September 1942, DHist 1700-219, vol. I. Commander Thompson was the Commanding Officer, HMS Witherington (a British destroyer) serving with the Western Local Escort Force. As a Western Local Escort Force (WLEF) ship commander, he had first-hand experience of problems of RCN-RCAF co-operation in ASW operations.

[22] Ibid.

from the mid-Atlantic for re-equipment and training, had reinforced Canadian naval authorities' interest in naval air power.

Captain Lay produced the naval staff's first paper on the subject in January 1943.[23] Lay reiterated Thompson's arguments and noted that "all the important Navies in the world have their own Naval Air Service, which are directly under the control of these navies."[24] He further stated that the surface escorts and shore-based aircraft presently available were unable to meet the demands of trade protection and anti-submarine warfare, while adverse weather conditions often found on the east coast of Canada frequently thwarted shore-based flying operations. Lay, noting that the RN and the USN were planning to provide escort carriers for trade protection duties, concluded that, if the RCN "wished to provide adequate escort for mid-ocean convoys, [it] must have, and be able to man, similar aircraft carriers for at least its mid-ocean groups."[25]

Lay made ambitious proposals. One or more RCN officers of commander or captain rank should be sent for duty in RN carriers; sufficient personnel should be sent to the United Kingdom to man four escort carriers; the RCN should build, convert, or purchase four escort carriers to be used with the four Canadian mid-ocean escort groups and; that Nelles should respond positively to the Admiralty's signal regarding training for Canadian personnel as pilots

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[23] Memorandum, "Formation of Canadian Fleet Air Arm," Director of Operations Division to Vice-Chief of the Naval Staff, 11 January 1943, DHist 1700-219, vol. I.

[24] Ibid.

[25] Ibid.

and observers in the Fleet Air Arm.[26] Admiral Jones, VCNS, added his own recommendation that Lay be sent to England to study all phases of naval air operations and suggested that the RCN accept the Admiralty's offer to train Canadian personnel.[27]

In February 1943, Acting-Captain H.G. DeWolf, Director of Plans Division (DOP), supported Lay's arguments with a note on a recent disaster at sea. "Convoy SC 118 was yet another indication that escort vessels alone cannot provide protection required by a convoy against determined attacks by U-boats."[28] Although the convoy was escorted by three RN destroyers and four Free French corvettes, and later reinforced by two USN destroyers and a cutter, these warships could not prevent the destruction of eleven ships. To the British, the performance of the escorts on SC 118 "drove home the need for training, teamwork, and good leadership."[29] It also drove home the fact that effective air support was urgently required in the Greenland Air Gap and should be provided by both very long-range aircraft and escort carriers.[30] One can only speculate that similar unsustainable losses to convoys

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[26] Ibid.

[27] Note from Vice-Chief of the Naval Staff to the CNS, 29 January 1943, DHist 1700-219, vol. I.

[28] Memorandum "Naval Air Protection," from DOP to Vice-Chief of the Naval Staff and CNS, 22 February 1943, DHist 1700-219, vol. I.

[29] Marc Milner, North Atlantic Run: The Royal Canadian Navy and the Battle for the Convoys, (Toronto: University of Toronto Press, 1985), p. 224.

[30] Analysis provided by the Operational Research Section of the Admiralty suggested that the best way to counter the U-boat was by very long-range aircraft and merchant aircraft carriers, but the argument fell on deaf ears. Some believed that very long-range aircraft would be better employed in strategic bombing offensives against submarine bases in France, and aircraft carriers should be used in fleet operations rather than anti-submarine warfare operations. See John Winton, Convoy: The Defence of Sea Trade, 1890-1990, (London:

escorted by Canadian groups further reinforced certain Canadian officers' convictions about the importance of naval aviation.[31]

DeWolf's memorandum is of special interest here because he called for the consideration of other aspects of naval aviation such as non-rigid airships (blimps) and helicopters, the latter operating from merchant ships in convoy.[32] Admiral Jones concurred with DeWolf's recommendation that naval aviation should receive top priority. The following day he advised Nelles that both Lay and DeWolf should report on what steps the RCN should take.[33] This note, of 23 February 1943, was the first formal proposal for the creation of a separate naval air arm in the RCN.

British interest in the helicopter dated back to 1941, when the Director of Naval Development and Production, Captain Caspar John, despatched a team to the United States to investigate the use of rotary-wing aircraft. They, and the British Admiralty Delegation in Washington, were convinced that helicopters might contribute significantly to anti-submarine

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Michael Joseph Ltd., 1983).

[31] I am referring to: SC 42 (September 1941), ON 113 (July 1942), ON 115 (July 1942), ON 127 (September 1942), and SC 107 (September 1942).

[32] For a detailed history of the Royal Canadian Naval Air Service during the Second World War see, Shawn Cafferky, "Towards the Balanced Fleet: A History of the Royal Canadian Naval Air Service, 1943-1945," (Victoria: University of Victoria, unpublished M.A. Thesis, 1989); Shawn Cafferky, "Flying High: The Royal Canadian Naval Air Service, 1944-1946," (Unpublished DHist Narrative, 1992), and; Donald E. Graves, "The Royal Canadian Navy and Naval Aviation, 1942-1944," (Unpublished DHist Narrative, 1989).

[33] Note from Vice-Chief of the Naval Staff to CNS, 23 February 1943, DHist 1700-219, vol. I.

warfare.[34] Indeed, the RN was so impressed with the potential of a prototype naval helicopter that, after trials in 1943, it ordered 250 of them from the USN.[35]

By contrast, the American response to helicopter had been lukewarm, to say the least. When Igor Sikorsky demonstrated his first helicopter at the start of the Second World War, the USN saw no future in the machine, leaving it to the U.S. Army Air Corps to watch developments. The U.S. Congress had appropriated two million dollars in 1938 to conduct research on rotary-wing aircraft, but the navy considered it a "minor application that hardly justified the expenditure of funds."[36] It was left to the U.S. Coast Guard (USCG) to develop the potential of the maritime helicopter, but that service was dependent upon the U.S. Army to provide the aircraft.

In early 1942, a year after the first successful test of the Sikorsky VS-300 (HNS-1), Commander Frank Leamy, USCG, endorsed the purchase of a few helicopters for training and testing. Both Rear-Admiral Harvey Johnson, Chief Engineer of the USCG, and Lloyd

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[34] Rear Admiral Richard Cobbold, "The Maritime Helicopter," in RUSI, (April 1994, vol. 139, no. 2), p. 56.

[35] The U.S. Coast Guard played a key role in the development of the helicopter for anti-submarine warfare. Indeed, the American Coast Guard was responsible for pointing out the merits of the helicopter to the USN. See Robert M. Browning, "The Eyes and Ears of the Convoy: The Development of the Helicopter as an Anti-Submarine Weapon," in Air Power History, Summer 1993, Volume 40, Number 2, pp. 30-37. In addition to the 250 Sikorsky helicopters already on order the RN was also negotiating to buy an additional 800 helicopters of the HOS type at a time when the U.S. Coast Guard had only two on order. J.F. Farley, "The Coast Guard and the Helicopter," 2-5, Central File, Aviation/Helicopter, RG 26, National Archives, Washington, D.C., as cited in Robert M. Browning, "The Eyes and Ears of the Convoy," p. 30.

[36] J.F. Farley, "The Coast Guard and the Helicopter," 2-5, Central File, Aviation/Helicopter, p.4, RG 26, National Archives as cited in Robert M. Browning Jr., "The Eyes and Ears of the Convoy," p. 32.

> will never be able to support a fleet carrier in peace time and their air organization would consequently become redundant....[15]

These officers as well as the First Sea Lord were more interested in alleviating the Royal Navy's manpower shortage (estimated at 20,000 men) than in assisting the Canadian navy in organizing its own air arm. If, however, Canadian personnel could be found to man one or two carriers in the Royal Navy and thereby alleviate the British manpower crisis, the Admiralty might look favourably on the larger project for an RCN air service.

Undeterred by the First Sea Lord's response, Nelles continued to press for recognition of Canadian post-war plans. W.A.B. Douglas has suggested that "it might be reasonable to assume that pressure for expansion emanated from the Royal Navy."[16] The documents suggests otherwise in the case of naval aviation. The proposal for the establishment of a Canadian naval air service had originated with Canadian naval authorities. At the Quebec Conference, the matter was not even considered by the Admiralty representatives to be part of the agenda. Admiral Nelles had forced the subject.

It says much about relations between the military and government in Canada that the naval staff used deception in putting its bid for bigger warships and new roles to the prime minister. Nelles asked Pound to include the RCN's shopping list as part of the RN's request for manpower assistance from Canada. The whole package, at Nelles's suggestion, was put

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[15] Assistant Chief of the Naval Staff (Air) to the First Sea Lord, 3 August 1943, ADM 205/31; First Lord and Deputy First Sea Lord to First Sea Lord, 24 August 1943, ADM 1/13044.

[16] W.A.B. Douglas, "Conflict and Innovation in the Royal Canadian Navy, 1939-1945," in Gerald Jordan, Naval Warfare in the Twentieth Century, 1900-1945, (London: Croom Helm, 1977), p. 210.

limitations which severely limited their capacity to carry out naval missions.[39] As shipping losses approached critical levels in the spring of 1942, however, the USCG was forced to ask the army for four Sikorsky helicopters - one HNS-1 and three HOS. Their acquisition later that summer marked the birth of the Coast Guard's helicopter programme.

Senior Canadian naval officers first learned of the helicopter's existence late in 1942. In December 1942, Lay requested new ideas for combating the U-boat. The following month, Lieutenant D.W. Overend, RCNVR, Staff Officer (Fuel) at NSHQ responded, suggesting that:

> some of the frigates [could] be built as baby aircraft carriers. A top flat deck would give them a landing area of perhaps 45 feet by 300 feet, which would not be enough for an ordinary plane; but this could accommodate gyro planes...[40]

Captain A.N. Harrison, Director of Naval Construction, rejected the idea:

> They [frigates] are not long enough and are too narrow in the beam, (bridges, funnels, etc.) unless we have gyro planes. [Moreover], stability will not stand [the additional] top weight. With the increased top hamper in a ship of this draft and power she would be unmanageable in any wind...[41]

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[39] Combined Board for the Evaluation of the Ship Based Helicopter, 31 October 1943, Records of the Chief of Naval Operations - confidential 1943, RG 38, National Archives, as cited in Robert M. Browning Jr., "The Eyes and Ears of the Convoy," p. 32.

[40] Lieutenant D.W. Overend, Staff Officer (Fuel) to Director of Operations Division, 23 January 1943, Record Group (hereafter RG) 24 acc 83-84/167, vol. 575, file 1700-913, vol. 1, National Archives of Canada (hereafter NAC). Previous accounts suggest that Overend was responsible for the original concept of operating helicopters off frigates. However, as his memorandum demonstrates he proposed operating helicopters off a small aircraft carrier (ie. similar to the Merchant Aircraft Carrier). See J.D.F. Kealy and E.C. Russell, A History of Canadian Naval Aviation, 1918-1962, (Ottawa: Queen's Printer, 1967), p. 126; Captain C. Dalley, "The Marriage of the Small Ship and the Large Helicopter," in Maritime Warfare Bulletin, (Commemorative Edition, 1985), p. 67.

[41] Director of Naval Construction to Director of Operations Division, 20 March 1943, RG 24 83-84/167, vol. 575, file 1700-913, vol. 1, NAC. At this time the RN and the USN were

The RCN continued to monitor the potential of the helicopter, but in the interim turned its attention to training a small core of officers as pilots.

In February 1943, Wing Commander Brie, RAF, visited NSHQ with the express purpose of outlining the latest developments in the operation of rotary-wing aircraft. Interest in the helicopter at the staff level led to a letter requesting additional information. On the initiative of Lay, Lieutenant J.S. Stead, Staff Officer (Air), wrote to Commander C.L.G. Evans, RN (FAA), Superintendent of British Air Training (Naval), USA, "for the purpose of ascertaining what the Fleet Air Arm helicopter programme was, and whether it would be possible to have a number of officers of the RCNVR trained together with RN pilots."[42] Commander Evans responded by noting the great potential of the helicopter and suggested that, if the RCN was interested in training a cadre of officers, they should approach the Admiralty directly.

On 2 March 1943, NSHQ despatched two signals to the Admiralty. The first stated that the RCN was prepared to lend personnel for training as pilots and observers with the Fleet Air Arm. The second message requested that "ten RCNVR officers be included in the first [helicopter] course".[43] The Admiralty requested that these officers (fixed-wing and helicopter pilots) be loaned for operational service with the RN. NSHQ agreed, but stipulated

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exploring the idea of operating helicopters off the stern of merchant ships and tankers. In March of 1943 the Admiralty suggested that one or two platforms be fitted to ships building in Canada.

[42] Memorandum from Staff Officer (Air), re: Helicopters, to DOD and Vice-Chief of the Naval Staff, 20 February 1943, RG 24 83-84/167, vol. 575, file 1700-913, vol. 1, NAC.

[43] NSHQ to Admiralty, 2 March 1943, RG 24 83-84/167, vol. 575, file 1700-913, vol. 1, NAC.

that these officers would have to be returned to Canada if the RCN created its own naval air service.

Production of the 250 helicopters ordered in the U.S. by the RN was expected to begin in 1944, and the Admiralty wanted 150 trained pilots, of whom fifty were required by April of that same year.[44] Meanwhile, additional helicopter trials, using two prototypes (HNS-1 and HOS), were scheduled for the spring of 1943. Working together, the British and Americans conducted flying trials off the stern of two merchant ships, S.S Daghestan and Governor Cobb, supplied by the U.S. Maritime Commission.[45]

Grover Loening, who had developed the first amphibious aircraft to go into production for the Coast Guard, and who served as a consultant to the War Production Board which exercised general direction over war procurement and production programmes, was determined to see that "submarines are sunk by helicopters."[46] Loening applied pressure on the USN and on 19 February 1943, Admiral Ernest King, Commander-in-Chief U.S. Fleet and Chief of Naval Operations, issued a directive which placed sole responsibility for the development of the maritime helicopter with the Coast Guard. He also instructed the Bureau of Aeronautics to contact the Maritime Commission to arrange the next series of trials, and

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[44] See Minute Sheet No. 2, NAD 1274/42, 19 November 1943, ADM 1/16464.

[45] The first trials were conducted in May of 1943, on board the tanker Bunker Hill. The Royal Navy conducted flying trials as early as 1942, on board S.S Daghestan, which the RN acquired through lend-lease. Both navies hoped to operate helicopters off merchant ships and tankers. It was also suggested that the Canadians be approached to fit platforms on one or two ships building in the St. Lawrence, to Admiralty account. This suggestion was deferred pending results of the trials. See Admiralty to British Admiralty Delegation (hereafter BAD), 1402A/5, 5 March 1943, ADM 1/16464.

[46] Ibid.

noted that the production of helicopters would be withheld pending the results.[47] The Coast Guard would test, evaluate, and develop the helicopter for anti-submarine warfare. If the tests proved successful, the Bureau of Aeronautics would supply the helicopters and the Coast Guard would supply the personnel and maintenance. To expedite matters, King proposed the creation of a combined board to supervise development.

In May 1943, as the Battle of the Atlantic raged, the "Combined Board for the Evaluation of the Helicopter in Anti-Submarine Warfare" was formed. It comprised representatives from the USN's Bureau of Aeronautics (BuAer), the British Air Commission, the British Admiralty Delegation, the USCG, and the Commander-in-Chief U.S. Fleet. Later, representatives from the War Shipping Board and the National Advisory Commission for Aeronautics were added.

The Combined Board realized that existing rotary-wing aircraft had too many limitations for early operational employment, but believed that these could be corrected and the machine adapted for observation and detection in anti-submarine warfare.[48] As Browning notes, some still held out for a role for the helicopter as a sub killer because it could carry a

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[47] Cominch to Chief, Bureau of Aeronautics, 15 February 1943, Cominch Confidential, Records of the Office of Naval Operations, RG 38, NA, as cited in Robert M. Browning Jr., "The Eyes and Ears of the Convoy," p. 33. King felt that the helicopter should have a minimum crew of one man with a parachute and a life raft, a radio capable of a minimum of one-hundred mile range, and should have no less than four hours endurance. The Army, which had contracted with Sikorsky for 800 helicopters, decided to divert some for naval use.

[48] Tests were underway in the United States to develop a dipping sonar for anti-submarine detection. That programme, which began in 1942, was in the early stages and was being tested on USN blimps.

MK IX 200-pound, fast-sinking-type depth charge.[49] The helicopters could be based on destroyers and directed by radio to the submarines. Then, by hovering until contact was made, the aircraft could drop a depth charge and return to the destroyer for re-arming. However, if the helicopter was rushed into production it would impinge upon airplane production. For that reason, it was decided to continue with evaluation and testing of the helicopter before proceeding with a full-fledged production run.

On 7 May 1943, with fifty observers present, shipboard trials took place on board the tanker Bunker Hill. Colonel Frank Gregory of the U.S. Army Air Force made more than twenty flights off the tanker using a strip of deck only 70 feet long between the forward deck house and the mainmast. The aircraft had no problems in any of the landings, even when the tanker was underway at a speed of 15 knots. Despite the success of these trials there were those observers in the navy who questioned the ability of the helicopter to adjust to a ship's roll, particularly in heavy seas, during the final stages of landing. Loening argued that the rotary-wing aircraft could make up for the vessel's roll by its quickness and that the conditions during the test "did not warrant the headshaking that some observers indulged in."[50]

Ten days after the Bunker Hill tests, representatives of the Maritime Commission, War Shipping Administration, USCG, and BuAer met to discuss the role of helicopters in anti-submarine warfare. A number of issues remained unresolved. Should these aircraft be based on a cargo or escort vessel? How many would form a protective screen? Would the aircraft

[49] Robert M. Browning Jr., "The Eyes and Ears of the Convoy," p. 33.

[50] Grover Loening, "Helicopters on Freighters versus Submarines," 14 May 1943, Coast Guard Historian's Office, as cited in Robert M. Browning Jr., "The Eyes and Ears of the Convoy," p. 34.

have two-way radios, an observer, a detecting device, bombs, or depth charges? How quickly could the helicopter see operational service if tests proved successful?

After the successful tests aboard Bunker Hill the USCG, USN, and RN began trials aboard S.S. Daghestan and Governor Cobb, both of which had been provided with flight decks. The Combined Board decided upon a three-stage testing program: calm water tests to familiarize pilots with ship-board take-offs and landings; open sea tests to evaluate ship motion as it related to take-offs and recovery; and operations as part of a convoy to Europe and back. The first stage of the testing was carried out on the transport James Parker, on a two-day coastal cruise between New York and the Virginia Capes. During the two day voyage, a total of "ninety-eight landing and take-offs were made in winds ranging from five to twenty-five knots, while the ship pitched up to 6.5° degrees."[51] By any criteria these trials must be considered a success.

Before any comprehensive program could be implemented, more pilots had to be trained. In May 1943, Frank Erickson reported to the Sikorsky Aircraft Factory in Bridgeport, Connecticut, to undergo pilot training and then to train crews for anti-submarine work. Two months later the first helicopter detachment was formed. The training conducted at the Sikorsky plant was only a temporary arrangement. On 19 November 1943, the Chief of Naval Operations designated the USCG Air Station at Floyd Bennett Field, Brooklyn, as

[51] James Russell Memorandum for Chief, Bureau of Aeronautics, 9 July 1943, Coast Guard Historian's Office, as cited in Robert M. Browning Jr., "The Eyes and Ears of the Convoy," pp. 34-35.

a helicopter training base equipped with three HNS-1 aircraft. Formal training courses did not begin until June 1944.[52]

In January 1944, one month after the opening of Floyd Bennett field, S.S. Daghestan began sea trials to test the HNS-1 and a British FT-834 helicopter. Convoy HX 274 sailed from New York on the sixth, with S.S. Daghestan in company, bound for Liverpool. Commander Hugh Pullen, RCN, who was the Senior Officer (SO) of the 5th Canadian Escort Group, which formed part of the screen, noted that HX 274 "must certainly hold the record for escorts. At Westomp there were sixteen escorts in company including Northern Pride and Adherent. Together with two MAC ships and Daghestan with her new weapon [helicopter] they produced a very respectable escort for thirty-nine ships. When HMS Wren joined the number rose to twenty-two escorts which is beyond the wildest dreams of any group."[53] This formidable escort did not prevent German U-boats from sinking a number of ships. Poor weather certainly contributed to the U-boats' success. It was not until 16 January, when weather conditions moderated, that helicopter trials began.

U-boats continued to shadow the convoy and escorts were detached from the screen to conduct A/S sweeps. HMS Bligh investigated one contact on the morning of the sixteenth and dropped four patterns without success. In the late afternoon, as the weather continued to moderate, the acting SO of the Escort, Lieutenant-Commander W. Woods, RCNR, in HMCS Dunver, ordered Empire McColl to launch her aircraft to search around the position

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[52] Robert M. Browning Jr., "The Eyes and Ears of the Convoy," p. 35; LCDR Barrett T. Beard, "The First Mission," in Foundation, (Spring 1991, vol. 12, no. 1), p. 103.

[53] Senior Officer 5th Canadian Escort Group, HMCS Ottawa, Report of Proceedings Convoy HX 274, 25 January 1944, DHist 81/520/8280 Convoy HX 274.

of HMS Bligh's last attack. At the same time, preparations were underway to launch a helicopter from Daghestan.

Even though the weather abated somewhat, conditions remained harsh. When the time came to move the float-equipped helicopter into position for installing the main rotor blades, the vessel's motion was such that it could not be wheeled on its dolly. The 15° degree roll and a wet deck made footing treacherous, but sixteen men eventually manoeuvred the helicopter into position. Before the blades could be installed, however, a wind break had to be installed. Once the final preparations and checklist were completed, and as darkness approached, Lieutenant Stewart Graham, USCG, climbed into his aircraft and took off from the deck of Daghestan, for the first ASW helicopter patrol of the war. For twenty-five minutes, Lieutenant Graham patrolled along the columns of vessels before landing back aboard Daghestan.[54]

The following morning, Flight Lieutenant "Jeep" Cable, RAF, climbed into the British helicopter, FT-835, for additional trials. Cable experienced some problems in clearing the deck. He later reported that:

> the helicopter's seven cylinder Warner-Scarab R-550-1 engine with 180 horsepower was insufficient to follow the pitching of the deck on lift off. The final landing, following the thirty-minute flight around the convoy, took skill to prevent the tail

[54] Acting Senior Officer of the 5th Canadian Escort Group, Lieutenant-Commander W. Woods, RCNR, in HMCS Dunver, Report of Proceedings Convoy HX 274, 18 January 1944, DHist 81/520/8280 Box 2, Convoy - HX 274. It remains unclear, however, what Lt. Commander Woods, or the RCN, thought of this new weapon; LCDR Barrett T. Beard, "The Deception: ASW Helicopter," pp. 82-84; Robert M. Browning Jr., "The Eyes and Ears of the Convoy," p. 36.

> rotor from striking the deck. He ran into the same problems due to the rolling of the deck as Graham had experienced."[55]

Three days of tests showed that shipboard/helicopter ASW operations from convoys were possible, but problematical. Observers concluded that "the HNS-1's performance was too marginal for an anti-submarine mission and that it did not have enough power to follow the deck when the ship was pitching."[56] Obviously, more powerful helicopters of longer endurance were required. In September 1944, Commandant Waesche, USCG, downgraded the HNS-1 to a training model and suggested that more work be done with the Cobb to solve problems and to assess the value of new types of helicopters.

In the April 1944, Waesche testified before the House Appropriations Committee to support the navy's 1945 budget. The appropriation as it stood would have given the USCG sufficient funds to operate 210 helicopters. The following month, it became evident that a suitable rotary-wing aircraft would not be forthcoming and the navy cut their order back to thirty-six machines.

Development work continued apace. To prepare pilots for a pitching and rolling deck, for example, the Coast Guard Special Services Division constructed a movable platform measuring 40 × 60 feet. Finished in early April 1944, it was christened the Mal de Mer or "sea sickness". It could be adjusted to simulate a five degree to ten degree roll with a ten-

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[55] LCDR Barrett T. Beard, "The Deception: ASW Helicopter," p. 84.

[56] R Garnett and J.W. Klopp to Combined Board, 24 January 1944, Coast Guard Historian's Office; J.F. Farley, "The Coast Guard and the Helicopter,"; Records of CNO Headquarters File A-16-1 (Box 514) cominch, RG 26, NA, as cited in Robert M. Browning Jr., "The Eyes and Ears of the Convoy," p. 36.

second interval between rolls.[57] During the spring of 1944, Cobb was equipped with a special deck with a net around it, and used for shipboard training. The first flight off the Cobb occurred on 29 June, and for the rest of the war, it was involved in limited operations. More important, particularly for post-war ASW helicopter operations, was the development and testing of dipping sonar.

Production delays and the shortage of personnel forced the Admiralty to revise downward their target of training 150 pilots. The new plan called for thirty trained pilots - five to be Canadian - by November 1944. The training scheme would be handled by the United States Coast Guard, at Floyd Bennett Field, on behalf of the USN. The course was five to six weeks in length and the Admiralty planned to have the Canadian officers fed into training at a rate of two per course. The first group of Canadians departed for the U.S. at the end of May 1944.[58]

Although the RCN never employed helicopters in an ASW role during the war, it had five qualified helicopter pilots by the cessation of hostilities. The U.S. Coast Guard trained 125 pilots - 96 Coast Guard, twelve USN, eleven British, two Army and four civilians - and

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[57] Frank Erickson, "Fishers of Men: The Story of the Development of Seagoing Helicopters," 3-6, 4-1, as cited in Robert M. Browning Jr., "The Eyes and Ears of the Convoy," p. 36.

[58] Based upon the recommendation of Captain F.L. Houghton, Senior Canadian Naval Officer (London) and the Admiralty: Lieutenants J.P. Fournier, J.W. Stewart, E.M. Marshall, F.S. Foulds and F.H. Leigh Spencer were selected for helicopter pilot training. Lieutenant L.F. Page, RCNVR, replaced Leigh Spencer. The sixth officer, Lieutenant D. Foley, RN was chosen because no more Canadian officers were available. The second course was scheduled to begin on 1 June 1944. See Admiralty to NSHQ, 11 March 1944; NSHQ to SCNO (L), 16 March 1944 and; SCNO (L) to NSHQ, 23 March 1944, ADM 1/16464. Interview with Lieutenant L.F. Page, September 1993.

Second group of RCN officers on the Royal Navy helicopter course at HMS Saker, Floyd Bennett Field, New York, 7 September 1944. Top Centre: Lieutenant Alan Bristow, RN (of Bristol Helicopters); Bottom Left: Lieutenant L.F. Page, RCNVR; Bottom Centre: Lieutenant John W. Stewart, RCNVR, and three unidentified officers. (Photo from Lieutenant L.F. Page's private collection) over 200 mechanics by the end of the war. From these inauspicious beginnings, the RCN would build its post-war destroyer/helicopter fleet.[59]

It will be remembered that research was underway in the United States on a dipping sonar for blimps to track submerged submarines. As the U-boat campaign reached a crisis in early 1943, American scientists abandoned work on dipping sonar for blimps and began exploring the idea of using the same dipping sonar for helicopters. In June 1943, Frank Erickson learned of this new development and visited Dr. H.C. Hayes, and his assistant Dr. Jessie James Coop, who were scientists at the Naval Research Laboratory in Anacostia. Erickson believed that, if this device could be carried aboard a helicopter, he might convince the USN to continue development of rotary-wing aircraft. Erickson persuaded Hayes to submit a proposal to the Board of Aeronautics recommending the installation of Hayes' experimental sonar in ship-based helicopters. The ploy worked and on 12 January 1945, the Chief of Naval Operations directed the Submarine Development Detachment, Atlantic Fleet, to evaluate and test equipment using a Coast Guard supplied helicopter and crew.

Within two months of Admiral King's directive, equipment was being installed in an HSN-1 helicopter for trials in Jamaica Bay, New York. Lieutenant Roy Rather, USNR, served as the project officer, while Dr. Coop acted as the technical advisor and Lieutenant Stewart Graham was appointed the team's test pilot. Two major problems faced the team. First, the team had to determine what effect, if any, the downwash from the rotors of the helicopter had on the dipping sonar equipment. Tests showed that the noise created by the

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[59] At the end of the war, all five of the Canadian helicopter pilots were demobilized. More important to our story, however, was the role played by Lay and DeWolf, who would continue to promote the use of helicopters in the RCN, well into the post-war period.

rotors did not interfere with the equipment. Second, could the HNS-1, with its limited horsepower carry the heavy equipment and hover over the water without overheating its engine? The solution to this problem was the appearance of a modified Sikorsky XHOS-1 aircraft, with 235 horsepower.

Nevertheless, lengthy modifications to the cabin were required in order to fit all the equipment. On 14 April 1945, the first test took place off Block Island from the Cobb. Stewart Graham and Frank Erickson took turns hauling Coop and Rather aloft in the sonar-equipped XHOS-1, while Captain Turner, USN, Commander of the Anti-Submarine Development Detachment, observed the trials from Cobb. Several problems were encountered during the trials, not the least of which involved proper positioning of the helicopter (reference point) in the hover-mode while dipping the sonar below the surface of the water. According to Graham, the team tried several devices such as float lights and dye markers but they were all swept away or dispersed by the downwash of the rotors, thus making precision hovering impossible. This problem was solved by using coloured newsprint which soaked up enough water to remain stationary and was visible from a height of twenty to twenty-five feet. More precise methods for remaining stationary while hovering would have to await future technical developments. Nevertheless, the trials were considered a success and Coop began redesigning the sonar equipment at the Naval Research Laboratory, D.C., for use in helicopters.

The development of the helicopter came too late to influence events at sea. By the spring of 1943, the Allies had broken the back of the Axis submarine force in the Atlantic, and although U-boats continued to operate in the north Atlantic the convoys with their valuable cargoes were getting through. The previous year's urgency to operate helicopters from ships in convoy had passed forcing the promoters of helicopters to find new roles for the aircraft. The USCG, for example, began to explore the helicopter's rescue potential. Ultimately, however, it was the ASW role that kept the helicopter development programme alive. As early as 1944, the Americans began using shore-based helicopters in a seaward defence role - checking merchant vessels, carrying out anti-sabotage patrols, and sweeping the approaches to the harbours, a mission that became particularly important during the latter stages of the war as well as during the post-war period. The RCN would also employ helicopters in the seaward defence role during the post-war period.

This is explained, in part, by the RCN's experience during the late stages of the war, when German U-boats operated with impunity off the east Coast of Canada. As Doug McLean has described the situation:

> prevented from employing wolfpack tactics by successful Allied countermeasures, U-boats resorted to 'static' strategies, lurking around focal points for shipping, such as narrow channels and off busy ports, while awaiting an opportunity to ambush vessels and then to withdraw furtively. The requirement for stealth, a result of overwhelming Allied ASW strength, was facilitated by the introduction of the schnorkel, which allowed U-boats to re-charge their batteries and renew their air supply with surfacing.[60]

The failure of the RCN to deal more effectively with the new submarine threat was the result of extremely poor asdic conditions off Canada's east coast, and a shortage of ships caused by the urgency of operations in European waters.[61] It is not surprising, then, that the RCN saw

[60] Douglas M. McLean, "The Battle of Convoy BX-141," The Northern Mariner, vol. III no. 4 (October 1993), p. 19.

[61] The attack on BX-141 "was a significant defeat for the RCN at the very doorstep of Canada's most important port: a convoy within a few thousand yards of sanctuary lost three

the potential of the helicopter as an effective counter to the fast submarine, operating in-shore or against convoys in the post-war period.

Traditional scholarship holds that the advent of both the snorkel and nuclear submarine was the catalyst for the development of the helicopter for ASW operations.[62] In fact, the helicopter and the concept of operating rotary-wing aircraft from the stern of small ships preceded the appearance of both types of submarines by several years. The development of the helicopter as an ASW weapons platform is directly attributable to the Battle of Atlantic. However, several factors militated against the development and hence deployment of helicopters in an ASW role. Tests revealed that the early prototypes, particularly the HNS-1, were underpowered for use in a maritime role.[63] Equally important, at this late stage of the war the once feared U-boat no longer posed the same threat to the Allied convoys. Had the threat increased more resources might have been devoted to this unusual anti-submarine weapon. The Allies were able to solve the problem of the U-boats by the use of more traditional methods such as long-range shore-based aircraft and escort carriers to close the Greenland air-gap. Nevertheless, the end of the war marked a turning

ships and the U-boat [U-1232] escaped". Ibid., p. 32.

[62] See Marc Milner, "The Dawn of Modern Anti-Submarine Warfare: Allied Responses to the U-Boats, 1944-1945," RUSI Journal, (Spring 1989), pp. 61-68; Roger Sarty, "Canada and Submarine Warfare, 1909-1950," A Paper Presented at the Centre for Foreign Policy Studies Conference, "Undersea Dimension of Maritime Security," Halifax, June 1990.

[63] The HNS-1 could carry a crew of two and a 325-pound depth charge, radio, and other equipment. It could cruise for approximately four hours at between 25 and 60 miles per hour and could possibly reach as high as 100 miles per hour. See J.J. Farley, "The Coast Guard and the Helicopter," in Robert M. Browning, "The Eyes and Ears of the Convoy: The Development of the Helicopter as an Anti-Submarine Weapon," in Air Power History, Summer 1993, Volume 40, Number 2, p. 32.

point for Canadian naval aviation. On 7 May 1945, NSHQ officially accepted the transfer of two light fleet aircraft carriers from the Royal Navy, and the creation of a fleet air arm followed shortly thereafter.[64]

Robert Browning argues that technology is evolutionary rather than revolutionary.[65] This is true in the case of the helicopter which could not be developed fast enough to be effectively used in the war, but the potential of the machine was not lost upon the Allied navies. Post-war retrenchment in the RCN meant that the development of the helicopter as a weapons platform would have to wait as initial priority was given to fixed-wing aircraft. In the interim, Canadian naval authorities continued to monitor developments in both the USN and RN. The RCN would not have to wait long, however, before it actively pursued the acquisition of the helicopter, as substantial advances in both the helicopter and sonar technology were made in the post-war era.

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[64] HM Ships Nabob and Puncher (two escort carriers) operated and manned, excluding air squadrons, by the Royal Canadian Navy during the war were to be exchanged for two light fleet carriers. For a detailed discussion on the operations of both Nabob and Puncher as well as these negotiations see Shawn Cafferky, "Towards the Balanced Fleet: A History of the Royal Canadian Naval Air Service, 1943-1945," (Victoria: University of Victoria, Unpublished M.A., 1989). On 19 December 1945, the Canadian government approved in principle the formation of the Royal Canadian Naval Air Service. Following the establishment of the navy's air branch the question of its name had to be settled and in May 1946 the title "Royal Canadian Naval Air Arm" was agreed upon. A year later the use of the terms "Fleet Air Arm" and "Naval Air Arm" was discontinued and the generic term "Naval Aviation" was adopted to describe the whole organization within the Service.

[65] Robert M. Browning Jr., "The Eyes and Ears of the Convoy," p. 37.

CHAPTER TWO

POST-WAR PLANNING, 1943-1945

The revolution in naval warfare that saw anti-submarine operations become a top Allied priority demanding massive resources had been entirely unexpected before 1940. In less than three years the small RCN was able to fill the gap in British and American preparations and become a major open-ocean fleet. Equally impressive, most of the RCN's more than 200 sea-going A/S escorts had been built in Canada, which had almost no prior experience of naval construction.

Even so, this was no way to build a substantial navy that would endure the sort of peacetime political controversy and slashing of budgets that had bedeviled the RCN since 1910. The best of the anti-submarine escorts were still emergency built types, whose designs incorporated many compromises for quick construction; they were in fact intended for early disposal from military service as soon as the war was over. That aside, mental habits died hard, and among senior officers of all nations anti-submarine warfare never lost its aura as a peculiar, overly specialized role best suited to wartime improvisation by odd-ball civilian scientists and "hostilities-only" reservists. Although the British and American naval leadership was always grateful for the RCN's heroic efforts, the British especially had never hesitated to criticize several lapses by the often ill-equipped Canadian escorts and their novice crews.[1]

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[1] See, Captain D. Macintyre, U-Boat Killer, (London: Weidenfeld and Nicholson, 1956), and Marc Milner, North Atlantic Run: The Royal Canadian Navy and the Battle for the Convoys, (Toronto: University of Toronto Press, 1985).

For all these reasons, senior Canadian naval officers always looked beyond the immediate crises to obtain, in wartime, the balanced fleet it had always wanted. Although the extreme demands of the Battle of the Atlantic in 1941-1942 caused a lapse in formal planning for the post-war fleet, the subject did not disappear entirely.

In a paper dated 10 May 1942, Paymaster Sub-Lieutenant J.S. Hodgson, RCNVR, a junior but influential planning officer at Naval Service Headquarters, argued that the opportunity should be taken to build public support for the navy during the war. He also suggested that Canada should not rely upon Great Britain and the United States for protection to the same degree as in the past. Nevertheless, he warned that the excellent wartime liaison with Great Britain and the United States must not be allowed to lapse. "This does not mean the cultivation either of an Imperial or a Pan-American Navy. Nor does it mean complete uniformity or imitation, but rather a complete exchange of information". Canada must keep abreast of new developments in naval affairs abroad. As Hodgson saw it, Canada was becoming "navy-conscious" and this attitude must be fostered at all costs to prevent the dismantling of the navy following the end of the war. More important, Hodgson recognized the possibility of cut-backs in the post-war period and recommended that planning "begin now so that maximum results could emerge from inadequate funds."[2]

Hodgson did not attempt to define the composition of the post-war fleet. Rather, he suggested that the navy needed to articulate a coherent naval policy and build its fleet on the basis of that policy. The RCN had to "maintain a large enough framework to build upon,

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[2] Paymaster Sub-Lieutenant J.S. Hodgson, RCNVR, "Post-War Naval Problems," 10 May 1942, RG 24, vol. 3844, file 1017-10-34, vol. 1, NAC.

properly trained reserves and a peacetime navy with attractive terms of service, including fleet exercises that were realistic for the requirements of modern naval warfare. Thought would have to be given to technical problems, bases, and the possibility of a Canadian merchant fleet benefitting from a much increased source of trained seamen."[3]

In so far as naval aviation was concerned, Hodgson called for the training of executive officers in air operations with a view to liaison work with other navies, joint operations with those fleets, and the acquisition of the RCN's own aircraft carriers. "We know that no Navy is safe without air protection, in the future it will be more of the same." This appears to be the first formal indication of interest within the RCN for the acquisition of aircraft carriers. The time had come, Hodgson suggested, for the navy to resolve the issue of whether or not it would continue to remain essentially an "escort navy" or become a general purpose fleet. Two days later Commodore H.E. Reid, Vice-Chief of the Naval Staff, responded:

> I find it very difficult to see how we can plan a post-war navy now. Its construction will be governed by so many factors which cannot take form until after the war. For instance Hemispheric defence will undoubtedly play a large part in the plans for the future and until we have drawn up these in conjunction with the USA and obtained Government approval it would be difficult to decide what ships, bases and personnel should be maintained. I agree it is a big problem which should be kept in mind and the planning organization formed the moment signs of peace are in evidence.[4]

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[3] Paymaster Sub-Lieutenant J.S. Hodgson, RCNVR, "Post-War Naval Problems," RG 24, vol. 3844, file 1017-10-34, vol. 1, NAC; W.A.B. Douglas, "Conflict and Innovation in the Royal Canadian Navy, 1939-1945," in Gerald Jordan (ed), Naval Warfare in the Twentieth Century, 1900-1945, (London: Croom Helm, 1977), p. 217.

[4] Minute Sheet, VCNS to DOP, 12 May 1942, RG 24, vol. 3844, file 1017-10-34, vol. 1, NAC; W.A.B. Douglas, "Conflict and Innovation in the Royal Canadian Navy, 1939-1945". Commodore Reid's view ran contrary to other senior naval officers who, rightly, argued that the time had come to start planning for the post-war period, both in terms of creating planning committees and acquiring the ships.

This exchange took place during the darkest days of the Battle of the Atlantic, when the RCN was pulled in all directions in response to the pleas of Great Britain and the United States for anti-submarine escorts of any type. Later in 1942, the Naval Staff attempted to consolidate the RCN's position in the Atlantic theatre, demanding the loan of more suitable escorts from Britain to augment the small-ship Canadian fleet, and seeking recognition of Canada in command and control of the war against the U-boats. The RCN began to achieve these goals in early 1943, at the Allied Atlantic Convoy Conference in Washington. At that conference, held in March, the British and Americans recognized the RCN as the command authority for convoy protection in the north-western Atlantic.[5] Soon after, and sooner than anyone expected, the worst crisis in the Atlantic passed. Allied planning began to take fuller account of future operations, including the defeat of Japan in the Pacific, most notably at the Anglo-American summit at Quebec City in August 1943. In the weeks before the Quebec meeting, as the situation in the Atlantic quietened, the naval staff gave more thought to the future of the RCN.

On 27 July 1943, Lieutenant G.F. Todd, a talented writer and thinker on the staff of DOP, produced an "Appreciation of RCN Ship Requirements for the War Against Japan and for the Post-War Navy". In a covering note, Todd insisted that the RCN should play a prominent role in whatever operations were planned for the Pacific theatre. The main difference between this appreciation and earlier assessments was the place assigned to escort vessels. In spring of 1943, Captain H.G. DeWolf, Director of Plans, had placed a great deal

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[5] W.G.D. Lund, "The Royal Canadian Navy's Quest for Autonomy in the North West Atlantic," in The RCN in Retrospect, 1910-1968, James A. Boutilier, ed., (Vancouver: UBC Press, 1982), pp. 138-157.

of emphasis on convoy escort in the Pacific, but Todd now argued that "in the war against Japan, anti-submarine protection of merchant shipping is likely to be a much less important task."[6] He foresaw, based upon British intelligence, the following scenario: a prolonged seaborne attack designed to destroy the Japanese fleet would be followed by the forces required to cover the initial landings in Japan and follow-up convoys. However, the RCN did not possess any capital ships and could not participate in the first phase of the offensive against Japan. Todd suggested that the RCN acquire a squadron of four cruisers. The bid for cruisers was not new, but now it was wrapped up in new clothing: the operational requirements of the war against Japan. Todd, citing earlier papers, noted "it is also highly desirable that Canada's post-war navy should include a squadron of four cruisers, and the requirements for the war against Japan therefore coincide exactly in this respect with the needs of the post-war navy...."

Cruisers alone, Todd noted, were no longer enough, given the rapid rise to pre-eminence of aircraft carriers in major warship operations, especially in the Pacific. Todd's suggestion that the navy also acquire carriers to create a balanced and complete national task force reflected the trend in thinking at headquarters. Negotiations were already underway for the RCN to assist the RN by manning two escort carriers, excluding the air squadrons. Acting-Captain H.N. Lay, Director of Operations Division (DOD), had in the meantime been investigating possibilities for the formation of the RCN's own naval air service, and on 27 August 1943 he submitted his final report to the Naval Staff.

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[6] "Appreciation of RCN Ship Requirements for the War Against Japan and the Post-War Navy," 29 July 1943, RG 24, vol. 3844, file NSS 1017-10-34, vol. 1, NAC.

Lay envisaged a time in the near future when the aircraft carrier would replace both the battleship and cruiser as the predominant capital ship. Although shore-based aircraft had proven their importance in maritime warfare, navigation difficulties, the rapidly variable weather in ocean areas, and the limited range of existing aircraft prevented the air force from providing continuous support for the fleet. This was the case in the Atlantic, and even more so in the Pacific owing to the vastly greater distances in that ocean and the lack of shore-based facilities. In his report, Lay noted that Canada's main naval commitment thus far had been trade protection in the North Atlantic, and if Canada was to meet her obligations, the navy would have to have the means to carry out its role.

The aircraft carrier had became the central weapon in the anti-submarine war, but it was not the only weapon. Lay described recent developments in naval aviation, such as the use of blimps and helicopters for convoy protection, and he urged the navy to investigate.[7] Lay's discussion of the helicopter, whose potential for trade protection duties was only now being realized, was brief. There was only one vague reference to recent trials in the U.S. where helicopters successfully flew from the stern of a merchant ship. The RN was so impressed with those trials that it ordered 250 helicopters for A/S operations. The fact that the helicopter was a new invention and, as yet, untried as an anti-submarine weapon accounts for the brevity of this section of his report. Moreover, the RCN, like the USN and RN, was not sure how best to employ the helicopter.

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[7] For a detailed discussion on the blimps see, Shawn Cafferky, "Towards the Balanced Fleet: A History of the Royal Canadian Naval Air Service, 1943-1945," pp. 95-107.

Captain Frank A. Erickson. USCG, a non-conformist and long-time supporter of the helicopter, was one of the few individuals to suggest a number of roles for the helicopter, including ship-borne A/S operations, patrols of harbour approaches (seaward defence), planeguard duties, and search and rescue.[8] It would be several more years, however, before Erickson's predictions would come true. It is not surprising then, that the bulk of Lay's report centred on the carriers, and only touched upon blimps. Fixed-wing aircraft and blimps, unlike the helicopter, were proven weapon systems. The RCN, with limited resources, chose to concentrate on fixed-wing carrier aviation.

Lay argued that, so far as trade protection in the Atlantic - the RCN's principal role - was concerned aircraft carriers were essential to complement the existing surface and land-based air escort forces. In terms of the post-war navy, Lay put forth two interrelated arguments. He stated that:

> Canada in the last ten years has become one of the world's largest exporting nations and she is playing an ever-increasing part in Empire and world affairs. It is inconceivable that she will not wish to continue to provide adequate protection for her growing volume of trade to make a contribution to Empire Defence commensurate with her importance in the British Commonwealth of Nations. The responsibility for providing such protection ... must necessarily devolve largely on the Canadian navy and any consideration of the means whereby this may be achieved must of necessity take into account the growing influence of air on all naval operations.[9]

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[8] See, Barrett Thomas Beard, Wonderful Flying Machines: A History of USCG Helicopters, (Annapolis, Maryland: Naval Institute Press, 1996).

[9] Actin-Captain H.N. Lay, DOD, "Report on the Formation of a Royal Canadian Naval Air Service," p. 8, 27 August 1943, copy no. 7, RG 24 acc 83-84/167, Box 575, file 1700-913, Part 1, NAC.

Lay suggested that a "high proportion of aircraft carriers should be included in any present or future planning for the RCN if it is to justify its existence."[10] He proposed, therefore, the acquisition of ten aircraft carriers.

Lay urged the Canadian government take the necessary steps to establish a naval air service modelled on the British Fleet Air Arm as soon as possible. Time was crucial. He emphasized the lengthy preparations required to train the necessary flying and ground personnel and build the support facilities ashore. He was also fully aware that the war had loosened the purse strings and the navy had to act quickly if it was to fulfil its dream of a balanced fleet.

Lay's report was well received at Naval Service Headquarters. Acting-Captain H.G. DeWolf, in outlining the navy's requirements for the war against Japan, had already stated that the "... policy concerning the number and types of ships that Canada should acquire were to be based on their post-war usefulness.... Accordingly, the [navy] should begin acquiring cruisers, fleet destroyers and possibly aircraft carriers."[11] Vice-Admiral Percy W. Nelles, Chief of the Naval Staff, agreed and he pursued the recommendation at the Quebec Conference.

On the first day of the Quebec Conference Nelles broached the subject of establishing a Canadian naval air service in a private meeting with Admiral Sir Dudley Pound, the British First Sea Lord. He told Pound that from a service point of view his p.oblem was "to see that

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[10] Ibid., pp. 8-9.

[11] Director of Plans to Assistant Chief of the Naval Staff, 29 July 1943, N.S. 1655-2 (1) as cited in Gilbert Norman Tucker, The Naval Service of Canada, vol. II, (Ottawa: King's Printer, 1952), p. 90.

the Royal Canadian Navy did not finish the war as a small ship navy..."[12] Nelles outlined a scheme for a post-war fleet of five cruisers, two light fleet carriers, and three destroyer flotillas.[13]

Nelles' proposal for establishing a naval air service met with a lukewarm response. Pound pointed out the heavy overheads involved and suggested instead that the Canadian navy provide crews to man British carriers while the Royal Navy furnished the flying and maintenance personnel in these ships. The documents suggest that the First Sea Lord was less than forthright with Nelles. Prior to the conference, he had been advised by both the Assistant Chief of the Naval Staff (Air), Rear-Admiral R.H. Portal and the Director of Plans, Captain C.E. Lambe, that, in their opinion, the creation of a Royal Canadian Naval Air Service would be a waste of effort. In Lambe's words, "in our present parlous manpower state ... avoiding the 'overheads' of a new Fleet Air Arm would give us quicker relief." He further stressed the need for the Dominions to maintain a balanced fleet consisting of cruisers and destroyers.[14] The Assistant Chief of the Naval Staff (Air) took the argument one step further with an eye to post-war considerations. It seemed unlikely that:

> Ships like escort carriers and the earlier light fleet carriers have a permanent future. One sees probably the later light fleet carriers going into reserve and training services, and only the [large] fleet carriers remaining in commission. Presumably the Canadians

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[12] Minutes of Meeting Held in Château Frontenac, 11 August 1943, DHist 81/520/1270 Conferences 1920-1945, vol. II.

[13] Ibid. Nelles' appreciation was based on the Director of Plans memorandum.

[14] Director of Plans to First Sea Lord, 7 August 1943, Admiralty 205/31 (hereafter referred to as ADM).

> wilt never be able to support a fleet carrier in peace time and their air organization would consequently become redundant....[15]

These officers as well as the First Sea Lord were more interested in alleviating the Royal Navy's manpower shortage (estimated at 20,000 men) than in assisting the Canadian navy in organizing its own air arm. If, however, Canadian personnel could be found to man one or two carriers in the Royal Navy and thereby alleviate the British manpower crisis, the Admiralty might look favourably on the larger project for an RCN air service.

Undeterred by the First Sea Lord's response, Nelles continued to press for recognition of Canadian post-war plans. W.A.B. Douglas has suggested that "it might be reasonable to assume that pressure for expansion emanated from the Royal Navy."[16] The documents suggests otherwise in the case of naval aviation. The proposal for the establishment of a Canadian naval air service had originated with Canadian naval authorities. At the Quebec Conference, the matter was not even considered by the Admiralty representatives to be part of the agenda. Admiral Nelles had forced the subject.

It says much about relations between the military and government in Canada that the naval staff used deception in putting its bid for bigger warships and new roles to the prime minister. Nelles asked Pound to include the RCN's shopping list as part of the RN's request for manpower assistance from Canada. The whole package, at Nelles's suggestion, was put

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[15] Assistant Chief of the Naval Staff (Air) to the First Sea Lord, 3 August 1943, ADM 205/31; First Lord and Deputy First Sea Lord to First Sea Lord, 24 August 1943, ADM 1/13044.

[16] W.A.B. Douglas, "Conflict and Innovation in the Royal Canadian Navy, 1939-1945," in Gerald Jordan, Naval Warfare in the Twentieth Century, 1900-1945, (London: Croom Helm, 1977), p. 210.

to Mackenzie King as a personal appeal from Winston Churchill. The ploy worked, and the Canadian government agreed to provide personnel for:

> Two fleet destroyers by December, three flotillas of landing craft (a total of 350 men) and one beach commando and beach signal unit (1,000 men) by the spring of 1944, and to provide 120 candidates for commissioned warrant rank to be trained in the United Kingdom, then loaned to the Royal Navy. All this was in addition to taking over two new light cruisers when they were completed in 1944.[17]

King, who was adamantly opposed to new manpower commitments, agreed because delays in the Canadian naval construction programme had created a surplus of personnel in the RCN. The fact that rendering assistance to the Royal Navy did not place undo strain on Canadian manpower reserves played a crucial role in allowing the Canadian navy to branch out into the field of naval aviation.

A committee of high-ranking naval and air force officers was struck by the Cabinet War Committee (CWC) on 8 September 1943 to evaluate the navy's plan to establish a naval air service. The committee tabled their report to their respective service headquarters on 12 October 1943. The committee recommended that the RCN acquire and operate aircraft carriers (escort carriers initially) and that the question of further development of an RCN Fleet Air Arm be deferred.[18] The discussions had been heated, with the naval members having to

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[17] Ibid., p. 212.

[18] Joint Royal Canadian Navy-Royal Canadian Air Force Committee on the Acquisition and Operation of Aircraft Carriers by the Royal Canadian Navy," 12 October 1943, RCN MS 1084-1-3, RCAF S 19-7-63, RG 24 83-84/167, Box 575, file 1700-913, Part 1, NAC. The Committee consisted of the following officers: K.M. Guthrie, Air Commodore, RCAF (Chairman); W.B. Creery, Captain, Assistant Chief of the Naval Staff; A.P. Campbell, Group Captain, RCAF and; J S. Stead, Staff Officer (Air), RCN.

stave off attempts by the air force to assume control of carrier-borne personnel, aircraft and ancillary services if and when a naval air service was established.[19]

The CWC dismissed the report on 21 October 1943. The Chief of Naval Staff and the Minister for Naval Services, Angus L. Macdonald, pleaded once again for a separate naval air arm, but to no avail. Mackenzie King expressed concern over the fact that the report made no mention of the costs involved and did not deal with the personnel issue.[20] King told Nelles and Macdonald, if such undertakings were considered imperative, then corresponding reductions must be made in other directions because Canada had reached the limits of both her personnel and financial resources.[21] Nelles responded by stating that the Naval Staff could not undertake any reductions in the present A/S shipbuilding programme. The Cabinet War Committee instructed him to prepare a thorough study on the financial and manpower implications of establishing a naval air service.[22]

Reductions in requirements for the Atlantic battle helped pave the way for the RCN to begin manning escort carriers. On 30 October 1943, the Admiralty announced its intention to cut down its escort building programme. Soon after, Admiral Sir Andrew Cunningham,

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[19] To counter the air force the naval members had to point out that the navy planned to use Fleet Air Arm training facilities and shore establishments. In fact, the Fleet Air Arm was to provide the whole basic organization for the RCN. Finally, it was pointed out that it was unlikely that the carriers would be operated from Canadian bases during the war and therefore the RCAF would not be required to provide permanent shore facilities.

[20] Cabinet War Committee minutes, 21 October 1943, document 633, DHist MG 26/J4.

[21] Mackenzie King attempted to scare off the service chiefs by voicing his fear of a Co-Operative Commonwealth Federation threat to the government if taxation were not decreased. King Diary, 21 October 1943, 10 and 27 November 1943, DHist MG 26/J13.

[22] Ibid.

Pound's successor as First Sea Lord, appealed to Nelles for additional assistance with manning beyond what had been agreed to at Quebec. Before making a decision, NSHQ sent Captain W.B. Creery, ACNS, to London to discuss the matter with Admiralty officials. With the information Creery obtained, the staff in Ottawa agreed that Canada would follow Britain's lead and reduce both the frigate and corvette construction programmes in order to release personnel for manning additional RN warships. The specific proposals called for the RCN to take over ten frigates and two escort carriers. A decision regarding the escort carriers had to await adoption by the Cabinet of a definite naval air policy, but there was no difficulty in securing approval for the acquisition of the frigates.[23]

The Admiralty offer of two escort carriers came about primarily because of the RN's acute manpower shortage, and because it was aware of the fact that the RCN "was not prepared to unbalance their [fleet] by limiting it to small vessels."[24] The two services needed each other, but at the same time had different immediate needs and longer term goals. Although Cabinet approval for the Royal Canadian Naval Air Service had yet to be granted, permission had been given the week before for the navy to partially man the first escort carrier, without committing the government to the creation of a naval air service. On 15 October 1943, Acting-Captain H.N. Lay took command of the new escort carrier HMS Nabob, and Canadian personnel began to join the ship, which was completing its fitting out at Vancouver, B.C.

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[23] Report by Captain W.B. Creery, 12 December 1943, NS 1017-10-22 (1), as cited in Gilbert Norman Tucker, The Naval Service of Canada, vol. II, p. 92.

[24] Report by Captain H. Hickling, Royal Navy, 1 July 1943, ADM 205/31.

The RCN was never satisfied with what it saw as a temporary arrangement to man two small carriers for the Royal Navy, and continued to press for the creation of its own naval air arm. To that end, the navy submitted a detailed cost analysis to the Minister. That estimate pointed out that it would cost approximately $43 million dollars to acquire two carriers, and build one naval air station and repair yard. The bulk of the funds ($26 million) would cover the initial purchase of two Kaiser-built escort carriers. These figures were based on Acting-Captain Lay's report, which called for 4,383 officers and men to man and support two escort carriers.[25] Later, the estimate was revised downward as a result of the Joint RCN-RCAF Committee's recommendation, which stipulated that the RCN should rely on British Fleet Air Arm support facilities. Lieutenant-Commander J.S. Stead, Staff Officer (Air), was able to trim 2,407 personnel, and nearly four million from the original estimate. The revised figures were sent to the Naval Minister on 5 November 1943.[26]

In early November the subject of acquiring the carriers was brought before the Cabinet War Committee. Once again, Mackenzie King reminded the Naval Service that only expenditures which were considered absolutely essential to the successful prosecution of the

[25] Lieutenant-Commander J.S. Stead to the Minister for Naval Services, Re: Royal Canadian Naval Air Service - Estimated, 26 October 1943, file no. MS 1084-1-3, RG 24 83-84/167, Box 575, file 1700-913, Part 1, NAC. The figure of 4,383 officers and men would allow the RCN to acquire 225 aircraft, four small naval air stations and two repair yards. See Acting-Captain H.N. Lay's Report on the Formation of a Royal Canadian Naval Air Service, 27 August 1943, p. 27, RG 24 83-84/167, Box 575, vol. 1700-913, Part 1, NAC.

[26] Lieutenant-Commander J.S. Stead to the Minister for Naval Services, Re: Royal Canadian Naval Air Service - Estimate, 5 November 1943, file MS 1084-1-3, RG 24 83-84/167, Box 575, file 1700-913, Part 2, NAC.

war should be proposed.[27] Angus L. Macdonald, who was fully aware of the need to acquire these vessels prior to the cessation of hostilities, agreed to reconsider the costs involved. In his words, "it might be possible to offset these expenditures by reducing the naval shipbuilding programme in other directions."[28] As a result of the Minister's proposal, the Cabinet War Committee agreed to postpone their decision until that option had been fully explored.

In the interim, plans were proceeding apace for the post-war fleet. Lieutenant G.F. Todd, now Head of the Policy and Strategy Section of DOP, outlined eight tasks for the post-war navy in a major paper:

> To maintain command of the oceans adjacent to Canada against all attacks except sustained battleship attacks; contribute to the maintenance of Imperial sea communications in proportion to Canadian resources; contribute to Hemispheric defence; protection of Canadian shipping; to prevent the commission of unneutral acts by foreign bell[illegible]nts in territorial waters; to support national policies; to contribute to post-hostilities policing of defeated enemy countries and; to contribute to post-hostilities minesweeping.[29]

These were not new roles, with the exception of policing and minesweeping, for the RCN. Todd was laying out in clear prose what the navy had endeavoured to do for a generation with utterly inadequate resources. As had not been done in previous planning papers, Todd highlighted the importance of more fully carrying out those roles by focusing

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[27] Cabinet War Committee minutes, 10 November 1943, DHist MG 26 J4.

[28] Cabinet War Committee minutes, 10 November 1943, DHist MG 26 J4. Vice-Admiral Nelles, who was not present at the meeting, would later write that "the navy had missed their opportunity to establish a naval air arm owing to the government's reluctance to assume any commitments." As cited in Chief of the Naval Staff's memorandum to the Minister for Naval Services, 13 November 1943, RG 24 83-84/167, Box 575, file 1700-913, Part 2, NAC.

[29] Lieutenant G.F. Todd, Acting Director of Plans, "The Post-War Canadian Navy," 17 November 1943, file no. NS 1017-10-34, p. 1, DHist 1650-1 Naval Policy, vol. II.

on Canada's growing sense of nationalism, exemplified by influential officials at External Affairs.

> There is evidence that the government desires that Canada should be accorded increasing recognition as a growing power in world affairs, and particularly in hemispheric affairs. In this latter connection, it is the hope of Canadian diplomacy that Canada may prove to be the link between the Western Hemisphere and the British Empire.... To obtain the prestige and recognition of status which it [Canada] thus seeks, it is essential that Canada should have as strong a navy as possible.[30]

Todd also stressed the importance of maintaining imperial ties so that Canada would not fall more completely under the hegemony of the United States. He did not, however, suggest that Canada would unreservedly place her navy under British control. Rather it was intended that Canada would assume the role of a middle power.

Todd proposed a fleet of five cruisers at least as modern as the "Fiji" class, two light fleet aircraft carriers of the "Glory" class, 27 fleet destroyers, including three flotilla leaders, 16 frigates, and 12 Algerine or diesel Bangor minesweepers. The "Glory" class carriers, the smallest fleet type likely to prove satisfactory - unlike the little escort carriers - for general service in a variety of roles were approximately 14,000 tons and capable of operating up to 30 aircraft as compared to the 18 aircraft which could operate from an escort carrier. The two carriers were needed so that at least one would always available for sea duty. To man this fleet, Todd estimated, would require 28,000 personnel, including 6,000 for naval aviation. The annual cost of the fleet would be $50 million, excluding the naval air service. That would require an additional $20 million, for a total annual expenditure of about $70 million dollars.

[30] Ibid., p. 2.

In concluding, Todd stressed that the navy should acquire these vessels prior to the end of the war when government retrenchment would freeze the RCN as a small-ship service.[31]

The Chief of the Naval Staff recognized that the government might not support such a large navy and directed DOP to prepare a paper for a post-war navy with a maximum complement of 12,000 men. The second report, which was produced as a complement to the first, recommended a fleet consisting of one squadron of four heavy cruisers, two light fleet carriers, one flotilla of nine fleet destroyers, including a flotilla leader and auxiliary craft.[32] This was a reduction of two flotillas of destroyers, a cruiser, two groups of frigates, the minesweepers, as well as miscellaneous craft.

This reduction in the fleet would limit its ability to carry out the tasks set forth in Todd's first paper. According to Todd, the fleet would effectively be reduced to a one-ocean service. That, in turn, would force Canada to rely on the USN and the other Commonwealth navies for the defence of Canada, and the maintenance of Imperial sea communications.

In late November 1943, Admiral Nelles asked Captain G.R. Miles, the new Director of Plans, to draw up another plan, this time based upon 15,000 men. Nelles considered that

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[31] Ibid., p. 12. There was some difference of opinion as to the composition of the post-war fleet. Captain Lay, for example, suggested that if the RCN comprised 30,000 men then fully one-third (10,000) should be directed to specialize in air duties. According to Lay this would allow the RCN to man ten escort carriers and that the navy should consider the acquisition of fleet or light fleet carriers in the future. Lay's main concern was to establish the naval air arm as soon as possible and the escort carriers were easier and cheaper to build than either the fleet or light fleet carriers.

[32] G.F. Todd, Acting Director of Plans, "The Post-War Canadian Navy," 17 November 1943, file no. MS 1017-10-34, p. 1, DHist 1650-1 Naval Policy, vol. II.

figure as the highest possible complement for a post-war permanent force that the government might support. The post-war navy recommended under these circumstances was as follows:

One squadron of four heavy cruisers
Two light fleet aircraft carriers
Two flotillas of eight fleet destroyers
One flotilla of six frigates
One flotilla of six Bangor minesweepers or four Algerines[33]

Although, as compared to the 12,000 man proposal, the size of the fleet had expanded to include another seven destroyers, this was achieved at the expense of the proposed naval air arm. It would now be necessary for the RCAF to assist in meeting the shore requirements of the Royal Canadian Naval Air Service. Nevertheless, Nelles directed that the figure of 15,000 men be considered the firm recommendation of the Naval Staff for the post-war navy. Despite the fact that the size and composition of the post-war navy had been approved in principle by the Naval Staff the exact details as to the composition of a naval arm had, as yet, to be determined.

Meanwhile, the subject of escort carriers came up again at the Cabinet War Committee meeting of 16 December 1943. The Naval Staff now agreed to cut back on its escort building programme in order to obtain the carriers, but difficulties remained. The main problem was that the U.S. had provided the carriers to Britain free of charge under lend-lease, and Canadian policy prohibited acceptance of lend-lease material. Macdonald suggested that Canada merely provide personnel to what would remain British ships, thereby gaining valuable experience in the operation of carriers. The CWC, concerned that Canada might be

[33] Captain G.R. Miles, DOP, "The Post-War Canadian Navy, A Second Supplementary Paper Outlining a Post-War Navy with a Maximum Complement of 15,000 Men." 23 December 1943, file no. MS 1017-10-34, p. 1, DHist 1650-1 Naval Policy, vol. III.

accused of accepting lend-lease by "back-door" methods, did not support the Minister's recommendation. Moreover, King was still opposed to what he rightly saw as the RCN's effort to use wartime projects to force the government into large post-war commitments. The Admiralty only wanted what Macdonald had proposed in the last resort - that the Canadian navy furnish crews for the lend-lease carriers which would remain under RN control - but the RCN's ambition was to integrate these ships into its fleet. As Roger Sarty has recently shown, King, never happy with the manner in which major warship acquisition was thrust upon the government at Quebec in August 1943, suggested that the navy was using the British manpower crisis for its own purposes.[34] Fortunately for the navy, the committee agreed to postpone their decision pending further investigation.

The time was fast approaching when HMS Nabob would be ready to sail, with Lay as captain and a partial Canadian crew, and the Naval Staff continued to press for a policy decision regarding the full manning of this and a second escort carrier. It will be remembered that the Canadian government had given permission for the RCN partially to man one escort carrier, but the Naval Staff was anxious to provide enough ratings to man two. The Minister for Naval Services raised the subject of escort carriers yet again at the Cabinet War Committee meeting on 12 January 1944, just one week after that body had come to the conclusion that vessels of this class should not be fully manned by the RCN. At the meeting,

[34] King's suspicions of the RCN were confirmed in late November after discussions with Admiral Sir Percy Noble, Head of the British Admiralty Delegation in Washington, regarding the provision of carrier crews from the RCN. King wrote in his diary that "it was our department rather than the British that really occasioned the cruisers being forced upon us by Churchill and Dudley Pound." King Diary, 27 November 1943 and 16 December 1943, MG 26 J13, NAC. See also Roger Sarty, "The Ghosts of Fisher and Jellicoe: The Royal Canadian Navy and the Quebec Conferences," pp. 20-21 (forthcoming publication).

Macdonald pointed out that the RN would provide the air and maintenance personnel and that the cost to the RCN would amount to $4 million a year. Manning would not be a problem because of extensive cuts in the escort building programme which had left the RCN with a surplus of personnel. After remarkably little discussion, the Cabinet War Committee approved in principle the manning of two escort carriers.[35] The RCN saw this as the stepping stone towards the creation of its own naval air arm. In spite of the difficulties experienced in attempting to man and commission the two escort carriers as HMC Ships, negotiations for their transfer to Canadian ownership continued throughout 1944.

While negotiations were proceeding between NSHQ and the Admiralty for the acquisition of Nabob and Puncher, lobbying for the creation of a naval air division at Naval Service Headquarters continued. On 17 February 1944, Lieutenant-Commander J.S. Stead, Staff Officer (Air) called for the immediate establishment of a division to administer the growing problems related to naval air matters. His recommendations were particularly important especially since the Canadian government had agreed, the previous month, to man the two escort carriers. The Naval Board quickly acted upon his recommendation, and on 31 March 1944, the board approved the formation of an air section at naval service headquarters under a Director of Naval Air Division. This directorate officially came into being on 1 April 1944, and Acting-Commander J.S. Stead was appointed as the director. The navy viewed the creation of the naval air division as a "stepping stone" to the creation of a naval air service.

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[35] Cabinet War Committee minutes, 1 and 12 January 1944, DHist MG 26/J4.

Even though naval air matters received more systematic attention, there would be no direct staff representation on the Naval Board until the RCNAS was formally established after the war.[36] Further hindering the cause of naval aviation within the navy was the fact that personnel were scattered throughout the three branches (Staff, Administration and Supply, Personnel) of the service. As a result, the officers were required to wear two hats at the same time, making it difficult to become specialists in naval air matters. No opportunity was taken to infiltrate key RN or USN aviation specialists in the RCN during this crucial period in the development of the naval air division. This situation was finally rectified with the creation of the naval air service in 1946, when the RN lent key officers to the RCN to assist in the organization of the naval air service. In the interim, the Naval Air Division had to make do with the officers that were available. Officers such as Lay, DeWolf and Bidwell were certainly qualified naval officers who had had exposure to naval aviation, but they were not experts in the field.

Another cause for concern were the terms of reference for the Director. Essentially the director was to act as an advisor on all matters relating to naval aviation. As such, he could not implement policy and he had no control over directorates which could interfere in the day to day running of the air division. The lack of continuity in the plans emanating from the various departments with regard to naval aviation became so acute that Stead recommended that the Director of the Naval Air Division's position be changed from that of an advisor to a line officer able to formulate and execute policy. Unfortunately, Stead's

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[36] J.D.F. Kealy and E.C. Russell, A History of Canadian Naval Aviation, 1918-1962, (Ottawa: Queen's Printer, 1967), Appendix A. The Assistant Chief of the Naval Staff became a member of the Naval Board in 1946.

recommendations were never acted upon and negotiations for a re-organization of the Naval Air Division dragged on until 1946.

By January 1944, the naval staff's plans envisioned two RCN task forces for the offensive against Japan. Each of these would consist of:

> two cruisers, one light fleet carrier and one flotilla of fleet destroyers. In addition, a contribution of at least thirty percent of the anti-submarine escort forces should be provided by Canada. According to Canadian figures this involved 108 warships. Finally, provision of two Landing Ship Infantry (medium), one anti-aircraft ship and 36 Landing Craft Infantry (large).[37]

Miles's justification of this ambitious proposal was pure nationalism: "the outstanding characteristic of the Pacific war to date has been the number of cruiser and destroyer actions; the second navy of the Empire should not accept any role other than that leading to direct conflict with the enemy's main naval forces and Canadian public opinion cannot be expected to endorse the exclusive employment of Canada's navy in a lesser role...."[38]

Captain W.B. Creery, ACNS, then in London, also supported the creation of Canadian task forces, but he discovered that the Admiralty was making different assumptions. The British staff envisioned Canadian participation in terms largely of escort work with small escort groups being despatched wherever needed. All resources would be pooled under RN

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[37] DOP to ACNS "Creation of RCN Task Forces," 7 January 1944, file no. 1057-1-4, DHist 1700-219 Naval Aviation (1940-1949); See also DHist 1650-1 Naval Policy, vol. I.

[38] Ibid.

control.[39] Despite Creery's warnings, NSHQ continued to press for cohesive national task forces under Canadian control.

In the spring of 1944, British-Canadian planning of a sort for the Pacific began in London, when the heads of the Canadian services in Britain, now constituted as the Canadian Joint Staff Mission, began to meet with the British Chiefs of Staff. The exercise was highly theoretical, for the U.S. forces utterly dominated Pacific operations and would have a decisive say in the form and scope of Commonwealth participation. No substantial British and Canadian forces, however, would be available until the defeat of Germany; the U.S. forces meanwhile were moving quickly, and disagreed among themselves as to the shape of the final offensive against Japan. There were profound disagreements among the British as well.[40] At the same time, the Canadian government, in the course of separate negotiations with the British on air force policy, came to the view that Canada had no interest in assisting in the liberation of British and other European colonies in the southern Pacific and Indian ocean. Rather, the effort of all three armed forces should be in the north Pacific, an area of specific interests and historic connections for Canada. The Naval Staff would no longer be free to

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[39] See Captain W.B. Creery to the Naval Board, 12 December 1943, RG 24 83-84/167, vol. 56, file NSS 1225-27, vol. 1, NAC; Lieutenant-Commander G.F. Todd, Naval Assistant (Policy and Plans, CNMO) for Deputy Head of Mission, "RCN Participation in the War Against Japan and in the Occupation of the European Continent," 27 May 1944, CS-21, DHist 1650-1, Policy and Plans (War Against Japan).

[40] Winston Churchill wanted to make the main effort in South East Asia and the services wanted to join the Americans in the Pacific offensive.

plan for Pacific participation according to their own criteria; Canadian domestic politics had entered the fray.[41]

This placed the RCN in a difficult position. The British Chiefs of Staff wanted the RCN to make a substantial contribution to operations against the Japanese, probably in southern waters, and was putting pressure on Canada for a firm commitment. As enticement, the Admiralty hinted that it might transfer eight modern fleet destroyers to the RCN. However, the British Chiefs of Staff stated forcefully that:

> the conditions of transfer of certain ships from the RN to the RCN included agreements to the effect that they would be placed under the operational control of the Royal Navy, and consequently such ships must presumably either be made available for the war against Japan under RN operational control or returned to the RN. In the case of other Canadian ships acquired by transfer from the RN, there is presumably at least a moral obligation to continue to employ them under RN operational control in the war against Japan.[42]

This referred not only to the hoped-for destroyers, but the two cruisers the RCN was already taking over and the two light fleet carriers it wanted. As Captain Miles had warned, strings were being attached to the big British warships that were crucial to the RCN's future, strings that were now being vigorously pulled. If Canada wanted a balanced fleet, it would have to acquiesce in British demands. Earlier that summer, Miles had suggested that all-Canadian units might be more readily accepted by the Americans, but this idea was dropped because

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[41] Cabinet War Committee minutes, 12 June 1944, MG 26 J4, NAC; PM to PM, cipher telegram, 27 June 1944, RG 24, vol. 8150, file NSS 1655-1, NAC; Brereton Greenhous et al, The Crucible of War, 1939-1945, vol. III (Toronto: University of Toronto Press, 1994), ch. 4, and; C.P. Stacey, Arms, Men and Governments: The War Policies of Canada, 1939-1945, (Ottawa: Queen's Printer, 1970), pp. 54-62.

[42] Report of the Joint Planning Staff of the British Chiefs of Staff on the "Employment of Canadian Forces After the Defeat of Germany," JP (44) 176, 24 July 1944, DHist 1650-1, Naval Policy (War Against Japan).

of the navy's concerns about the on-going negotiations with the British for light fleet aircraft carriers and cruisers. Even Captain Miles considered it somewhat of a tradeoff: assistance to the RN in the south-east waters in exchange for the ships needed to create a balanced fleet.[43]

By late summer 1944, on the eve of the second Anglo-American summit at Quebec City ("Octagon") that would settle strategy for the defeat of Japan, King began forcefully to impose his will on both his cabinet colleagues and the services. He reminded the Cabinet War Committee about the importance of deployment north of the equator and pressed for a reduction of the forces for the Pacific to the bare minimum. As Roger Sarty notes, "he was able to use to good effect intelligence from Washington that the Americans did not want or need substantial British forces in the Pacific."[44] King was determined to avoid a repeat performance of the first Quebec conference, when the British and Canadian admirals had conspired to lever more out of the Canadian government than it had ever intended.

King called a meeting of the full cabinet, in which he felt he had greater influence than in the Cabinet War Committee, in Quebec City on 13 September 1944, the first day of the Anglo-American summit.[45] In the cabinet meeting, King blasted the notion that the country

[43] The RCN wanted to exchange the two escort carriers - Nabob and Puncher - for two light fleet aircraft carriers. Service in American rather than British theatres had already been discussed by the Chiefs of Staff Committee.

[44] Roger Sarty, "The Ghosts of Fisher and Jellicoe: The Royal Canadian Navy and the Quebec Conferences," unpublished paper, p. 23.

[45] Ibid.

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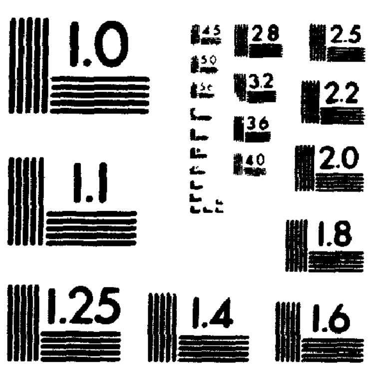
PM-1 3½"x4" PHOTOGRAPHIC MICROCOPY TARGET
NBS 1010a ANSI/ISO #2 EQUIVALENT



should make a large effort in the Pacific. He began with political fundamentals, discussing the government's prospects in the forthcoming general election:

> and said that we must not let it develop into an argument about Imperialism and the use of Canadian forces as part of an Imperialistic Army. We have done a great deal in this war, our taxes are very high. How much more could our people stand? The great financial contributions that we have made should be considered and should be taken to some extent as in lieu of manpower contribution....[46]

When the Chiefs of Staff joined the meeting, Admiral G.C. Jones, Nelles's successor as CNS, made it clear that he favoured a substantial naval effort, along the lines suggested by the RN. He also said that "the geographical demarcations were meaningless in the naval context, because the RN would be mounting a Pacific fleet that would work as an integral part of the main American fleet"[47] (the strategy that was just being settled between the Americans and British at Octagon). Macdonald, for his part, took the prime minister on directly, "accusing him of distorting agreed policy by incorrectly converting the 'preference' expressed for the north and central Pacific into a demand."[48] After three-and-a-half hours, the Cabinet confirmed the government's view that Canadian military forces should participate in operational theatres of direct interest to Canada, that is north of the equator. Mackenzie King mistakenly believed that the matter had been resolved. It was not. Macdonald accepted

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[46] Cabinet War Committee minutes, 13 September 1944, MG 26 J4, vol. 425, NAC.

[47] Minutes of the Cabinet War Committee Meeting, 13 September 1944, MG 26 J4, vol. 425, NAC; Roger Sarty, "The Ghosts of Fisher and Jellicoe: The Royal Canadian Navy and the Quebec Conferences," pp. 33-34.

[48] Ibid. It should be noted that the services did have the support of some Cabinet members. Gardner and Ilsley believed that the forces should be placed where they would be most effective.

the decision as a political one that would not be pressed should military developments require operations to the south.

On 22 September, the Minister for Naval Services presented the Canadian navy's plan for participation in the Pacific theatre to the Cabinet War Committee. The Minister proposed:

> 20,258 men afloat for service in the Pacific, with some 30,000 ashore to support the overseas effort, would enable the RCN to man all of the larger vessels expected to be available at the time, including 2 cruisers, 2 light fleet carriers, 25 destroyers, 54 frigates, 12 corvettes (improved), 12 Algerines and the three Prince ships.[49]

The Prime Minister declared that "the Naval proposals were altogether too high, and quite disproportionate to an appropriate Canadian effort in the Pacific".[50] King then called for drastic reductions to minimize the financial and manpower burdens on Canada. Macdonald challenged the Prime Minister, but to no avail. King's decision would not only restrict the scope of operations, but the very existence of a substantial fleet contribution.

Admiral Jones, a cautious bureaucrat who refused to be drawn into the heated discussions of the Cabinet War Committee, suggested a smaller but balanced fleet of two cruisers, one aircraft carrier, two fleet destroyers, four Tribal-Class destroyers, four River-Class Destroyers, 27 frigates and six Algerines.[51] The Prime Minister was still not satisfied.

By early October the RCN had completed a revised estimate, which the Naval Minister presented to the CWC. The new plan called for:

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[49] Cabinet War Committee minutes 22 September 1944, MG 26 J4, vol. 425, NAC.

[50] Ibid.

[51] Cabinet War Committee minutes, 5 October 1944, MG 26 J4, vol. 425, NAC. I am indebted to Roger Sarty for this assessment of Vice-Admiral Jones. See, Roger Sarty, "The Ghosts of Fisher and Jellicoe: The Royal Canadian Navy and the Quebec Conferences," pp. 26-27 and note 49.

> 8,812 naval personnel for the Central Pacific, to serve with the British forces under Admiral Nimitz [USN], manning two cruisers, one anti-aircraft ship and some 40 frigates and destroyers; while two light fleet carriers and eight destroyers (4,600 personnel) would be added later.[52]

The CWC subsequently approved these proposals which involved 13,412 personnel. Although this represented a reduction of more than 50 per cent of the Naval Staff's original proposal, it at least implied approval for the acquisition of the light fleet carriers. However, in view of the Canadian government's policy, confirmed during Octagon, limiting operations to the north Pacific, the question of the ships' deployment proved a stumbling block in the Anglo-Canadian negotiations for the transfer of the carriers and the cruisers. Negotiations for the light fleet carriers would drag on until the end of March 1945. In the interim, the manning of HM Ships Nabob and Puncher, by Canadian personnel served as the "stepping stones" in the RCN's drive to acquire a naval air service.

In the end, the Naval Staff's aspirations of providing a large fleet for operations in the Pacific never materialized. HMCS Uganda arrived in the Pacific in time to join the British Pacific Fleet's operations in the pitched battle for Okinawa in May 1945. The second cruiser and the first fleet destroyer were en route to the Far East when the Americans dropped the atomic bomb on Japan.

Despite King's conviction that wartime programmes should not become the basis for the post-war forces, he allowed the RCN to press forward with the acquisition of the light

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[52] Cabinet War Committee minutes, 11 October 1944, MG 26 J4, vol. 425, NAC. The CNS pointed out during the course of the meeting that the actual composition in terms of the various categories of ships would require further review. The Prime Minister had hoped to limit the naval contribution to 10,000 to 12,000 ratings, all ranks. The navy's original proposal (submitted at the meeting) called for 15,138 ratings. This proposal was rejected by the CWC.

fleet carriers, cruisers and the fleet destroyers, albeit fewer than originally planned for. This is explained, in part, because of the navy's reductions in its escort building programme, and the fact that the warships were a gift from the Royal Navy.[53] The RCN did acquire two state of the art cruisers, two fleet destroyers (Crescent-class), and two light fleet carriers, Warrior and Magnificent, although the navy only ever operated one carrier because of manpower shortages and limited budgets. The Canadian navy eventually returned Warrior to the British, because of the costs to modify her to operate in the northern climates, and commissioned Magnificent. On 19 December 1945 the Canadian government finally gave its approval to form a Canadian naval air service. In May 1944, the RCN had begun the process of "Canadianizing" the four FAA squadrons scheduled for service in the two light fleet carriers, and eventually took over two fighter (803 and 883), and two bomber (825 and 826) squadrons.[54]

Sarty argues that "if government policy greatly restricted the scope of the balanced fleet, developments during the final months of the war and after eroded the strategic

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[53] King was more concerned with the costs devolving on the Canadian taxpayer, and with the use of the War Measures Act to acquire ships intended for the post-war navy, than with the actual creation of a Royal Canadian Naval Air Service. Indeed, Mackenzie King always supported the notion of the RCN having its own naval air arm. Following a meeting of the CWC, in the spring of 1943, the prime minister noted in his diary, "I would like to see the navy have this particular arm, but they would have to get it at the expense of something else". See, King Diary, 21 October 1943, DHist MG 26/J13.

[54] In 1946, owing to manpower shortages Squadrons 826 and 883 were disbanded, although, on paper, they remained RCN squadrons. See, Shawn Cafferky, "Flying High: The Royal Canadian Naval Air Service, 1944-1946," (Unpublished DHist Narrative, 1992), pp. 69-78.

justification for such a force."[55] NSHQ was so concerned about the German inshore campaign that it called back its most experienced frigate group from UK waters to protect Canadian home waters during the 1945 shipping season.[56] At the end of the war, the Admiralty confirmed Naval Service Headquarter's fears that all of the RCN's anti-submarine craft were now obsolete - the new frigates had a top speed of only 19 knots.[57] The navy's acquisition of the light fleet carriers, late in the war, promised to redress that situation. It should be pointed out that the navy had planned to use the two escort carriers on the north Atlantic run, only to have this idea overturned by the RN who still maintained operational control of the carriers till the end of the war. The RCN's thrust to gain aviation experience of all types beginning in 1942-1943 did succeed in providing experienced personnel, especially fixed-wing pilots, who would be indispensable for the navy's helicopter programme in the post-war period.

During the Second World War, the RCN faced numerous challenges, not the least of which included building a fleet from scratch to meet ever-expanding commitments. Despite the navy's success in the Battle of the Atlantic, there were teething problems which had to be overcome if the RCN was to improve upon its anti-submarine record.

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[55] Roger Sarty, "Canada and Submarine Warfare, 1909-1950," p. 42, unpublished manuscript.

[56] See Douglas M. McLean, "The Battle of Convoy BX-141," in The Northern Mariner, (vol. III, No. 4, October 1993), pp. 19-35, for a detailed discussion of the German inshore campaign.

[57] NSHQ to CNMO, signal 14 September 1945, CNMO to NSHQ, signal 27 September 1945, extracts from DHist 1650-1, Naval Policy, vol. I, as cited in Roger Sarty, "Canada and Submarine Warfare, 1909-1950," p. 42.

CHAPTER THREE

DOWNSIZING: THE SEARCH FOR A ROLE, 1945-1949

> What we needed now was to get back to
> the old Liberal principles of economy,
> reduction of taxation, anti-militarism.
>
> Mackenzie King, 1946

The period immediately following the Second World War was in many respects a most difficult era for the Royal Canadian Navy. All navies, including the RCN, had to face the very complex legacy of the Second World War. The United States was now a global power. Britain was broke and relations were deteriorating with the Soviet Union, a power whose circumstances and traditions, especially when coupled with the effects of new technologies, raised particularly tricky problems for western navies.

Canada certainly felt the impact of the international changes, given its long-standing tradition of relying upon Britain as a counter-balance to American influence, and the dominion's location directly on the polar route between the Soviet Union and the United States. The Canadian forces faced the additional challenge of a government that was not interested in defence. The events of the early Cold War and consultation among the western allies gradually helped to clarify Canada's defence posture. From all of these developments came two inducements for the introduction of helicopters into the RCN - the imperative for arctic operations to secure the north against the U.S.S.R. and uphold Canadian sovereignty in the face of huge U.S. projects in the region, and the emergence of an A/S specialty for the RCN that emphasized large, modern anti-submarine destroyers.

The return of the RCN in the post-war decade to the role that had been forced upon it in 1940-1942, and which it had then tried to escape in 1943-1945, was a development of profound importance that determined the shape of the service to the present day. The nature of the Soviet threat, western alliance strategy, and the expectations of Canada's alliance partners were decisive influences on Canadian naval policy, but at least as important was the constraint of limited budgets made tighter still, despite greatly increased government spending on defence from 1950, by the escalating costs of new military technology. Given the great expense of procuring additional carriers, priority fell to the destroyers. It was the search to exploit the full potential of this type, which the Canadian service could afford to operate in significant numbers, that brought the marriage of the helicopter with the destroyer. In the end, this creative response to circumstances that eroded cherished assumptions brought Canada to lead the world in producing a new type of moderately priced warship that allowed smaller navies to have a naval air component at a time when carriers were becoming too costly and complex for anything but the major powers.

At war's end, the RCN struggled with rapid demobilization and diminishing defence dollars. The government's interest was in returning men and women from the armed forces to civilian life as quickly as possible and re-converting the economy to avoid the slump that had followed the First World War.[1] In 1947, when the federal government cut the RCN's manpower from 10,000 to 7,500 personnel - half the number, as we have seen, that the staff had identified as the minimum for supporting a properly balanced fleet - the navy had to place a number of warships in reserve.

The question of how to build from this cadre, aside from the fundamental issue of resources, turned to the nature of the threat. The war-making potential of the Axis powers had been utterly smashed. These were the nations that since 1900 had, like Britain and the U.S., concentrated on building major surface fleets. Altho Russia had once been a major factor in the international naval balance, upheavals in its military leadership since the Soviet revolution, and then the course of the great land war with Germany in 1941-1945 had relegated the navy to a largely coastal role consisting of destroyers, torpedo boats and submarines whose principle role was to support the army.[2] There were cruisers and battleships, but they had spent much of the war tied up in port.

Most of the Soviet fleet fed the defences of Leningrad and Moscow with heavy guns and seamen remustered as infantry. In the late 1970's, Admiral Sergei G. Gorshkov, former Commander-in-Chief of the Soviet navy, stated that 400,000 Red navy personnel were

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[1] The RCN's budget for fiscal year ending 31 March 1946, was $241 million dollars. The following year it was cut to $64.8 million dollars, a reduction of $176.2 million dollars. The navy's budget for fiscal year 1947-1948 was slashed again to $43.7 million dollars. It will be recalled that the projected costs to maintain the two light fleet carriers as well as the squadrons was approximately $20 million dollars per year.

[2] See Lieutenant-Commander G.F. Todd's paper entitled "Post-War Strategic Security of Canada," n.d. (probably written in January 1944), DHist 1650-1, vol. 3. Nevertheless, Todd argued that a seaborne invasion could be launched by Russia of sufficient strength to sustain an invasion across the Pacific or Atlantic directly against Canada, or against places like Greenland and Iceland, and use them as forward bases for operations against Canada.

committed to land fronts. Only 100,000 men remained with the fleets and flotillas and participated in the defence of naval bases and in amphibious operations.[3] Still, the Soviet navy posed a potential threat to the West, especially its submarine fleet.[4]

As the Red Army marched west in 1945, it had captured prototypes and plans for the latest U-boats together with the scientists and technicians who had developed them.[5] With this technology, Stalin called for a vast building program of 1,200 submarines in twenty years.[6] Moreover, the Soviets were in possession of German missile technology which they hoped to develop in order to build ballistic missile-firing submarines. That was only a future

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[3] Peter Tsouras, "Soviet Naval Tradition," in The Soviet Navy: Strengths and Liabilities, eds., Bruce W. Watson and Susan M. Watson, (Boulder, Colorado: Westview Press, 1986), p. 16.

[4] On Canadian views of the Soviet threat, see J.L. Granatstein, The Ottawa Men: The Civil Service Mandarins, 1935-1957, (Toronto: Oxford University Press, 1982), ch. 8, and Norman Hillmer and Donald Page, eds., Documents on Canadian External Relations, vol. 13: 1947, (Ottawa: Minister of Supply and Services, 1993).

[5] The Soviet's obtained four Type XXI submarines in the post-war division of German tonnage. They also captured fourteen in advanced assembly at Schichau/Danzig, as well as parts for twenty more. In addition, they also captured the central design office at Blankenburg, where the Germans had been working on the Walter boats (Type XXVI). Norman Friedman, Submarine Design and Development, (Annapolis, Maryland: Naval Institute Press, 1984), pp. 100-101; Jan Breemer, Soviet Submarines: Design, Development and Tactics, (Surrey: Jane's Information Group, 1989), p.78.

[6] Norman Friedman, Submarine Design and Development, p. 100; Jan Breemer, Soviet Submarines: Design, Development and Tactics, pp. 78-79. Stalin's building programme was confirmed by Admiral Kuznetsovin in 1948.

possibility, in fact a decade away,[7] but possession of proven German Type XXI submarine technology posed a more immediate problem.

During the last year of the war, the effectiveness of the massive Allied anti-submarine forces had been greatly reduced when the Germans had fitted schnorkels on the U-boats. This allowed the submarines to cruise submerged for weeks on end, never showing anything more than the schnorkel head above water. Allied surface search radar, which had played a major role in smashing the wolfpacks in 1943, was no longer effective, and the schnorkel boats were also able to take full advantage of water conditions that often blinded or degraded the performance of sonar. The U-boats began to strike with impunity again, including in Canadian coastal waters. Although shipping losses were not heavy, and, after some months of all out effort, the huge Allied air and escort forces available were able to neutralize the boats once more, this was mainly because the types of U-boats in service had a very limited underwater speed, only four to eight knots. For this reason, the Allies were extremely alarmed by intelligence about the new Type XXI U-boat that could make 15 knots while submerged, fast enough to outrun most existing escorts and strike at convoys as the wolfpacks had once done on the surface. As it happened, Allied strategic bombing of construction facilities had prevented the Type XXI's from getting into action, but there was

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[7] "During the late 1940's, the Soviets continued work on the German weapon, and in the early 1950's they tested Golem I and II, advanced versions of the German system. Following cancellation of this unsuccessful project, a new ballistic missile system was developed. Unlike the Golem, a modified Army Scud A missile was carried within the submarines hull. Using a Zulu-class submarine and the Scud A, the Soviets conducted the world's first successful ballistic missile launch from a submarine in September 1955." Robert E. McKeown and David Robinson, "Submarines," in The Soviet Navy: Strengths and Liabilities, p. 58.

no doubt that the Germans had achieved a major leap ahead of the best anti-submarine technology.[8]

Post-war tests conducted by the USN showed that the Type XXI boat could run at 5.2 knots in the silent mode, 12.5 knots at high speed and, 16.5 knots at maximum speed. Moreover, tests also showed that, running at 15 knots, the Type XXI was as quiet as the quietest U.S. fleet submarine at 8 knots. More disturbing was the fact that a Type XXI at 5 knots was so quiet that it could detect and obtain a bearing on a 16-knot destroyer from several times the destroyer's detection range.[9] In one stroke, then, Type XXI submarines rendered Western ASW technology and tactics obsolete.

Both the British and American intelligence communities anticipated that the Soviet navy would pursue development of the Type XXI to the exclusion of almost all other building programmes. Only four months after V-J Day, the U.S. Office of Naval Intelligence (ONI) warned:

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[8] The latest American airborne radar of the day (APS-20) could not detect a schnorkel at more than 13 miles in smooth Sea State 2; it was useless in slight Sea State 3 or more. Even if it was surprised on the surface the U-boat could dive extremely fast, to periscope depth in ten seconds, to 100 feet in 40 seconds. Finally, Type XXI submarines were more streamlined than Type VIIC (which were smaller boats) and presented a smaller sonar target. Norman Friedman, Submarine Design and Development, p. 57; Fritz Kohl and Eberhard Rossler, Anatomy of the Ship: The Type XXI U-Boat, (Annapolis, Maryland: Naval Institute Press, 1991), pp. 7-11.

[9] Norman Friedman, Submarine Design and Development, p. 57. The Type XXI was outfitted with passive sonar to detect convoys at long-range, completely submerged. Homing or pattern-running torpedoes could be fired without precise fire control information, so that the U-boat would never have to come to periscope depth; it could fire from a depth of 100-150 feet. See also, Fritz Kohl and Eberhard Rossler, Anatomy of the Ship: The Type XXI U-Boat, pp. 22-23.

> In view of the performance of German submarines, the strides made by German industry in their mass production, and the availability of German talent, a radical change in Russian submarine design philosophy may be reasonably expected in the next few years.[10]

ONI estimated that by 1950 the Soviet navy would have no fewer than 300 submarines of the Type XXI class. In early 1947, a classified USN publication painted a gloomy picture of future ASW: "double the number of screening ships were now required to protect convoys from the faster, schnorkling submarines".[11]

In the summer of 1948, ONI estimated that the Soviet submarine fleet included four operational Type XXI's, while work on another four was nearing completion. "This total of eight", a recent author has commented, "was close to ONI's 1946 projection, but the intelligence organization's evaluation of the scale of the Soviet Union's Type XXI construction effort was a far cry from its prediction that no fewer than 300 boats would be completed by 1950". Yet, even as ONI revealed its revised estimates, in early 1948, the Navy Secretary, John L. Sullivan, told a Navy League audience that "Soviet production of the Type XXI was running at 20 to 30 units pe year, and would increase to 200 before the end of 1951. This force, the Secretary warned, would join 350 conventional boats for a combined submarine fleet vastly superior to any operated by the German navy during the Second World War".[12]

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[10] Jan Breemer, Soviet Submarines: Design, Development and Tactics, p. 79. See also Willem Hackmann, Seek and Strike: Sonar, anti-submarine warfare and the Royal Navy, 1914-1954, (London: Her Majesty's Stationary Office, 1984), ch. XIV.

[11] Willem Hackmann, Seek and Strike, p. 335.

[12] Jan Breemer, Soviet Submarines: Design, Development and Tactics, pp. 79-80.

Estimates of Soviet intentions as well as their capacity to build these submarines varied wildly because of the lack of reliable intelligence. The West was dependent upon repatriated Germans for information and their reports were frequently contradictory. As Jan Breemer notes, "reports of Soviet experimentation or even of an expressed interest in a given technology area, tended to be interpreted as indicative of an established military programme and intention".[13]

The Western Allies were left with two choices: to develop an anti-submarine submarine (SSK) an extremely costly proposition, or design new surface countermeasures. Only the USN had the resources to pursue both courses. Smaller navies, like the RCN, were limited to the second alternative only.

Some authorities, especially in the American air force, believed atomic weapons had rendered naval warfare redundant. In mid-1946, in a series of tests conducted at Bikini Atoll, nuclear airbursts and underwater blasts did not heavily damage warships beyond 1,000 yards. Aircraft parked on the decks of the sacrificial fleet did receive some damage at 2,000 yards, but damage could be minimized by keeping the ships 2,000 yards apart, while steaming in a convoy. The main threat to both ships and personnel was radioactivity, but that could be counteracted by sealed fighting compartments and superstructure wash-down facilities, practicable if expensive solutions. The tests at Bikini appeared to confirm the USN's contention that navies still had a role to play in the atomic age. At the time the tests were conducted, the Americans were the only power that had the atomic bomb, and it was widely

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[13] Ibid., p 80. Soviet intervention in eastern Europe and the Middle East beginning in Iran in 1946, only served to heighten the West's fears.

believed that the Soviets would not obtain the bomb for another ten years.[14] That estimate allowed the western navies to concentrate on the more immediate threat, the fast submarine.[15]

The USN was the first to begin testing the A/S helicopter and dunking sonar. Two months prior to the Bikini tests, the Chief of Naval Operations directed that an experimental helicopter squadron be commissioned for comprehensive service trials and experimentation with existing types of helicopters. VX-3 took over the responsibility for training all navy helicopter personnel, including tasks such as radar calibration and torpedo tracking duties. Helicopters from the squadron were detached as needed, to other ships and shore units including Development Squadron VX-1, which was the unit of the Operational Development Force, Atlantic Fleet, responsible for anti-submarine development. VX-3 was officially commissioned on 1 July 1946, at Floyd Bennett Field, but testing of the latest dunking sonar (designated XCF) had begun two months earlier with VX-1 squadron.

In March 1946, Project Pilot Lieutenant Graham and his mechanic flew a Coast Guard helicopter (HO2S) to Naval Air Station Key West, Florida to begin tests. For a period of three months, trials were carried out against both conventional and schnorkel type submarines (Type XXI). Unfortunately, the tests had to be suspended when the only available helicopter crashed into the sea because of engine overheating. Helicopters of the day lacked sufficient

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[14] Captain H.N. Lay, then Director of Plans, RCN, attended the tests and probably witnessed first-hand the use of helicopters in a utility role, performing photographic missions, ferrying duties and radar calibration. It remains unclear, however, what impact helicopters had upon him at this time considering he was there to witness the effect of the atomic bomb.

[15] On British developments see, "The Development of Anti-Submarine Warfare, 1946-48/49," in ADM 1/20960, and "Helicopters in A/S Warfare," in ADM 1/20933, as cited in Willem Hackmann, Seek and Strike, p. 336.

horsepower and, when loaded with additional equipment and forced to hover in conditions of high humidity and temperature, tended to lose lift and crash. Nevertheless, the exercise showed that helicopters were able to track both types of submarines.[16] Similar ASW helicopter trials were also conducted in the United Kingdom. In January 1947, the Royal Navy formed its first all-helicopter squadron, 705, with R-4B and R-6 machines left over from the war. The unit conducted A/S trials, and worked on search and rescue techniques.[17] British experiences mirrored those of the USN.

Despite promising results, ASW helicopter development in the USN slowed as the service re-evaluated the ASW mission and helicopters. Lack of funding, inter-service rivalry, and the fact that the navy was focusing its efforts on developing a transport helicopter for Marine Corps amphibious operations explain the lack of progress in ASW helicopter operations. In September 1946 VX-3 squadron was transferred to Naval Air Station Lakehurst, New Jersey, where it began testing what became known as the "Vertical Assault Concept" for amphibious operations. More important to the Canadian story, however, was American interest in the north.

In March 1946, USS Midway, and three destroyers, left Norfolk under command of Rear-Admiral John H. Cassady to conduct cold weather tests in Davis Strait (Exercise

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[16] Lieutenant Colonel Eugene W. Rawlins, USMC, Marines and Helicopters, 1946-1962, (Washington, D.C.: History and Museums Division, 1976), p. 8; Clarke Van Vleet and William J. Armstrong, United States Naval Aviation, 1910-1980, (Washington, D.C.: U.S. Government Printing Office, 1981), p. 164; Tommy H. Thomason, "Carrier-Based Helicopter ASW," in The Hook, (Bonita, California: The Tailhook Association, Fall, 1985), p. 18.

[17] Eric J. Grove, Vanguard to Trident: British Naval Policy since World War II, (Annapolis, Maryland: Naval Institute Press, 1987), p. 44; Willem Hackmann, Seek and Strike, note 6, p. 399.

Nanook). For two weeks, these units operated as a carrier task force off the coast of Labrador and above the Arctic circle, conducting flight operations with various aircraft types, including a helicopter. In December 1946, a helicopter was assigned to the icebreaker Northwind for Operation High Jump, a joint USN/USCG expedition to the Antarctic. The helicopter performed a number of assignments, including ice reconnaissance and navigational duties, utility jobs and, search and rescue (SAR).

At about the same time, in January 1947, Commander A.H.G. Storrs, Acting DNP&I, at NSHQ in Ottawa, produced the first paper on the shape of the future Canadian fleet that took full account of the chill with the Soviet Union and the upheavals in technology. He pointed out that the threat to sea communications was two-fold: attacks by submarines and air forces. The development of the submarine, he bluntly declared, "has made the bulk of present day surface escorts virtually obsolete and the escort of the future does not yet exist. It will be necessary for it to have greater speed, better sea keeping qualities, and be of such construction as to promote the rapid construction in an emergency".[18] Moreover, the operating range of aircraft was increasing dramatically and they could be equipped with air-to-ship guided missiles. The combination of the two posed a deadly threat to surface navies and merchant ships. Storrs noted intelligence that the Soviets were constructing new surface warships - cruisers and destroyers - but dismissed them because their short endurance which meant they were capable of carrying out little more than the traditional Soviet role of defence of home waters. Storrs concluded that fleet task forces, the long-held dream of the RCN and

[18] Memorandum, "RCN Future Planning," Acting-Director Naval Plans and Intelligence to ACNS, NS 1650-26 F.D. 5183, 17 January 1947, RG 24 83-84/167, vol 455, file 1650-26 Part II, NAC.

the basis of its policy since 1943, were not a priority. "In order to have such forces available in war they must be retained in peace. The retention of such force~ is beyond the capability of Canada's peacetime economy. Canada's naval planning should therefore be governed by the dominant requirement for anti-air, anti-submarine and anti-mining forces. Such forces comprise aircraft carriers and aircraft, all purpose destroyers, escort vessels and minesweepers".[19]

Captain H.N. Lay, DNP&I, concurred with Storrs' recommendations, albeit with some reservations. Lay, a long-time supporter of naval aviation, was loath to relinquish the concept of carrier task forces and played up the protection of trade to make his point. "Protection of trade can be most effectively be achieved by the provision of hunting groups and an increased number of close escorts, both consisting of carriers and fast escorts".[20] In any case, he

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[19] Ibid. Brian Cuthbertson argues that the re-birth of the post-war RCN was dependent upon the creation of the North Atlantic Treaty Organization (NATO). See Brian Cutherbertson, Canadian Military Independence in the Age of the Superpowers, (Toronto: Fitzhenry and Whiteside Limited, 1977), p. 127. Mathwin Davis suggests that Storrs's "perceptive observations introduced the concepts that would revolutionize the RCN and lead to major new construction programmes. It was a bold initiative, well in advance of Western European Union, the Brussels Treaty, or NATO...." It should be noted, however, that Storrs was not alone in this assessment: both the RN and USN were well aware of the threat posed by the new generation of submarines. As early as September 1945, the Admiralty had informed the RCN th›t present-day escorts were obsolete. Davis also implies that Storrs' ideas were accepted wholeheartedly. This is not the case. See S. Mathwin Davis, "The St. Laurent Decision: Genesis of a Canadian Fleet," in The RCN in Transition, 1910-1985, edited by W.A.B. Douglas, (Vancouver: UBC Press, 1988), pp. 195-196.

[20] Memorandum, "Planning of Post-War Navy," Captain H.N. Lay, DNP&I to DCNS, NSS 1650-26, 14 March 1947, RG 24 83-84/167, vol. 455, file 1650-26 Part II, NAC. The difference in the two memorandums can be explained, in part, because of the varying experiences of the two officers. For example, Commander Storrs spent the bulk of his time commanding small warships (minesweepers and corvettes) whereas Captain Lay spent a great deal of time in capital ships and destroyers, commanded the escort carrier HMS Nabob, and held important shore appointments (ie. Director of Naval Plans) during the war.

concluded by stating that the number of ships required by the RCN could not be finalized until the Canada-US Basic Security Plan was completed and agreement reached between the two countries as to the division of the joint tasks.

Work on the basic plan had begun in 1946 in the Military Cooperation Committee (MCC), and other working committees of the Permanent Joint Board on Defence. Several officers represented the RCN at those discussions including Rear-Admiral F.L. Houghton, Assistant Chief of the Naval Staff, Captain H.N. Lay, DOP, who served as the member of the Joint Planning Committee (JPC) of the Military Cooperation Committee, and Captain D.L. Raymond, Director of Weapons and Tactics (DWT), who served as the Chairman, Sub-Committee on the Sea Lines of Communication.[21] Other naval members of the Canadian section included Lieutenant-Commander D.W. Gross, Assistant Director of Naval Plans and Intelligence and Lieutenant-Commander W. Bremner.

The Canada-US Basic Security Plan laid out the war plans of the U.S. and Canada in the event of war. As such, it was an all-encompassing plan. The naval section of the plan was divided into three parts: peacetime strategic action, peacetime tactical action, and wartime action. The peacetime strategic plan gave priority to research and development in anti-submarine measures and equipment; selection and development of anti-submarine bases, including air bases; the allocation of forces, and the stock-piling of equipment. Peacetime tactical action focused upon joint training to establish common operational procedures and

[21] See Minutes of Meetings of the Canada-United States Military Cooperation Committee, 1946-1960, DHist 84/540. Captain D.L. Raymond, DWT, also served on the Arctic Tests and Experience Sub-Committee. Captain G.A. Rotherham, DNA, also served on the Protection of Sea Lines of Communication Sub-Committee with Lieutenant-Commander R.P. Welland.

included surveillance of outlying areas, with emphasis on the Arctic, North Atlantic and North Pacific areas; also the planning and installation of essential harbour defences. The wartime plan included the implementation of operations in light of existing circumstances.[22] The section of the plan which dealt with the sea lines of communication was further sub-divided into two sections: anti-submarine measures and naval convoy and re-routing, and; naval/air striking forces.

When the Canadian Chiefs of Staff Committee met in February 1948 to discuss the plan, Captain Raymond outlined the strategic assumptions.

> It was assumed that any potential enemy would realize the importance of a full submarine offensive, also that submarines might be used for the launching of guided missiles, aircraft or rockets against shore objectives. It was assumed further that the best protection of sea lines of communication was offensive action against enemy military potential. Purely defensive forces should therefore be kept to a minimum.[23]

Captain Raymond's last comment stemmed from the realization that anti-submarine measures had not kept pace with submarine technology. Captain Lay, in a comment clearly directed to the air force, reminded the Chiefs of Staff that strategic bombing of submarine bases would

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[22] Ibid. The plan was designed to provide for the protection of coastal and overseas shipping in the coastal waters of Canada, the U.S., including Alaska, and Newfoundland and in the northwest Atlantic and north Pacific. When the MCC approved the Canada-US Basic Security Plan, in May of 1946, the following projects were considered urgent: the investigation of and establishment of essential elements of the air defense system; a programme of air mapping and photographing; collection of vital Arctic experience and scientific data; familiarization of appropriate personnel of the armed forces of both countries in military operations under extreme climatic conditions. See "An Appreciation of the Requirements for Canada-US Security," No. 1, 23 May 1946, in Report of Proceedings of the Joint Canadian-United States Military Cooperation Committee, 20-23 May 1946, DHist 84/540.

[23] Minutes of the 411th Meeting of the Chiefs of Staff Committee, 12 February 1948, DHist 73/1223, files 1305-1307.

not solve the submarine threat any better than it had in 1939-1945. During the Second World War, German submarine production continued to increase, despite intensive air and other attacks on submarine bases and production facilities.[24] Lay also told the COSC that the RCN did not have sufficient numbers of warships to meet the goals outlined in the anti-submarine plan. He noted that force requirements for ships and aircraft to counter submarine attacks had increased substantially: 52 small carriers and 967 escort vessels were required for escort of shipping, and hunter/killer groups. Responding to that section of the plan which dealt with

[24] Opposition to naval aviation came from the RCAF and the government. In 1946, Mackenzie King, supported by the Secretary of State for External Affairs, told Brooke Claxton, Minister of National Defence, that "the Navy had no need at all at the present time for aircraft carriers". When Claxton attended his first Cabinet Defence Committee (CDC) meeting, in January 1947, the committee discussed reducing defence spending, and debated eliminating the carriers altogether. The following year, the Chief of the Air Staff, Air Marshal Wilf Curtis, led the campaign to eliminate the carriers stating "the operation of aircraft carriers by the RCN was, in principle undesirable". Two years later, in 1950, at a special meeting of the COSC, he was less subtle, stating "I desire to place on the record my recommendation for the disbandment of the Naval Air Arm". See, W.J. Pickersgill and D. Forster, The Mackenzie King Record, vol. 3, p. 394; Ibid., vol. 4, p. 9; Minutes of the Cabinet Defence Committee, 21 September 1948, RG 2, vol. 2748, vol. III, NAC, and: Minutes of a Special Meeting of the Chiefs of Staff Committee, 31 January 1950, RG 24 83-84/167, vol 223, NAC, respectively.

the Arctic, he pointed out that the RCN could not carry out surveillance of Canada's northern coastline, because the navy did not possess an icebreaker.[25]

The Chiefs of Staff felt that Canadian planners were handicapped in their discussions with their American counterparts because of lack of direction from the government. While the Canadian government agreed in principle with the plan, it was reluctant to commit resources. Lester Pearson, then Under-Secretary of State for External Affairs, noted that these talks were non-committal and exploratory in nature, and had served to dispel any impression that Canada was reluctant to undertake practical defence measures in cooperation with the United States...."[26] Having said that, the Prime Minister had warned President Truman that "care would have to be taken not to give the Russians a chance to say that we were trying to fight them".[27] The Canadian government viewed the Canada-US Basic

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[25] Ibid. The Chiefs of Staff also discussed the merits of offensive versus defensive ASW strategies. The American armed forces, especially the USAF and USN, favoured offensive operations. The RCN had limited capabilities - with only two cruisers and one light fleet aircraft carrier - to carry out offensive ASW operations (strategic bombing and off-shore bombardment of naval bases and installations). Regardless, the RCN managed to maintain a general purpose fleet to carry out some of these roles on a limited basis. By 1949, however, the RCN was forced to accept the defensive ASW role, and became for all intents and purposes an ASW navy. For a detailed discussion of the USN's fight for a strategic role in the post-war period see, Michael A. Palmer, Origins of the Maritime Strategy: American Naval Strategy in the First Postwar Decade, (Washington, DC: Naval Historical Center, 1988), chs. 3-6, and; Jeffrey G. Barlow, Revolt of the Admirals: The Fight for Naval Aviation, 1945-1950, (Washington, DC: Naval Historical Center, 1994), chs. 3-10.

[26] Extract from the Minutes of the 25th Meeting of the Cabinet Defence Committee, 9 January 1947, RG 24, vol. 8067, file NSMS 1270-15-7 vol. 1, NAC. See also, "Working Papers for Use in Discussions with the United States," in RG 25, vol. 34, file 52-C (S), Parts 1-3, NAC; and MG 32 B5, vol. 122, file Joint Defence Policy.

[27] J.W. Pickersgill and D. Forster, The Mackenzie King Record, vol. 3, (Toronto: University of Toronto Press, 1970), pp. 362-363.

Security plan as just that, a plan. American authorities, however, acted as if the plan had already been approved by the respective governments, and that it should serve as the basis of future procurement programmes. Consequently, the COSC decided that discussion would be deferred until such time as Canada was able to accept full responsibility for implementation measures in Canadian territory.

Fiscal considerations, as always, were at the forefront of the Canadian government's treatment of specific measures. In March 1947, A.D.P. Heeney, the influential Secretary to the Cabinet whose efforts in 1944 had helped King limit the size of the Canadian contribution planned for the Pacific, drafted a paper that brought together some key concepts: "ideally, we should, as a small country with limited resources in manpower and finance, `specialize' intensively as between Services and as between arms of Services in concert with our larger partners, the United Kingdom and the United States". He then observed that "such specialization would lead to drastic alterations in our present organization; probably the elimination of many features of our present balanced forces for example, heavy bombers, aircraft carriers, even perhaps infantry".[28] Although Heeney recognized that specialization could not be carried out until such time as Canada, the United Kingdom and the United States had reached an agreement on defence policy, he argued that the principle should henceforth govern Canadian policy.

The notion of "specialization" or "division of effort" came about as a result of discussions between the Canadian and U.S. sections of the PJBD regarding the implementation of the short-term and long-term projects laid down in the Canada-US Basic Security Plan. Major-General Guy Henry, U.S. Army, and Chairman of the U.S. Section of the PJBD, submitted a memorandum to the members of the PJBD in an attempt to speed up implementation of the Canada-US Basic Security Plan. Moreover, he wanted to start joint exercises immediately so that more than just a paper plan existed. The general believed that the time had come to stop talking and take action. Mr. E.W.T. Gill, Secretary of the Cabinet Defence Committee, summarized General Henry's argument for Brooke Claxton, Minister of National Defence,

[28] A.D.P. Heeney to Brooke Claxton, 3 March 1947, The Honourable Brook Claxton Papers (hereafter Claxton Papers), MG 32 B5, vol. 122, file Joint Defence Policy, NAC. Mr. E.W.T. Gill, Secretary of Cabinet Defence Committee concurred with Heeney's recommendations and had submitted a similar proposal to Claxton under a separate cover. General Guy V. Henry, U.S. Army, and Chairman of the U.S. Section of the PJBD, was also proposing a "division of effort," in the tripartite discussions on defence policy conducted during the same time period. See Permanent Joint Board on Defence - Journal of Discussions and Decisions, DHist 82/146, vol. 6. When Canada entered NATO in 1949, it was required to provide "balanced forces". The RCN took that to mean that it would continue to operate a small balanced fleet consisting of an aircraft carrier, cruisers, fleet destroyers, escort destroyers, frigates, minesweepers etc. However, to the politicians "balanced forces" meant that the RCN would provide the ASW component of a balanced NATO maritime force. This difference of opinion (general purpose fleet versus ASW fleet) generated intense discussion not only between the various levels of government and the navy, but within the navy itself, and would continue for more than a decade.

> If war occurs in the near future, our major effort would probably be in a theatre outside North America but thereafter a much larger proportion of our forces would be engaged in North American defence. As the likelihood of attack in the next five years is recognized to be slight, it seems reasonable to suggest that our forces should be organized to meet conditions which will exist after 1952, particularly if such forces would come close to satisfying short-term requirements. Acceptance of this principle would mean that our defence forces should be organized primarily for North American defence and on this basis there would seem to be little doubt that some changes in present Service strengths would be found desirable.[29]

The narrow focus of Henry's paper on the Soviet air threat brought naval members of the PJBD - Admiral C.W. Styer, USN, and Admiral F.L. Houghton, RCN - to point out the danger of submarine attacks at the next meeting of PJBD, held on 11-12 September 1947.

Brooke Claxton's own thinking on defence policy had begun to crystallize by early 1947. Although he did not believe that the Soviets would launch an all-out attack on the U.S. with their bombers or submarines, he did accept the possibility of hostilities between the two superpowers, and that it would be a large-scale conflict. He felt that Canada should build up a base of knowledge and skill rather than large reserves of equipment and manpower; there would be time enough to recruit personnel when the conflict erupted. Claxton proposed a

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[29] E.W.T. Gill to Brooke Claxton, 28 February 1947, Claxton Papers, MG 32 B5, vol. 122, file Joint Defence Policy, NAC. See also Memorandum for Members of the PJBD, prepared by Major General Guy V. Henry, U.S. Army, 10 September 1947, and; Minutes of the 403rd Meeting of the Chiefs of Staff Committee, 30 September 1947, RG 24, vol. 8067, file NSMS 1270-15-1, NAC. It should be pointed out that General Henry submitted a similar version of this memorandum to the PJBD as early as 9 September 1946. See Minutes of PJBD - Journal of Discussions and Decisions, 19-20 September 1946, DHist 82/196, vol. 5.

small force which specialized in certain fields, such as northern operations, anti-submarine warfare, early warning, and scientific research, among others.[30]

At a special meeting of the Naval Staff, held on 2 September 1947, it was pointed out that the "primary commitment of the RCN is A/S warfare and, therefore, A/S training must have a high priority".[31] Despite the Naval Staff's recognition of the submarine threat and its pronouncement to that effect not all members of the staff agreed. Captain Raymond suggested that a requirement for cruisers and even battleships existed. As a result of joint discussions between Canada and the United States, the Naval Staff began to prepare two papers on the short-term and long-term goals and commitments of the RCN. What is of interest here is the apparent change in direction for the Canadian navy. Since 1943, the navy had actively pursued the acquisition of a balanced fleet; now it was being forced, because of external events and budget concerns, to change direction in mid-stream and acquire an ASW fleet.

Failure to resolve these issues created problems for Canadian naval planners. Raymond wanted the capital ships for strategic surface actions against enemy shore bases and installations in the eastern Atlantic. This would require fast striking forces consisting of aircraft carriers in excess of those required for A/S operations, cruisers for A/A defence and bombardment and possibly even battleships for bombardment by guided missiles. Turning to the ASW issue, Raymond expressed concern about "the increased difficulty of finding and

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[30] Claxton Papers, MG 32 B5, vol. 122, NAC; Captain P.C. Paterson, "The Defence Administration of Brooke Claxton, 1946-1954," (Kingston: Unpublished M.A. Thesis, 1975), pp. 16-17, DHist 79/137.

[31] Minutes of the 387th Naval Staff Meeting, 6 October 1947, DHist 1000-100/3.

destroying modern submarines when submerged makes it more important than ever to prevent them from reaching the open sea. Strategic operations would entail offensive action against submarines in focal points of egress from their harbours or surprise bombardments of enemy bases and shore installations by gunfire or guided missiles".[32] For close escort of the convoys - defensive operations - Captain Raymond recommended the use of escort carriers and fast escorts of the frigate type or possibly destroyers. Regardless of the type chosen, Raymond considered that speeds of 25 knots were essential and 30 knots would be even better.

A week later Commander Storrs, now Director of Naval Plans and Operations (DNPO), responded to Captain Raymond's paper. Storrs agreed with Raymond's assessment of the RCN's main functions in a future war, with the important exception of strategic operations. He questioned the necessity of creating "Fleet" and "Escort" categories. "The suggested role of the RCN in a future war does not envisage the conduct of fleet operations as a primary function. The employment of A/S escorts is therefore mainly with convoys and with Hunting Groups. In both cases the speed of the A/S ship is governed by the speed of the submarine which is faster than the convoy in the first case and as fast as or faster than the Light Fleet or Escort Carrier in the second case".[33] To meet the inshore requirements (seaward defence of harbours and coastal convoys), Storrs stated that consideration should

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[32] Memorandum, "Types of Ships to Meet RCN Requirements," DWT to Naval Staff, 3 May 1948, RG 24 83-84/167, vol. 461, file 1650-34 vol. 1, NAC.

[33] Memorandum, "Type of Ships to Meet RCN Requirements," DNPO to ACNS, file TS 11650-27, 11 May 1948, RG 24 83-84/167, vol. 461, file 1650-34 vol. 1, NAC. To overcome this problem Storrs suggested building a fast tanker for the Hunter-Killer Groups. Commander Storrs believed that with the coming of the atomic age large numbers of fleet oilers were necessary to render the fleet as independent as possible of fixed bases for replenishment.

be given to the operation of blimps, which showed considerable promise as a vehicle for the operation of dunking sonar. Curiously, there was no mention of the helicopter in this role. Storrs concluded his paper by calling for coordinated staff requirements subject to a review of the tactical employment of the different types of escorts with a view to either consolidation or elimination of certain types of warships. He particularly wanted a study of the tactical employment of escort and light fleet carriers, paying particular attention to the possibility of concentration on one type for all A/S roles.

In a minute to the VCNS, Commodore H.N. Lay, ACNS, noted that the Chief of Naval Technical Services (CNTS) had some very definite ideas about the type of the escort vessel which could be built in Canada and asked the VCNS to invite him to attend the next Naval Staff meeting. So too did the Naval Constructor-in-Chief, Captain A.N. Harrison. Captain Harrison pointed out that the Admiralty had determined that it was impractical to combine anti-aircraft, anti-submarine and aircraft direction qualities in one small ship suitable for rapid production in an emergency. Therefore, the RN decided to produce three distinct types of convoy escorts. To allow rapid production in large numbers, the design for all three types proposed using a common hull. The minimum length of 320 feet with a displacement of 1900 tons and a maximum speed of 25 knots was now required for A/S work. Eventually a requirement to embody basic machinery would exist in all three types. In other words, it was the ultimate policy to have a standard design with basic hull and machinery which would be identical below the weather deck, the type being determined by the armament, controls, bridge arrangement, etc., carried above that deck. Destroyer design was following a similar course with three main classes, but was considerably larger for fleet work.[34]

Apparently the CNTS was unaware of these latest developments. In the margin of Harrison's memo, he wrote a note to the VCNS that these developments were well worth following up. Three days later, the CNTS recommended to the Naval Staff that RCN requirements should be reduced to three types of vessels with common hull and machinery requirements, and that they ought to possess an average speed of 30 knots.

Before any decision could be made on future A/S vessels it was necessary to determine the role of naval aviation in anti-submarine warfare. Captain Rotherham, DNA, believed that "if sono buoys are developed and helicopters and blimps (each in its particular sphere of operations) are used to tow dunking sonar, the navy would find itself well content with a speed of 25 knots for its escort vessels".[35] Rotherham then turned his attention to the issue of air defence of the fleet. He noted that the Soviet air threat was limited, but circumstances could change quickly if the Soviets overran France. Rotherham asked the DNPO whether "fighter aircraft would take care of this commitment or whether it should be left to the guns, rockets, etc. A decision on this point was required before the size and speed of carriers could be finalized".[36]

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[34] Memorandum, "Fleet and Convoy Escorts," Naval Constructor-in-Chief to CNTS, NSMS 11650-27, 17 May 1948, RG 24 83-84/167, vol 461, file 1650-34 vol. 1, NAC.

[35] Captain G.A. Rotherham to DNPO and DWT, NSMS 11650-27 (Staff), 22 May 1948, RG 24 83-84/167, vol 461, file 1650-34 vol. 1, NAC.

[36] Ibid.

Commander Storrs responded to DNA's request four days later. He began by noting that "the enemy strategy would include the overrunning and domination of Western Europe and that basic Allied undertakings would include the maintenance of essential air and sea communications to available bases including those in the Middle East, Africa and if possible the United Kingdom".[37] He also pointed out that, although there was no agreement yet on the allocation of areas of strategic responsibility between the potential Allies, for the purposes of preparation of the long-term RCN plan it was reasonable to assume that Canada's primary area of responsibility for sea communications would be in the North Atlantic, and that the RCN would be responsible for the protection of convoys within range of enemy shore-based aircraft. Local fighter protection for convoys would therefore be required.[38]

On 20 July 1948, the Naval Staff met again to discuss the RCN's long-range plan and determine not only the ship types but the equipment and weapons they were to carry in order to meet the plan. The Staff agreed in principle with many of the DWT's original recommendations regarding the role of the RCN and the type of vessels required to carry out the navy's long-range goals, but the discussion over the escort vessels and the aircraft carriers was long and drawn out. The Staff was reluctant to differentiate between fleet and convoy escorts since the speed and weapon requirements were virtually the same. The CNTS pointed

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[37] Memorandum, "Aircraft Carriers Required for Fighters." DNPO to ACNS, DWT, DNA, TS 11650-27, 26 May 1948, RG 24 83-84/167, vol. 461, file 1650-34 vol. 1, NAC.

[38] Ibid. In the margin of the DNPO's memo Commodore Lay, ACNS, noted that it was unlikely that the RCN could acquire the 17 aircraft carriers (CVL's) required by the long-term plan. He proposed that the RCN explore the possibility of getting the RN and USN to provide Combat Air Patrols in the eastern Atlantic and have Canadian CVE's in the western Atlantic. The latter would specialize in A/S aircraft. Lay concluded by stating that a programme of conversion of CVE's in Canada was also necessary.

out that construction of the escorts was dependent upon the availability of machinery, and that 23 knots was the maximum speed that could be obtained from diesel power. Staff requirements for speeds over 23 knots would require using turbines which would be difficult to build in Canada. He suggested, therefore, that the Staff consider building anti-aircraft and aircraft detection escorts with diesel machinery, and confine the high speed turbine construction to A/S escorts. Commodore Lay, ACNS, pointed out that escort vessels with a 25-knot speed would be sufficient for the foreseeable future - approximately ten years. Lay proposed that four 23-knot vessels be ordered immediately in order to keep Canadian shipyards busy and that the funds be included in the 1949/50 Estimates. It was then brought to Lay's attention that four new destroyers were already included in the RCN implementation programme and that they would be suitable as A/S escorts.[39]

The carrier question generated even more debate. The Staff did not support Captain Raymond's recommendation that the RCN procure two types of carriers. The Staff concluded that "the RCN should provide Convoy Escort Carriers (primarily A/S), noting that "Fighter Carriers," requiring a speed of 30 knots, would be extremely expensive. Furthermore, A/S carriers should be capable of operating a limited number of fighters, as they are definitely a requirement for convoy protection".[40] Not all Staff members agreed. CNTS suggested that the RCN concentrate on building only escort vessels, of a standard hull and machinery design,

[39] Excerpt from Minutes of the 420th Naval Staff Meeting, 20 July 1948, RG 24 83-84/167, vol. 461, file 1650-34 vol. 1, NAC; Minutes of the 420th Naval Staff Meeting, 20 July 1948, DHist 1000-100/3.

[40] Ibid. The RCN was still organized around the small carrier task force and was not yet ASW oriented.

with a view to exchanging this type of vessel with the RN or USN for aircraft carriers. Commodore Lay then reiterated his desire to acquire a second light fleet carrier for the West Coast. To strengthen his argument for the acquisition of carriers, Lay pointed out that while fleet carriers had been excluded from the RCN Long-Range Plan, 17 light Fleet or escort carriers had been included in lieu. Because of the complexity of these two issues, the Naval Staff concluded that further study was required before rendering a final decision. While the carrier issue, as well as the corresponding problem of naval aircraft procurement, remained unresolved, the fast A/S escort programme began to take shape - accelerated in part because of the Soviet submarine threat and increasing East-West tension.

When the Cabinet Defence Committee met, on 26 October 1948, to discuss Service Programmes for 1949-1950, events in Europe were already driving the agenda. The Soviet coup in Czechoslovakia in February 1948, followed by the Berlin Blockade in March of that same year, as well as concern about the position of Finland and Norway, forced the Allies, including Canada, to accelerate their defence programmes in preparation for an "accidental" war.[41] Vice-Admiral H.T.W. Grant, CNS, began the meeting by outlining the navy's long-range requirements which would provide basic security. The RCN required 78 A/S escort

[41] See, Minutes of the 44th Meeting of the Cabinet Defence Committee, 2 June 1948, RG 2, vol. 2748, NAC. Canada and the United States were currently reviewing their short-range plans in order to meet any emergency. Brooke Claxton believed that "the U.S.S.R. was unlikely to provoke a planned war in the near future, but the possibility of an "accidental" war due to Russian miscalculation must be taken into account. While it would be wrong to regard war as inevitable, the attitude of Russia made it necessary to plan defence measures as if it were".

vessels, 142 minesweepers and 70 local anti-submarine patrol craft.[42] Following this presentation, Grant summarized the existing short-term rearmament programme which was designed to place Canada in a position to make the greatest possible contribution in the event of an early war. This plan, which was incorporated into the 1949-1950 Estimates, called for the procurement of three anti-submarine frigates, one Algerine minesweeper, four L/L sweepers, and three Gate vessels. This rearmament programme represented one-seventh of the entire shipbuilding programme to meet the long-range goals of the Canada-US Basic Security Plan. The cost of the entire programme - short-term plan and the 1949-1950 estimates - was $85 million dollars. This represented an increase of $22 million dollars to the navy's budget over the previous year. Of that $22 million dollars roughly $19 million was earmarked for new construction and rearmament.

During the course of the meeting, Brooke Claxton questioned the need for 290 vessels for coastal defence duties. Admiral Grant responded by pointing out that during the last war some 400 vessels were operated by the RCN and that, even if the RCN acquired the 290 vessels, it did not necessarily guarantee complete protection of Canadian coastal waters. Moreover, the CNS stated that the 290 ships did not even represent the total naval force required to meet all contingencies, because the long-range plan called for an even larger Canadian contribution. Moreover, the plan excluded auxiliary vessels, which would add to the total. Finally, Admiral Grant pointed out that these ships could perform duties outside of Canadian coastal waters if the situation warranted. Douglas Abbott, Minister of Finance,

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[42] Seventeen of the A/S escort vessels were already in commission or reserve, and 18 ships were considered reconvertible. The navy had eleven minesweepers, and four A/S patrol craft in commission as well.

wanted to know whether or not the Canadian navy was being "designed to cooperate with Allied navies, or to operate as a self-contained organization?" Grant replied that the main role of the RCN was generally considered to be an anti-submarine one, and it would perform this role in cooperation with other Allied navies. "While no definite arrangements had been worked out, protection of the North Atlantic sea lanes in cooperation with the Royal Navy appeared to be a reasonable assignment".[43] After further discussion, the Cabinet Defence Committed approved, for inclusion in the 1949-1950 estimates, the procurement of three A/S frigates, 1 Algerine M/S, 4 L/L sweepers, and three Gate vessels.[44] This decision was the genesis of the St. Laurent class destroyer escorts, which when they began to enter service in 1955 would be the most advanced A/S escorts in the world; a decade later they would be the first warships of their type to operate helicopters.

American interest in the arctic provided a more immediate impetus to employment of helicopters in the RCN. In a speech to the House of Commons, on 9 July 1947, Claxton spoke of the inter-continental reach of new weapons, and its implications for the Canadian north.

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[43] Minutes of the 49th Meeting of the Cabinet Defence Committee, 26 October 1948, RG 2, vol. 2748, NAC.

[44] Ibid. Three days after the Cabinet Defence Committee meeting the Naval Board expressed "their concern regarding the tendency to put more and more varied equipment in HMC Ships. The Board felt that the time had come to consider removing some equipment presently installed for functions which had become secondary roles of the ships, and concentrate on A/S equipment (eg. that gunnery equipment in Tribal Class Destroyers would have to be sacrificed in order to provide up to date A/S equipment)". The Board was equally concerned about the "V" Class Destroyers which were being converted to A/S escorts. See Minutes of the Naval Board, 29 October 1948, DHist 1000-100/2.

> It is apparent to anyone who has reflected even casually on the technological advances of recent years the new geographic factors have brought into play. The polar regions assume new importance as the shortest routes between North America and the principal centres of population of the world. In consequence, we must think and learn more about those regions. Our primary objective should be to expand our knowledge of the north and of the conditions necessary for life and work there with the objective of developing its resources.[45]

The USN, it will be recalled, had already shown a particular interest in polar operations. On the question of arctic operations at least, the government was showing some movement. At the 40th meeting of the Cabinet Defence Committee, in January 1948, the question of naval participation in Arctic activities had already come up for discussion in relation to North American security, and specifically to ensure a greater measure of Canadian participation in the development of northern projects approved as a result of the Canada-United States Basic Security Plan. Admiral Grant "agreed that it was desirable for the navy to gain experience in Arctic waters, but at present this could best be done by operating an icebreaker or two, rather than fighting ships...."[46] Dr. Oman Solandt, Chairman of the Defence Research Board, supported the notion of building an icebreaker to expedite the supply of material to the north. The committee agreed that the "important question of Canada taking over more responsibility for supply and transportation services (including air and water transport) to northern installations would be the subject of further study by the Department of National Defence in consultation with civilian departments".[47] Two days later, the Naval

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[45] "Canada's Defence: Information of Canada's Defence Achievements and Organization," 9 July 1947, RG 25 B-3, vol. 2160, file - Defence Canada, 1946-1947, NAC.

[46] Minutes of the 40th Cabinet Defence Committee Meeting, 8 January 1948, RG 2, vol. 2748, vol. II, NAC.

[47] Ibid.

Board directed the Naval Staff to investigate the inclusion of one or more icebreakers in the fleet for arctic operations. In addition, the Staff was to outline the staff requirements for an icebreaker based on U.S. standards, including armament. The Board noted that the ship should be built in Canada, and that a helicopter was to be included in the ship's equipment with the necessary handling facilities. Finally, the Staff was to conduct a survey of possible operating areas in the Canadian arctic.[48]

On 3 March 1948, the Cabinet Defence Committee met again to discuss the provision of an icebreaker for the navy. Brooke Claxton pointed out to his cabinet colleagues that the Department of Transport did not possess suitable ships for arctic navigation, and in view of the increased activities in the north there appeared to be a requirement for a modern well-equipped icebreaker. In peacetime, it would permit a greater measure of Canadian participation in Canadian-American defence undertakings in the north, and in wartime it would be essential for the conduct of amphibious operations in that area. A ship of the U.S. Edisto type appeared to be the most suitable and the navy estimated that such a ship could be constructed in Canada at the cost of $6 million, and would take approximately two years to build. No provision had been made in the 1948-49 estimates for the icebreaker, and the personnel for the ship's complement would raise the navy's authorized ceiling above 7,500 personnel. Despite this state of affairs, both the Chief of the Naval Staff and the Secretary of State for External Affairs supported the plan noting that, "the ship offered a logical means

[48] Excerpt of the Minutes of the 399th Naval Staff Meeting, 27 January 1948, DHist 1000-100/3; Minutes of the 234th Naval Board Meeting, 10 January 1948, DHist 1000-100/2; RG 24 83-84/167, vol. 4024, file 8885-AW-50, vol. 1, NAC. See also Minutes of the Cabinet Defence Committee, 8 January 1948, RG 2, vol. 2748, vol. II, NAC. The navy had considered embarking a fixed-wing aircraft on the icebreaker instead of a helicopter.

by which RCN personnel could gain experience in the Arctic and by which Canada could make a useful contribution to the Canada-US defence plan."[49] After further discussion, the committee agreed to recommend the proposal to the Cabinet. On 25 March, Brooke Claxton announced that the construction of the icebreaker had been approved by the government.

On 29 April 1948, the Naval Staff met to discuss the procurement of helicopters for the RCN. During the course of the meeting, it was pointed out that:

> practical experience in the USN (Task Force 78[?]) proves that a helicopter is far superior to a seaplane for use in Northern waters, and can be used for the following: aid to navigation; general reconnaissance; photographic work on air strips, harbours and ice; ship to shore transport of material and personnel. The Staff also noted that aircraft carriers find a helicopter useful for the following purposes: Air Sea Rescue of crashed aircraft at sea (outside Canadian continental waters); a general purpose transport for personnel, mail and material between ships and between ship and shore and; helicopters can if necessary be used in lieu of plane guard destroyers, permitting destroyers in an emergency or Fleet training to be temporarily detached for other duties.[50]

These were exactly the same duties that helicopters had been successfully performing for the last two years with the USN and the USCG during operations High Jump and Frostbite.

Captain G.A. Rotherham, RN, the Director of Naval Aviation, went so far as to suggest that the Canadian navy procure a Canadian-built helicopter.[51] Rotherham recommended the SG Mark VI-D, over other types, because it had 60% more range than

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[49] Minutes of the 42nd Cabinet Defence Committee Meeting, 3 March 1948, RG 2, vol. 2748, vol. 3, NAC.

[50] Excerpt from Minutes of the 410th Naval Staff Meeting, 29 April 1948, DHist 1000-100/3; RG 24 83-84/167, vol. 4024, file 8885-AW-50, vol. 1, NAC.

[51] In the early years it was common practice in the RCN, especially in naval aviation, to borrow specialist officers from the Royal Navy and place them in key positions in Naval Service Headquarters.

other helicopters of the day, was economical to maintain, and had a lower unit cost.[52] The Naval Staff concurred in principle "that the purchase of at least three helicopters is necessary for the advancement and modernization of naval operations," and agreed that the SG Mark VI-D would be the most suitable, provided its payload was at least 400 pounds. Admiral Grant confirmed the decision of the Naval Staff and directed Captain Rotherham to investigate the cost per unit, as well as the cost of spare parts and maintenance, and obtain the exact specifications of the Canadian-built helicopter.[53]

In the interim Captain A.N. Harrison, Naval Constructor-in-Chief, obtained information from the USN and USCG regarding their icebreakers. In a memorandum to DWT and DNAD, Harrison pointed out that in Northwind and Mackinac-class icebreakers the after armament had been removed and the forward armament reduced because:

(a) USN ships carry a helicopter in position of the after twin 5-inch mounting

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[52] Excerpt of the 410th Naval Staff Meeting, 29 April 1948, DHist 1000-100/3; RG 24 83-84/167, vol. 4024, file 8885-AW-50, vol. 1, NAC. At the time Captain Rotherham was considering three helicopters: the Sikorsky R-5, Bell HTL-1 and, the SG Mark VI-D. The SG Mark VI-D was manufactured in Montreal by a small aircraft firm that went out of business soon after building its first prototype helicopter. Lieutenant L.F. Page, one of the RCN's first helicopter pilots, joined the company as a test pilot, after leaving the service. See Appendix No. VI, for a comparison of these helicopters.

[53] Ibid. It has been suggested in the Canadian literature that Captain Rotherham favoured the British over the Americans when it came time to procure naval aircraft for the RCN. Rotherham's recommendation that the RCN procure Canadian-built helicopters shows that he based his decisions upon the latest information and that he had the best interests of the service in mind. See Stuart E. Soward, Hands to Flying Stations: A Recollective History of Canadian Naval Aviation, 1945-54, vol. 1, (Victoria: Neptune Developments, 1993); Stuart E. Soward, "Canadian Naval Aviation, 1915-1969," in The RCN in Retrospect, ed., James A. Boutilier, (Vancouver: UBC Press, 1982) and; Commander Tony German, The Sea is at Our Gates, (Toronto: McClelland and Stewart Inc., 1990).

> (b) The USN ships were being built at a later date and in view of growth in weight of equipment added, it was necessary to save weight. It is understood that the USCG have or are removing the after 5-inch mounting in their ships.[54]

Harrison requested additional information regarding the type of guns to be fitted in the Canadian icebreaker, keeping in mind that the staff requirements called for the maximum number of close-range weapons that could be carried. This information would determine both the number of mountings that could be carried, and the amount of ammunition that could be stored. Harrison also needed to know how many, and what type of fixed-wing aircraft or helicopters were to be carried in the icebreaker.

Captain Rotherham, who was still awaiting further technical data from the British and Americans, responded several weeks later with some general information. He suggested that the icebreaker embark two helicopters, which would be carried on the after part of the ship, similar to the layout of USS Edisto, an arrangement that would "necessitate retaining the whole of the after deck for flying operations". He therefore requested that before any decision was reached on armament, or anything else, the various directorates were to ensure that nothing interfered with flying operations. He pointed out that whatever helicopter was chosen it would not exceed a weight of 5,000 lbs, length of 58 feet, and a height 12 feet.[55]

The Privy Council approved the letting of a contract for an icebreaker to Marine Industries, Limited, Sorel, Quebec, in January 1949, and the following month preliminary work began. The RCN had chosen the USN-USCG Wind-class design but incorporated

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[54] Captain A.N. Harrison, Naval Constructor-in-Chief to DWT and DNAD, 4 June 1948, file NSC 8885-408 (TS), RG 24 83-84/167, vol. 4024, file 8885-AW-50, vol. 1, NAC.

[55] Captain G.A. Rotherham, DNA, to DNPO and ACNS, 23 June 1948, file NSC 8885-408 T.D. No. 2 (STAFF), RG 24 83-84/167, vol. 4024, file 8885-AW-50, vol. 1, NAC.

several improvements, including enlargement of the flying deck by about 50% to allow the operation of as many as three helicopters. These changes, and more especially delays in the delivery of material and equipment, delayed the launch of the ship until 15 December 1951.[56] The slow progress of construction forced the Naval Staff, in June 1949, to defer procurement of the helicopters and to delay training of pilots until May 1950.[57] Although the construction of the St. Laurent class destroyers, to counter the Soviet submarine threat, would eventually have a significant impact upon Canadian naval aviation, the building of the icebreaker was the real catalyst for the Canadian navy to procure helicopters.

By 1949, the RCN finally appeared to be firmly on course, at least in terms of long-term planning. The naval estimates had been increased by some $22 million dollars, and plans for building of the arctic patrol vessel, three A/S frigates, minesweepers and the gate vessels were well advanced.[58] The shape of the fleet during this period was determined primarily by budget constraints and the escalating Cold War. The RCN struggled to come to terms with diminishing resources - both manpower and financial - while facing ever-increasing demands upon the service to meet all contingencies. Although the navy's budget increased in the late

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[56] See "History of HMCS Labrador," pp. 1-4, DHist 8000 - HMCS Labrador (1948-1958).

[57] Minutes of the Naval Staff, 30 June 1949, DHist 1000-100/3.

[58] In 1949 the RCN was struck broadside by a series of mutinies. For the rest of the year the service struggled with the issues that caused these incidents, namely inadequate pay, poor accommodation both ashore and afloat, working conditions, and poor or insensitive leadership which exacerbated the problems. The release of the Mainguy Report in the fall of 1949 proposed a number of changes to rectify the problems. For a detailed discussion of those mutinies see, L.C. Audette, "The Lower Deck and the Mainguy Report of 1949," in The RCN in Retrospect, 1910-1968, James A. Boutilier, ed., (Vancouver: UBC Press, 1982), pp. 235-249.

1940's, it was never able to meet the planned force levels required by the Canada-US Basic Security Plan. That plan, however, did lay the foundation for future expansion of the RCN, prior to the creation of the North Atlantic Treaty Organization (NATO) in the spring of 1949. Brian Cuthbertson has argued that "once the Canadian government committed forces to Europe and made Europe a strategic frontier of Canadian defence, then the maintenance of secure sea communications across the Atlantic was a sine qua non".[59] This is not the case. As this chapter has shown, the RCN, as well as the federal government, was committed to the protection of the Sea Lines of Communication (SLOC's) long before the formal creation of NATO and the commitment of forces to Europe.

The creation of NATO was in direct response to Soviet actions in Europe. Canada joined NATO because she recognized that, as a middle power, she could not hope to face the Soviet Union alone. Finances dictated that she enter into a collective arrangement, such as NATO, to stem the Soviet tide. The concept of collective security appealed not only to Canadians generally, but specifically to high ranking politicians such as the Prime Minister, Louis St. Laurent, and Brooke Claxton, Minister of National Defence, as well as key members of the Department of External Affairs.[60] Equally important, Canadian membership in NATO would not only help - it was believed - to defray some of the costs associated with defence,

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[59] Brian Cuthbertson, Canadian Military Independence in the Age of the Superpowers, (Toronto: Fitzhenry and Whiteside Limited, 1977), p. 127.

[60] See John English, Shadow of Heaven: The Life of Lester Pearson, vol 1: 1897-1948, (Toronto: Lester and Orpen Dennys Limited, 1989), ch. 12. As David Bercuson points out Brooke Claxton was an early, and avid, supporter of collective security. In fact, his experiences during the Great War informed and shaped his views of collective security for the rest of his life. See David Jay Bercuson, True Patriot: The Life of Brooke Claxton, 1898-1960, (Toronto: University of Toronto Press, 1993).

but would give Canada the opportunity to fulfil her traditional role as a mediator between Britain and the United States, and give her a voice on the international stage.

Soviet expansion in eastern Europe, the Berlin blockade in 1948, and the Soviet's first successful test of an atomic bomb in 1949, further heightened East-West tension, but it did little to alter Canadian defence planning in the short-term. The Korean War would change everything. As we shall see, events in South-East Asia would not only accelerate defence spending but would serve to formalize Canada's commitment to Europe. These same events would also force the RCN to take a more active role in the ASW field, especially as it related to the helicopter.

CHAPTER FOUR

THE RCN, NATO AND KOREA: REBIRTH OF THE ASW NAVY?

On 25 June 1950, North Korean forces swarmed across the 38th parallel into South Korea. Within four days the North Korean troops had captured Seoul, forcing President Syngman Rhee to flee for his life, while the forces of the Republic of Korea (ROK), retreated down the peninsula. U.S. troops were immediately dispatched to Korea, and were able to stem the tide of the North Korean advance.

The Western Allies quickly responded to the situation, and Canada was no exception. Within days of the invasion, the RCN despatched three destroyers to the Pacific; eventually they would be placed under United Nations (UN) command. Less than a month later, the Canadian government offered one squadron of North Stars (RCAF's No. 426 Transport Squadron), in lieu of ground forces, to help supply and reinforce UN forces in Korea. The U.S., however, continued to apply pressure on her allies to furnish ground forces, and by the end of July Australia, New Zealand and Britain agreed to send troops. Two weeks later Canada followed suit, announcing that it would despatch a brigade to either Korea or Europe. The brigade was sent to Korea in September.

By late October, it looked like the American led UN forces would defeat North Korea and that the Canadian infantry brigade would not be needed after all. This was not to be, as Allied fortunes took a turn for the worse. The North Koreans reinforced by 300,000 Chinese troops, attacked General MacArthur's forces near the Yalu River and the U.S. Eighth Army collapsed. By February 1951, the Chinese offensive ground to a halt and UN troops led by U.S. General Matthew B. Ridgway were starting to push north again. The following month, all of south Korea was back in UN hands, and a war of stalemate and attrition began. Many Western leaders feared that the invasion of South Korea was a prelude to a major Soviet offensive in Europe, and thus the hostilities in South East Asia served as the catalyst for an accelerated rearmament and modernization of the armed forces of the West.

The Accelerated Defence Programme came about as a result of the Korean War, but improving forces for NATO in Europe was the real priority. Each NATO country was to report back to the North Atlantic Council, by 28 August 1950, on what steps it had taken to increase the number of combat forces (these forces were supposed to be ready by 1 July 1951). In its report to the Council, Canada stated that by July 1951 it would have refitted four A/S destroyers (Tribal and fleet destroyers), and in the following years would recommission one cruiser, three destroyers, one frigate (Prestonian class), and two Bangor-class minesweepers. The conversion of the Tribal and fleet class destroyers meant eliminating the heavy gun armament the RCN had always cherished for its balanced fleet and fitting the latest A/S equipment. Similarly, the wartime Loch class frigate HMCS Prestonian was converted to a modern ocean escort, and she became the first of the Prestonian class frigates. In addition, accelerated shipbuilding projects included seven St. Laurent class destroyers, 14 Bay class minesweepers, five gate vessels, and the icebreaker Labrador. In 1948, the aircraft carrier Warrior had been replaced by Magnificent, and in 1950 her air squadrons were re-equipped with 75 used USN anti-submarine Avenger aircraft, and 12 Sea Fury fighters. The Avenger was able to carry the latest ASW equipment and provide increased flying hours as well as operational capability. Authorized personnel strength was to increase from 9,600 to 13,440. In the fiscal year ending 31 March 1951, the RCN's budget was $99.9 million dollars, an increase of $26.5 million dollars over the previous year. The following year the budget doubled to $182.4 million dollars.[1]

The Canadian navy's A/S specialization was now in full swing, but A/S required substantial warships. The RCN, because of the accelerated defence budget, was getting good, big ships, that provided the navy with an open-ocean capability, as well as a good deal of flexibility. The balanced fleet was taking a different form from the more traditional concept.

The naval war in Korean waters was very different from the Canadian experience in the Second World War. The main threat in Korea was not submarines and large surface fleets, but mines and shore batteries. RCN tasks included shore-bombardment, anti-aircraft fire, interdiction of enemy supply lines, minesweeping, naval blockade, and replenishment of Allied forces. They also screened and carried out plane guard duties for the Allied carriers, participated in anti-submarine exercises with other Allied naval units, and gave medical

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[1] Claxton Papers, MG 32, B5, vol. 94, Folder, Accelerated Defence Programme, NAC. See also, Joel Sokolsky, "Canada and the Cold War at Sea," The RCN in Transition, 1910-1985, W.A.B. Douglas, ed., (Vancouver: UBC Press, 1988), pp. 214-215, and Dan W. Middlemiss, "Economic Considerations in the Development of the Canadian Navy since 1945," The RCN in Transition, 1910-1985, W.A.B. Douglas, ed., (Vancouver: UBC Press, 1988), p. 259.

treatment to ROK and civilian casualties.[2] The RCN's involvement in these last two roles concerns us here.

The Korean War demonstrated the potential of the helicopter, especially in air observation, medical services, and rescue. The USAF's 3rd Air Rescue Squadron, for example, brought 846 United Nations personnel to safety from behind enemy lines.[3] Similarly, the allied navies employed helicopters for air/sea rescue, plane guard duties, minespotting and utility tasks such as carrying fleet mail. In addition, they continued to develop and test the aircraft's capability as an ASW platform.[4]

Commander A.B.F. Fraser-Harris, Commander, Canadian Destroyers Far East, in HMCS Nootka, was so impressed with the helicopter's abilities that he wrote to NSHQ extolling its virtues. He recommended that:

> consideration be given in the design of all new ships of corvette size and above to the provision of a suitable deck where a helicopter can be stowed, and from which it can operate. This could be most applicable to our new A/S vessels [St. Laurent Class Destroyers], since the helicopter also shows great promise as a potential A/S weapon

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[2] John Bovey, "The Destroyers' War in Korea, 1952-1953," in The RCN in Retrospect, 1910-1968," James A. Boutilier (ed.), (Vancouver: UBC Press, 1982), pp. 250-270; Commander Tony German, The Sea is at Our Gates: The History of the Canadian Navy, (Toronto: McClelland and Stewart, 1992), pp. 216-232; David Jay Bercuson, True Patriot: The Life of Brooke Claxton, 1898-1960, pp. 207-239.

[3] Forrest L. Marion, "The Grand Experiment: Detachment F's Helicopter Combat Operations in Korea, 1950-1953," in Air Power History, Summer 1993, Volume 40, Number 2, pp. 38-51.

[4] On 1 September 1951, the RCN formed the No. 1 Helicopter Flight, at HMCS Shearwater. The Flight consisted of three Bell HTL-4's, and began training for the following duties: photography, land and sea rescues, co-operation in ships' torpedo firings etc. Lieutenant-Commander J.D. Lowe was appointed in command. See J.D.F. Kealy and E.C. Russell, A History of Canadian Naval Aviation, p. 55; "A Chronological Review of Helicopter Operations in the RCN," DHist 86/377.

> of considerable ability. For search, sonar hunt, holding down and, indeed, shortly for attack, it will be a powerful weapon, and has a tremendous advantage that it is neither detectable by, nor vulnerable to the submarine unless the latter surfaces.[5]

Fraser-Harris, when he became the Director of Naval Aviation in Ottawa, would be able to pursue these ideas himself. In the interim, senior Canadian naval officers continued to witness various helicopter operations throughout the war.

On 8 February 1952, while HMCS Sioux was patrolling off Choda, the USAF Rescue Detachment requested the immediate services of a surgeon. Poor weather conditions and distance prevented the use of Sioux's boat to transport the surgeon, and so the deck atop the squid handling room was cleared and shored up as an emergency landing pad. "About half an hour later, two Sikorsky H-5 helicopters flew out from Choda, and after a brief survey of our `flight deck', one made two perfect landings. The other, which was carrying the patient in an under-blister, made several passes before alighting successfully".[6] The Commanding Officer (CO) of Sioux, Commander P.D. Taylor, stated in his report that "this is believed to have been the first helicopter landing on a destroyer. Needless to say, only the ship's peculiar

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[5] HMCS Nootka, Report of Proceedings, 5 May 1951, DHist Ships Files 8000 - HMCS Nootka. Fraser-Harris was referring to the new St. Laurent class destroyers currently building in Canada. Commander Fraser-Harris saw a demonstration of the helicopters' ASW capabilities at the USN's Operational Trials Unit, Key West, Florida, the previous year. Commander Fraser-Harris transferred from the Royal Navy to the RCN in 1946. He had extensive experience in fixed-wing fighters and ASW aircraft during the war, and not surprisingly, therefore, supported the use of helicopters in anti-submarine warfare.

[6] HMCS Sioux, Report of Proceedings, 1-29 February 1952, DHist Ships Files 8000 - HMCS Sioux.

structure made this possible, but it is worth noting for the future".[7] He was right on both counts.

Notable among many other experiences was the participation of HMC Ships Iroquois and Athabaskan in USN anti-submarine "Hunter/Killer" exercises, that included helicopters off the east coast of Japan in September 1953. The CO of HMCS Iroquois, Captain W.M. Landymore, echoed Fraser-Harris' recommendations of two years before:

> the most unusual step was the use of sonar fitted helicopters to close the gap between finding the submarine by long-range aircraft and the arrival of the surface attack unit. This, of course, is not a new thought or procedure to either the RCN or RN but is felt that such great strides forward have been made in their operations that it is time to enter the development with more than observers interest.... The most significant advance in A/S detection operations since World War II is this development and that it holds the greatest possible promise for the future [emphasis in original].[8]

Landymore recommended that the RCN immediately investigate the possibilities of adding an A/S helicopter squadron to the fleet and that serious consideration be given to operating them from escorts. He also suggested that the navy familiarize themselves with all facets of helicopter operations, including tactics, ship-to-air communications, fuelling, etc. Commander J.C. Reed, CO of Athabaskan, concurred with Landymore's recommendations.

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[7] Ibid.

[8] Commanding Officer, HMCS Iroquois, "Report of Hunter/Killer Exercise," to Commander, Canadian Destroyers , Far East, 25 September 1953, RG 24 83-84/167, vol. 1713, file 4903-4, vol. 4, Interim Box 24, NAC; Commander F.C. Frewer, Director of Tactics and Staff Duties, "Report of Hunter/Killer Exercise," to Director Tactics and Air Sea Warfare, 28 October 1953, RG 24 83-84/167, vol. 1713, file 4903-4, vol. 4, Interim Box 24, NAC.

and urged the RCN "to commence training in this vital aspect of anti-submarine warfare."[9] The subject generated further discussion at Naval Service Headquarters in Ottawa.

NSHQ, as noted in the last chapter, had already initiated procurement of helicopters before the war as part of the icebreaker project. On 2 August 1950, the Naval Board approved the Naval Staff's recommendation for the purchase of two helicopters in 1951-1952, and three more aircraft the following year. The Board observed that, in view of the Accelerated Defence Programme, it was desirable to proceed with procurement immediately.[10] The first two helicopters would be used to gain general experience in maintenance and flying while the three aircraft from the latter procurement programme were to be embarked in Labrador. During the course of the meeting, the Board noted that helicopters were being employed in experimental ASW, and that further employment would depend upon the success of those trials.[11]

The Staff wanted an aircraft capable of performing reconnaissance and general duties when operating with the Arctic Patrol Vessel, but also to carry out certain ASW functions. Given that helicopter ASW operations were still in their infancy, the Naval Staff attached the

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[9] Commanding Officer, HMCS Athabaskan, to Commander, Canadian Destroyers, Far East, 27 September 1953, RG 24 83-84/167, vol. 1713, file 4903-4, vol. 4, Interim Box 24, NAC.

[10] Minutes of the Naval Board, 2 August 1950, DHist 1000-100/2; Claxton Papers, MG 32, B5, vol. 94, Folder, Accelerated Defence Programme, NAC. See also, Joel Sokolsky, "Canada and the Cold War at Sea, 1945-1968," The RCN in Transition, 1910-1985, W.A.B. Douglas, ed., (Vancouver: UBC Press, 1988), pp. 214-215, and; Dan W. Middlemiss, "Economic Considerations in the Development of the Canadian Navy since 1945," The RCN in Transition, 1910-1985, W.A.B. Douglas, ed., (Vancouver: UBC Press, 1988), p. 259.

[11] Minutes of the 328th Naval Board Meeting, 2 August 1950, DHist 1C 0-100/2.

proviso "that if all the staff requirements cannot be met at present, preference is to be given to meeting those for service with the Arctic Patrol Vessel". The aircraft had to be small enough to store two in the icebreaker, and three abreast in the carrier's hangar. It had to have four hours' endurance with a range of 300 nautical miles, be able to cruise at 70 knots, and reach a ceiling of 10,000 feet. When fitted for general duties, it had to accommodate a crew of two, with space for 800 pounds of freight or four passengers. If configured for the A/S role, there would be one pilot and one observer in a sound proof cabin fitted with sonar equipment and a radar display; the helicopter also had to be able to carry an A/S weapon.[12]

No less important than the search for a suitable helicopter was training of personnel for the still esoteric art of rotary-wing operations. In 1950 there was only one qualified helicopter pilot in the RCN - Lieutenant Commander Dennis Langley Foley, who had received his training some six years before.[13] The RCN had attempted to obtain additional flying time for Foley in late 1948, about the time when the decision was made to build the icebreaker, but the request was turned down by the Royal Canadian Air Force because the only Sikorsky S-51 available was undergoing tests at the Experimental and Proving Establishment, Rockcliffe, Ottawa. The following year, the RCN approached the USN with greater success, obtaining refresher training on the latest types for Foley. Lieutenant-Commander Foley departed for

[12] Appendix A, Minutes of the 328th Naval Board Meeting, 2 August 1950, DHist 1000-100/2.

[13] At this time Lieutenant-Commander Foley was on the staff of Officer-in-Charge RCN Depot, Halifax. Lieutenant-Commander Foley qualified as a helicopter pilot with the RN, in 1944, at HMS Saker, Floyd Bennett Field, New York. Later he took up A.E. and flight testing duties at HMS Saker with DAMR (W) as well as liaison duties at the U.S. Naval Air Station Norfolk, Virginia. He transferred to the RCN on 30 October 1946.

the United States in the spring of 1951. Upon completion of his training at the USN's naval air station, Lakehurst, New Jersey, he reported for six weeks duty in the American icebreaker USS Edisto.[14]

In September 1950, Canadian Naval Headquarters (CANAVHED), directed the Naval Member, Canadian Joint Staff, Washington, D.C. (CANAVUS) to inquire whether the USN and USCG would undertake basic pilot training to include light and heavy helicopters as well as provide three months' operational training aboard a USN carrier and up to six months aboard a USCG icebreaker.[15] Again the USN was ready to help. The two pilots selected for the inaugural course, beginning in March 1951, were Lieutenant-Commander J.D. Lowe and Lieutenant George Herbert Marlowe.[16] They were followed by Lieutenant J.H. Beaman and

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[14] During his time in the U.S., and while onboard the icebreaker he was to report on normal and cold weather operations, as well as the maintenance and service reliability of the helicopters he flew. Following completion of his refresher courses in the U.S., the RCN approached the RCAF in order to obtain additional flying time for Foley at the RCAF Station, Greenwood. The RCN was told that only one helicopter was available for training and Search and Rescue (SAR) operations, and that the air force could not accommodate the navy at this time.

[15] CANAVHED to CANAVUS, 6 September 1950, RG 24 83-84/167, vol. 1726, file 4912 vol. 1, NAC. Naval Service Headquarters wanted two pilots to begin training by late 1950, and another two by mid-1951. In 1949 the defence paper began the process of amalgamating the three branches of the services. Naval Service Headquarters now became Canadian Naval Headquarters, however, the RCN continued to use NSHQ in all its internal correspondence. The navy only used the new title for foreign correspondence. I will use the former designation throughout, unless a document specifically uses the latter term.

[16] In addition to pilot training the RCN also made arrangements to send Lieutenant-Commander Foley, and six maintenance men on courses in the U.S. The navy proposed the follow training schedule: five weeks on the basic course, three weeks with an operational unit, and three weeks with an Operations and Maintenance section (O and M). The RCN also requested that Foley receive additional training on a Bell HTL-3. The refresher flying was eventually carried out at the Bell Aircraft plant in Fort Worth, Texas, and was followed by a visit to their service department in Buffalo, New York.

Lieutenant J.C. Runciman in September 1951.[17] It appears that most of the early aviators received their basic training at Naval Air Station (NAS), Pensacola, Florida. The pilots then reported to one of three air stations, depending upon the needs of the parent service, for advanced operational training: NAS Lakehurst, New Jersey, Helicopter Utility Squadron 2, for plane guard and icebreaker flying; NAS, Key West, Florida or NAS, Weeksville, North Carolina, HS 1-4, for A/S flying or; Marine Corps Air Station Cherry Point, North Carolina, for transport flying. Upon completion of the advanced training, the pilots were usually posted to operational squadrons for duty. Lieutenant F.R. Fink, RCN, for example, served in Marine Helicopter Transport Squadron HMR-161, in Korea. The primary missions of this squadron were casualty evacuation, recovery of downed pilots, medical and surgical team transport, and resupply. During a six week tour Lieutenant Fink flew 109 hours with the squadron, performing a number of these tasks.[18]

Lieutenant W.E. James served in Helicopter Utility Squadron 2, NAS Lakehurst, New Jersey. In the summer of 1953, he sailed in the icebreaker USS Atka, for a month-long cruise to Greenland for trials of both the ship and the Bell HTL-4 helicopter. The aircraft's role in

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[17] Canadian pilots were slotted into courses as spaces became available. For example, the next group of pilots sent to the U.S., included: Lieutenant K.L. Gibbs, Lieutenant F.R. Fink, Lieutenant W.E. James, Lieutenant-Commander R.V. Bays, Lieutenant G.J. Laurie, Lieutenant D.A. Muncaster and Lieutenant-Commander D.B. Cobley. Lieutenant A.J. Woods, was sent on the Royal Navy Helicopter Course at Royal Naval Air Station (RNAS) Gosport.

[18] See Naval Member, Canadian Joint Staff, Washington, D.C. to Naval Secretary, 19 October 1953, Subject: Report from Lieutenant F.R. Fink, RG 24 83-84/167, vol. 1726, file 4912-6 vol. 1, NAC. Prior to his departure overseas Lieutenant Fink took part in two amphibious exercises, with HMR-262, at Cherry Point, which entailed aircraft-carrier helicopter operation. In addition, he also undertook mountain flying with HMR-363.

this operation (Sunec) was to act as the eyes for the ship by carrying out ice reconnaissance flights, navigation duties and photographic flights. Lieutenant James, one of two pilots embarked, logged 80 flights, totalling some 78 hours. Operations such as these gave Canadian pilots invaluable experience in icebreaker/helicopter operations prior to the commissioning of HMCS Labrador.

More important, perhaps, were the experiences of pilots like Lieutenant-Commander J.D. Lowe and Lieutenant-Commander R.V. Bays. Following basic training at NAS Pensacola, Florida, Bays went to NAS Lakehurst, New Jersey, in the fall of 1953 for duty in a detachment of HU-2 Squadron embarked in the carrier USS Siboney. The American aircraft carrier was part of an anti-submarine hunter/killer task group, which was scheduled to take part in two exercises, Norsortex and Mariner. Mariner, a major 19-day NATO exercise, included 300 ships, 1000 aircraft and half a million men from nine countries, among them an RCN task group that included the carrier HMCS Magnificent.

Poor weather conditions in the north Atlantic severely hampered flying operations and USS Siboney's aircrews only managed to get in two days of flying during the crossing. Once the carrier group reached the Azores, it was to support a convoy from Gibraltar to Land's End, England. The fixed-wing aircraft of VS-31 Squadron, using Grumman 'Guardian' AF's, claimed five successful attacks on the opposing submarines. During this stage of the exercise, the three Sikorsky HRS helicopters were used to augment the destroyer screen. According to Lieutenant-Commander Bays, "this was only partially successful due partly to inexperienced aircrews.... Eventually, it was decided to use the helicopters only when a possible contact was made in the screen". Once a suspected submarine was detected, two helicopters were flown from the carrier's deck to hold the contact until the surface units arrived. Results varied from good to excellent. Following completion of the exercise, the American carrier sailed for the Mediterranean, where better weather permitted the squadrons to conduct additional ASW exercises, and trials with the dunking sonar. It is unclear, however, if Bays flew the Sikorsky helicopters because his primary duty throughout the cruise was plane guard operations in the HUP-2. He concluded his report by recommending that the RCN stop sending pilots to the U.S. for plane guard training, stating that "the mechanics and techniques of plane guarding are easily learned, and that the time might be better used if the pilots were attached to HS squadrons".[19] NSHQ agreed, and stopped sending RCN pilots to the U.S. for this type of training.

Lieutenant-Commander J.D. Lowe, following basic training at NAS Pensacola, Florida, was appointed as Commanding Officer, No. 1 Naval Helicopter Flight, Shearwater. The Helicopter Flight, with its three Bell HTL-4's, was responsible for training pilots to perform a number of roles, including photography, air/sea rescue, and cooperation in ships'

[19] Lieutenant-Commander R.V. Bays to Naval Member, Canadian Joint Staff, Washington, D.C., 28 November 1953, RG 24 83-84/167, vol. 1726, file, 4912-6 vol. 1, NAC. In his report Lieutenant Bays noted the problems experienced with the HUP helicopter, stating that the HUP's were restricted from flying fleet mail and personnel, whereas there were no such restrictions placed upon the Sikorsky helicopters. One can only surmise that the HUP's suffered from some sort of performance or handling problems. During Exercise Mariner the RCN performed its first successful Air/Sea Rescue (plane guard duty) with a Sikorsky HO4S helicopter, embarked in HMCS Magnificent, and flown by Lieutenant Ian Webster, RCN, (Short Service Appointment - SSA) and Lieutenant Frank Harley, RCN (SSA). Both pilots transferred from the RN to the RCN in 1949 and 1951, respectively. See HMCS Magnificent, Report of Proceedings, 1-30 September 1953, DHist, Ships Files 8000 - HMCS Magnificent; John MacFarlane and Robbie Hughes, Canada's Naval Aviators, (Victoria: Maritime Museum of BC, 1994), pp. 76 & 173 and; Stuart E. Soward, Hands to Flying Stations, p. 258.

torpedo firings. In May 1953, Lowe was then appointed commanding officer of VH-21 Squadron.[20]

Shortly thereafter, Lowe was assigned to the USN Helicopter Anti-Submarine Squadron Number 3, at the Naval Air Facility, Weeksville, Elizabeth City, North Carolina. During his thirteen month tour, he became knowledgeable in all phases of helicopter anti-submarine work. Lowe participated in "four extensive Hunter/Killer cruises at sea including five months of duty afloat, acting as Officer-in-Charge of the Helicopter ASW Detachment on two of them. [In addition], for training purposes, [he] held assignments in the electronics division of the Maintenance Department; in the Administrative Department; and during his last eight months was Squadron Operations Officer".[21] Lowe was then assigned to Squadron VX-1, based at Key West, Florida, for additional A/S training. After ten months, he returned to Ottawa for duties on the staff of the Director of Naval Aviation, as Staff Officer (Helicopter). As Canadian pilots neared the end of their basic and operational training, and as more helicopters came on line the RCN began to build the infrastructure needed to sustain this component of naval aviation. As we shall see there were many roadblocks to overcome.

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[20] Squadron VH-21 was formed in November 1952, and was a utility squadron. In May 1953, No. 1 Naval Helicopter Flight was disbanded and the squadron's personnel joined VH-21. In November 1952 the RCN renumbered its squadrons, following the American system which took the form of a two-letter prefix before the squadron number. The significance of the first letter (V) was "heavier-than-air", while the second was a guide to the function of the unit, (H) standing for helicopter.

[21] Commanding Officer J.R. Wilson, Helicopter Anti-Submarine Squadron Three to Naval Member, Canadian Joint Staff, Washington, D.C., 22 September 1954. From September 1953 until April of 1954, Lowe's primary assignment consisted of helicopter pilot training in anti-submarine warfare tactics.

In December 1950, the Naval Staff recommended to the Naval Board that the RCN procure three light helicopters (Bell HTL-4) and one large helicopter (Sikorsky HO4S-2) by mid-1951, and two additional large helicopters in 1952-1953.[22] Although senior naval officers had come to accept the need for helicopters to perform a variety of roles, opposition from the RCAF to naval aviation of all kinds was growing. The RCAF had attempted to wrest control of naval aviation from the navy before. On 21 September 1948, Air Marshal W.A. Curtis, CAS, told the Cabinet Defence Committee that "the operation of aircraft carriers by the RCN was, in principle, undesirable".[23] In early 1950, when the Chiefs of Staff Committee met to discuss the Armed Forces Five Year Plan, Air Marshal Curtis went so far as to recommend the disbandment of the naval air arm He believed that the planned expenditures on naval aviation could be put to better use by the RCAF and the Canadian Army, both of which were exploring the use of helicopters.[24] The issue of control over maritime aviation remained unresolved and interservice sniping continued.

The inclination among some senior naval officers was to take the offensive. At the RCN's eighth senior officers' conference, in 1951, there was talk of the need to make the case for the navy taking over all shore-based maritime aviation from the RCAF. Early in 1952, Commodore H.N. Lay, now the naval member of the Canadian Joint Staff in Washington,

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[22] Minutes of the Naval Staff, 12-26 December 1950, DHist 1000-100/3.

[23] See, Minutes of the Cabinet Defence Committee, 21 September 1948, RG 2, vol. 2748, vol. III, NAC.

[24] Minutes of Special Meeting of the Chiefs of Staff Committee, 31 January 1950, RG 24 83-84/167, vol. 223, NAC. It should be noted that it took time for the RCAF to re-acquire anti-submarine capabilities which had been given up in the post-war retrenchment. It was not until 1950 that the first post-war maritime patrol squadron was formed.

urged that the question should be pursued at the ninth senior officers' conference, scheduled for March.[25] Lay was concerned that the development of certain weapon systems such as helicopters and airborne magnetic anomaly detection equipment (MAD) would strengthen the RCAF's position vis-a-vis the navy, especially since these systems were far less expensive than ships. He recommended that the navy take a more active role in developing these technologies. "Waiting for the ultimate in any particular development for the sake of economy can be carried to extremes. The policy can also be misinterpreted".[26] He concluded with a declaration that future naval policy should emphasize more strongly the growth and development of aviation, and that the service should plan for the eventual absorption of all maritime operations.

Lay at the same time was able to report encouraging developments by the USN in helicopter anti-submarine technology. American firms were producing an improved version of the AN-AQS 4 dunking sonar which overcame the principal limitations of the existing model. This, coupled with the fact that the USN had recently replaced their HO4S helicopters with the improved HRP and were planning to introduce the XHSL in the near

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[25] The Senior Officers' Conferences served as a forum for the senior officers to air their views. The conferences were not meant to decide action or lay down policy. Commodore Lay was worried about the RCAF's growing interest in maritime air, especially in the sphere of command. He noted that the RCAF is seriously challenging naval supremacy and was desirous of co-equal status with the navy. Given recent advancements in airborne detection and weapon systems, like: helicopters, dunking sonar, Infra-red and Magnetic Anomaly Detection gear (MAD), and the more static development in surface ship weapons the time had come for the RCN to secure its place in maritime air, once and for all. See CANAVUS to the Secretary of the Naval Staff, 5 February 1952, RG 24 83-84-167, vol 575, file 1700-913 vols 1-4, NAC.

[26] Agenda Item for 9th Senior Officer's Conference, undated, RG 24 83-84/167, vol. 575, file 1700-913 vol. 4, NAC.

future, meant that A/S helicopters had come of age. Commodore Lay suggested that the RCN procure the more powerful R-1300 engine for their own HO4S-2 helicopters, and purchase two or three AN-AQS 4B sonar sets for evaluation in Canadian waters.[27]

The RCN was not in a position to implement Lay's recommendations. At the ninth senior officer's conference the new CNS, Vice-Admiral E.R. Mainguy, hinted that the government's recent requests for the navy to trim its budget dictated that "the proper course for the RCN was to assist, support, and push the RCAF in every way to enable them to build up an efficient Maritime Air Arm".[28] Budget may only be part of the story. Mainguy, was conciliatory and a seeker of consensus by nature, in contrast to his predecessor, the sometimes impatient and fire-breathing Grant. Unfortunately, support was not a two-way street. The RCAF continued to insist that because air was ubiquitous the air force alone should be responsible for all facets of operations.

Having put to one side the idea of a bureaucratic offensive against the air force to win control of all maritime aviation, the senior officers turned to a discussion of helicopters. During the course of the meeting, Commodore C.L. Keighly-Peach, RN, ACNS (Air), stated that "there was no question in my mind that the helicopter is the thing in the anti-submarine

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[27] Memorandum, "Dunking Sonar," Appendix A, Commodore H.N. Lay, Naval Member, Canadian Joint Staff, Washington, D.C., to the Naval Secretary, 28 February 1952, NMWS 7401-205, RG 24 83-84/167, vol. 143, file S-1279-118 Part 3, NAC.

[28] Extract from the Ninth Senior Officer's Conference, 17-21 March 1952, RG 24 83-84/167, vol. 575, file 1700-913, vols 1-4, NAC. Rear-Admiral H.G. DeWolf, VCNS, pointed out during the meeting that there had been three reductions in the navai estimates so far this year. Our first estimate was for $337 million, which was trimmed down to $314 million, and finally to $294 million. See Transcript of Address given by VCNS to the Ninth Meeting of Senior Officers, RG 24 83-84/167, vol. 144, file TS 1279-118, NAC.

war of the future. The sooner we get in on it the better, instead of relying entirely on either the UK or the U.S. for all the information we require. I think we could get it ourselves".[29] Keighly-Peach's persuasive argument did little to speed up the acquisition of A/S helicopters. At this time the navy was concentrating on several other ambitious programmes, including the acquisition from Britain of a new carrier, Bonaventure, built to operate the most modern aircraft to replace Magnificent. The navy's helicopter programme did not completely grind to a halt. Preparations had to be made for aircraft for the icebreaker, whose commissioning was scheduled for June 1953. Procurement efforts, however, soon bogged down because of development problems in the United States. It will be remembered that the RCN had decided to purchase three Bell HTL-4's for the icebreaker. However, there were reports from Washington in 1952 about problems, especially engine reliability, with the Bell machines.[30] Engine performance was a problem endemic to most of the early helicopters.

There were engine problems with the larger Piasecki HUP helicopters as well, but in October 1952, Commodore M.A. Medland, who had replaced Lay in Washington, was able to report that the Piasecki Company was encouraged with the results of its modifications to the engine and cooling system. More important, Medland noted that the USN HUP-2's were

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[29] Transcript of Address given by the ACNS (Air) to the Ninth Meeting of Senior Officers, 17-21 March 1952, RG 24 83-84/167, vol. 144, file TS 1279-188, NAC. The ACNS (Air) recognized the limitations of the current fixed-wing ASW aircraft and rightly believed that whatever problems helicopters had (ie. poor engine performance) they could be overcome in the near future. Keighly-Peach came to the RCN, on loan from the Royal Navy, in 1951. He, like Fraser-Harris, was a fixed-wing pilot in the RN, and had extensive knowledge of naval aviation.

[30] See Appendix V "Air Engineering." Naval Member, Canadian Joint Staff (NMCJS), Monthly Report of Proceedings for May 1952, NMWS 1926-193/139, DHist - Shore Establishment Files 8000 - HMCS Niagara.

coming off the production line with a dipping sonar set (AN-AQS-4A) already installed. When the RCN later learned that the USN planned to use the HUP-2's for icebreaker operations, it decided to drop the Bell procurement programme, and purchase the Piasecki helicopters instead. The dual-purpose capability of the HUP-2 helicopter - utility and ASW - was the determining factor in the decision.

In November 1952 Mainguy laid out the situation for the Deputy Minister of National Defence. There was now no doubt that the Bell HTL-4 helicopter was not up to the task. According to information received from Captain Robertson, Commanding Officer (Designate) of HMCS Labrador, the "Bell helicopter had been used on board U.S. icebreakers, and has proved uneconomical because of its small size and its inadequate instrument flight characteristics".[31] If the navy decided to embark the Sikorsky HO4S helicopter instead of the Bell HTL, its larger dimensions would prevent the embarkation of a second machine, and thus limit the operational capabilities of the icebreaker. The CNS, therefore, requested that the Naval Estimates for 1953-1954 be altered to permit the procurement of three HUP-2 helicopters, and supporting spare parts in lieu of the three Bell aircraft.[32]

Teething problems with the HUP-2, however, would delay their procurement. Piasecki Helicopter Corporation, Continental Engine Company, and the USN had been working diligently to overcome the engine problems, and it was hoped that upcoming trials

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[31] CNS to Deputy Minister of National Defence, NS 7800-408/1 (CNS), 27 November 1952, RG 24 83-84/167, vol. 11, file 1115-35 vol. 1, NAC; RG 24 83-84/167, vol. 3428, file 7820-102-1 vol. 1, NAC.

[32] Ibid. The cost of the three HUP helicopters, plus spare parts, was estimated at $800,000 dollars.

would demonstrate once and for all whether or not the HUP-2 helicopters were airworthy. In the interim, the RCN undertook its own engineering study. In January 1953, Commander J. Doherty, Acting-Chief of Naval Technical Services (Air), reported that extensive consultation with several American authorities had brought him to the conclusion that "it would be unwise for the RCN to purchase these aircraft".[33] In his opinion there was no indication that Piasecki had solved the engine problems. Moreover, the HUP-2 aircraft was not designed for cold weather operations. These two factors alone would endanger aircrews operating the helicopter in the Arctic. Finally, in view of the limited funds available to the RCN, and the possibility of losing the aircraft to engine failure, the purchase of these helicopters could be uneconomical.[34]

There were some differences of opinion however. Captain P.K. Will, USN, on loan to the RCN, Deputy Chief of Naval Aviation, in Ottawa, wrote to Keighly-Peach supporting the acquisition of the HUP-2 helicopters. Will based his recommendations on interviews with four HUP pilots, two of whom had experience in icebreakers, and conversations with the engineers at the USN's Bureau of Aeronautics (BuAer). "All the pilots were enthusiastic about the HUP, and expressed no concern regarding the reliability of the engine".[35] Some of the pilots attributed recent crashes to pilot error rather than engineering defects. Moreover,

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[33] Memorandum, "Report on Piasecki HUP-2 Helicopter," A/CNTS (Air) to ACNS (Air) and CNTS, NSS 7820-102-3 (TS Air), 27 January 1953, RG 24 83-84/167, vol. 3428, file C-7820-102-3, NAC.

[34] Ibid.

[35] Memorandum "HUP-2 Helicopter," Deputy Chief of Naval Aviation to ACNS (Air), NSC 7820-102 (Staff) & NS 7800-408/1 (Staff), 19 February 1953, RG 24 83-84/167, vol. 3428, file C-7820-102-3, NAC.

the engineers at BuAer were confident that recent modifications to the Continental engine would eliminate all problems. Captain Will had visited the Helicopter Office in the Chief of Naval Operations branch (CNO) in Washington, and learned that the HUP-2 was considered quite good for utility work, but that it was unsatisfactory for ASW because of the heavy load involved and the extensive hovering required in order to dip sonar.[36] The engine modifications, however, were expected to overcome the limitations. Captain Will concluded that "there was no other helicopter which could possibly meet the RCN's immediate requirement for utility purposes, and the future requirement for dipping sonar operations".[37] He recommended Canadian procurement of three HUP-2 helicopters, as soon as the USN had completed acceptance trials of the modified type.[38]

Problems with the engines continued to plague the Piasecki machine. On 24 April 1953, Commodore Medland reported from Washington that "in view of the continuing engine failures BuAer officers strongly recommend that the RCN delay procurement at this time".[39]

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[36] Ibid.

[37] Ibid.

[38] Ibid. Once the engine modifications were completed the USN wanted the Continental Engine Company to conduct an engine test (150 hours). If the engine passed the test the USN would consider lifting their restriction. Captain Will noted in his report that the U.S. authorities expected deliveries of the HUP-2 helicopter to resume in April 1953.

[39] Commodore M.A. Medland, NMCJS, to the Naval Secretary, NMW 7820-102-1, 24 April 1953, RG 24 83-84/167, vol. 3428, file C-7820-102-3, NAC. Commodore Medland pointed out that the USN was considering retro-fitting the Wright R-1300 engine in the HUP-2 helicopters but the cost was approximately $76,500 dollars. If the USN pursued this course of action a delay of one year could be expected before the re-engined aircraft would be in service.

In view of this disappointment, the Naval Staff appointed a special committee under Commander S. Hook, RN, the Deputy Chief of Aviation (Tactics), also on loan to the navy, to study the exigent ASW helicopter requirements. The members agreed to limit their investigation to ship-borne helicopters, since the use of shore-based aircraft in the seaward defence of harbour approaches was still under study, and the operation of land-based helicopters in defence of coastal convoys was not the responsibility of the RCN.[40]

On 5 May 1953, the committee met to consider a paper Hook had drafted. He had relied on information gathered in Great Britain and the United States by Canadian liaison staffs, but the most useful material came from reports filed by Canadian pilots undergoing basic and operational training in the USN and RN. Commander Hook was quick to point out that, while there were still teething problems with the helicopter, particularly in its lack of performance, endurance, and all-weather capability, it showed great promise especially in the hunter/killer role. Moreover, recent trials in the use of helicopters for the defensive screening of ships had produced satisfactory results. In his report he outlined the four areas in which rotary-wing aircraft could make the greatest contribution: augmenting convoy screens when the number of surface escorts available was insufficient for the task; extending the detection range of convoy screens; forming small barrier screens, and; shortening the time needed for

[40] Memorandum "First Progress Report of Committee on RCN Requirements for A/S Helicopters," NSS 1115-39 (Staff), 5 May 1953, RG 24 83-84/167, vol.11, file 1115-39 vol. 1, NAC. The Committee consisted of the following members: Lieutenant-Commander J.M Favreau, DNPO; Commander J.P.T. Dawson, DTASW; Commander J.A. Charles, DN COM; Commander A.D. McPhee, DND; Mr P.B. Wilson, DOR (N) and; Lieutenant-Commander F.H.W. Bradley, CNP.

A/S forces to reach a datum point ie., a position where fresh intelligence strongly suggested a submarine was located.[41]

Hook's first observation was particularly insightful and important, for one of the fundamental problems for all navies at war has been to find adequate numbers of fighting ships, and the escalating costs of technology in the late 1940's and 1950's was exacerbating that situation. Although the committee did not discuss historical precedents, they were well enough known. The RCN, more than any other western navy, had had to make do with very few warships in peacetime, but then in both World Wars, especially the second, been compelled by circumstances and the pressure of allies to rush large numbers of inadequate equipment and crewed vessels to sea for the anti-submarine escort role. In this light it is not at all surprising that the RCN should be so interested in methods, however radical, for increasing the effectiveness of each available escort.

The committee's records do show that the officers were particularly influenced by the seriousness with which both the USN and RN regarded the ASW potential of the helicopter. The USN already had four A/S squadrons in commission. The RN were conducting their own trials using American dunking sonar, and they hoped to establish a helicopter squadron for tactical evaluation in September of that year. Commander Hook concluded his report by stating that "the RCN has hitherto specialized in anti-submarine warfare but cannot be

[41] Memorandum, "First Progress Report of Committee on RCN Requirements for A/S Helicopters," Appendix A, The Role of Helicopters in ASW, NSS 1115-39 (Staff), 5 May 1953, RG 24 83-84/167, vol. 11, file 1115-39 vol. 1, NAC.

regarded as a balanced A/S force without helicopters.... It is recommended [therefore] that the RCN form one squadron for training and evaluation".[42]

A week later the committee met again, this time to discuss how to implement their recommendation. The committee decided that the selection and procurement of suitable aircraft and the formation of the squadron, was the responsibility of ACNS (Air), and that the director of torpedo anti-submarine weapons [DTAS (W)] should look after sonar equipment. The committee had to decide what type of ship was required to operate an A/S helicopter squadron. In the committee's opinion, three classes of ships were best suited for this role: CVL (Light Fleet Carrier), CVE (Escort Carrier), and Merchant Aircraft Carriers (MAC Ships). Although the USN and RN could operate helicopters from CVL's, the Americans preferred to use CVE's, which was the basic USN A/S class (the RN did not have any CVE's in the fleet). The MAC Ships could operate helicopters but their slow speed would limit the performance of the helicopter. Whatever class of ship was chosen, it would have to be capable of controlling the helicopters operating in the screen.

The committee rejected the notion that a special ship was required to operate A/S helicopters. It suggested, however, that the navy should acquire a CVE from the USN when the expansion of the RCN's A/S helicopter commitment warranted the manning of such a ship. More interesting was the committee's recommendation that "the ability to control screening

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[42] Ibid.

helicopters be included in the Staff requirements for all RCN Destroyer Escorts [DDE's]".[43] This was prescient, considering that the new generation of destroyers - the St. Laurent class - was then under construction in the shipyards, and, as it turned out, would operate the A/S helicopters in the mid-1960's.

At the same time that Hook's committee was attempting to formulate ASW helicopter requirements, the inter-service RCN-RCAF Sea/Air Warfare Committee was wrestling with the broader issue of control of maritime aviation. This issue had been a thorn in the side of the navy ever since 1943, when it first began to explore the possibility of operating escort carriers. Ten years later the service was still struggling to have its views accepted by the air force. Not surprisingly, the work of the inter-service committee and its various sub-committees was characterized by footdragging and endless studies. Part of the problem was the fact that the naval and air members reported to their service chiefs.[44] Frequently, the recommendations of the air force members were revised - especially if the CAS did not share the views of his committee members - before they were submitted to the Chiefs of Staff Committee for discussion.

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[43] Memorandum, "Second Progress Report of Committee on RCN Requirements for A/S Helicopters," NSS 1115-39 (Staff), 12 May 1953, RG 24 83-84/167, vol. 11, file 1115-39 vol. 1, NAC. The Director of Tactics and Air Sea Warfare recognized that helicopters presented a most difficult attack problem for submarines, and he recommended, therefore, that RCN ships be fitted with helicopters. See, Director of Tactics and Air Sea Warfare Minute, 4 November 1953, RG 24 83-84/167, vol. 1713, file 4903-4, vol. 4, Interim Box 24, NAC.

[44] Following the 503rd Meeting of the Chiefs of Staff Committee (14 August 1951), the name of the Committee was changed to Sea/Air Warfare Committee. More important, the committee was instructed to report jointly to the Chiefs of Staff Committee, rather than to the respective Chiefs of Staff as previously.

At the RCN's tenth senior officers' conference in May 1953, helicopters were again on the agenda. Keighly-Peach, ACNS (A), the Board member responsible for the subject, told the officers in attendance that the NATO Supreme Allied Commander, Atlantic (SACLANT), force requirements indicated:

> the need for escorts in such numbers that the problem of supply will not be solved easily, if at all. SACLANT's staff considers that requirements have reached a point where known methods cannot provide an acceptable answer within financial reach. It is believed that it may be possible to reduce the escort requirement considerably, if helicopters could be used as an outer screen to provide early warning of an attack...."[45]

The Royal Navy was also thinking along the same lines. After further discussion, the senior officers concluded that the RCN "must establish a need for ASW helicopters at sea, rather than ashore where RCAF Maritime Air [could] come into the picture. Our argument for helicopters should centre around the lack of escorts rather than their replacement by another weapon".[46] The RCN would not hesitate to play this card at the higher levels - the DND Screening Committee, Chiefs of Staff Committee meetings and the Cabinet Defence Committee - when the time came to acquire ASW helicopters. Having said that, Commodore Keighly-Peach questioned the RCN's basic ASW policy.

> from the moment that Canada decided to pool her naval resources in NATO, she virtually handed over what should be her birthright to a community of nations or

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[45] Tenth Senior Officer's Conference, Appendix A, Item No. 5, "Operation of ASW Helicopter by RCN," RG 24 83-84/167, vol. 143, file 1279-118 vol. 4, NAC. See also CANAVUS to Naval Secretary, "Item for Discussion at Tenth Senior Officer's Meeting," CANAVUS Item No. 1, 10 March 1953, RG 24 83-84/167, vol. 143, file 1279-118 vol 3, NAC.

[46] Minutes of the Tenth Senior Officers' Conference, Item No. 5, 6-9 May 1953, RG 24 83-84/167, vol. 143, file 1279-118 vol. 4, NAC.

> common user and thereby lost that prime factor in any modern navy - the balanced fleet.[47]

The ACNS (A) was concerned about the Soviet cruiser threat as well as the air threat in the eastern Atlantic, and he was supported by Commander J.P.T. Dawson, the Director of Torpedo, Anti-Submarine and Mine Warfare, and Commander E.S. MacDermid, on the staff of Directorate of Weapons and Tactics, as Director of the Gunnery Division.[48] Contrary to popular belief, the RCN did not wholeheartedly support the ASW role, and debate among senior Canadian naval officers throughout this period serves as testimony to that fact. This has been ignored in the Canadian literature, and it is worthy of further investigation.

In the interim, the Naval Staff met to discuss two papers, "Helicopters in the ASW role - employment in Seaward Defence," and "RCN requirements for ASW helicopters". Broadly speaking, these were two separate questions, although there were certainly some overlapping issues. The former dealt with control of shore-based helicopters employed in inshore ASW, while the latter considered procurement and to a lesser degree tactics for ship-borne helicopters. The Staff concurred with the Hook committee's recommendation that the RCN form an ASW helicopter squadron for training and evaluation. The Staff did not recommend procurement of a particular type of aircraft, nor did it suggest the number to be procured. Commodore Keighly-Peach, however, noted that the number of helicopters in the inventory was hardly sufficient to meet current requirements (mostly pilot training), let alone

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[47] See, Tenth Senior Officers' Conference, Appendix A, Item No. XVII, "Review of RCN A/S Basic Policy," 6-9 May 1953, RG 24 83-84/167, vol. 143, file 1279-118 vol. 4, NAC.

[48] See, Director of Torpedo, Anti-Submarine and Mine Warfare to DTSD and ACNS (W), 28 April 1953, and; Director of Gunnery Division to DTSD and ACNS (W), 30 April 1953, RG 24 83-84/167, vol. 143, file 1279-118 vol. 4, NAC.

additional responsibilities for inshore and deep-ocean ASW evaluations.[49] The CNS, Admiral Mainguy, approved the recommendations of the Staff, and it fell to Commodore Brown, ACNS (A) to determine the number and type of helicopters to be procured.[50]

Shortly after Commodore Brown began his study, the armistice signed at Panmunjom on 27 July 1953 ended three years of fighting in Korea. The Korean conflict had helped solidify the commitment of the Western Allies to the concept of collective security. One result had been a massive rearmament programme among the members of NATO. That build-up was fuelled by the fear that the Korean War was a feint to distract the Western nations from a Soviet invasion of western Europe.[51] As part of Canada's Accelerated Defence Programme, the navy was able to rearm, refit, and recommission ships laid up in reserve since 1945, and build new ships, including ASW frigates and escorts, minesweepers, gate vessels, and an arctic patrol vessel. The goal was a fleet of 100 ships, and 20,000 personnel. This represented a substantial expansion of the fleet from its 1950 total of 52 ships of all types and 9,000 personnel. To carry out the programme, the navy's budget increased every year of the war from $44 million in 1949 to $260 million by the end of the war. However, it must be

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[49] Minutes of the 557th Naval Staff Meeting, 7-28 May 1953, DHist 1000-100/3.

[50] Commodore W.L.M. Brown, on loan from the Royal Navy, assumed this responsibility as the new ACNS (A). Commodore Brown served as an observer with the Royal Navy. He replaced Commodore Keighly-Peach in June 1953.

[51] Doris M. Condit, History of the Office of the Secretary of Defense: The Test of War, 1950-1953, vol II, (Washington, D.C.: U.S. GPO, 1988), ch. 16; Stanley R. Sloan, NATO's Future: Toward a New Transatlantic Bargain, (Washington, D.C.: NDU Press, 1985), pp. 9-11.

emphasized that the navy consistently placed a distant third after the air force and the army in budgetary allotments, $915 million and $436 million respectively by 1953-1954.[52]

Canadian naval aviation had made great progress by 1953. The government had given approval in principle to acquire fifty-four F2H-3 McDonnell-Douglas Banshee fighters for the carrier, and to replace the aging Avengers in the anti-submarine squadrons with the new twin-engined USN Grumman S2F Tracker aircraft. In 1952, the Canadian government approved the expenditure of $21 million dollars for the purchase of a modified Majestic class light fleet carrier HMCS Bonaventure to replace HMCS Magnificent. The navy, all the while, was closely monitoring several British projects to improve carrier capabilities, such as the angled-deck carrier, mirror-landing system and the steam catapult. Second generation jet-aircraft, like the Banshee, with their higher landing speeds, increased size and weight presented problems, especially for navies operating the smaller light fleet carriers.[53] In fact, without incorporating these inventions in the new carrier, the RCN could not have continued to operate effective carrier aircraft types. By the spring of 1953, the RCN's sole helicopter squadron, VH-21, was operating three Bell HTL-4 helicopters in a utility role, and three Sikorsky HO4S-2 aircraft in a general-purpose and plane guard role. In addition, the navy

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[52] Joel Sokolsky, "Canada and the Cold War at Sea, 1945-1968," in The RCN in Transition, 1910-1985, pp. 215-216, and; Dan W. Middlemiss, "Economic Considerations in the Development of the Canadian Navy Since 1945," in The RCN in Transition, 1910-1985, pp. 256-262. Fiscal year ending March 1949, the Canadian Army's budget was $101.9 million dollars, and the RCAF's was $90.2 million dollars.

[53] For a detailed discussion of these inventions and how they effected carrier flying operations see the following sources: J.D.F. Kealy and E.C. Russell, A History of Canadian Naval Aviation, 1918-1962, 104-105; J. Allan Snowie, The Bonnie: HMCS Bonaventure, (Erin, Ontario: Boston Mills Press, 1987), pp. 11-25 and; Stuart E. Soward, Hands to Flying Stations, pp. 211, 222-223, 235.

had recently purchased one Sikorsky HO4S-3 helicopter (navalized version of the S-55).[54] Other developments included the establishment of VX-10 Squadron, an experimental squadron formed to test new aircraft and equipment as they entered into service with the navy. This squadron would play a key role in the development of the helicopter-carrying destroyer, as we shall see later. Finally, the RCN's air station, HMCS Shearwater, had undergone significant changes since it had been taken over from the RCAF in late 1948, including the building of a new and longer runway to handle larger aircraft, and the construction of a bombing and gunnery range.

Canadian naval aviation was now poised to make a significant contribution in the ASW field. For three years the navy had struggled to balance the operational demands of the Korean war, while endeavouring to rebuild the service within the context of the Soviet threat and the evolving NATO structure, all in the face of rapidly changing technology. Korea, however helpful in opening the purse strings of government, appeared to western navies to be an aberration. Combat with Soviet strategic forces on the high seas would demand a whole different order of equipment and skills.

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[54] In 1951, the RCN had procured the three Bell HTL-4 helicopters to gain experience in maintenance and flying (pilot training). These aircraft, because of the problems outlined earlier, were not scheduled for service with the icebreaker. These helicopters, however, were suitable for pilot training. See, DHist 85/427, RCN Aviation Monthly States.

CHAPTER FIVE

MARITIME STRATEGY AND RCN FLEET COMPOSITION

When Commodore W.L.M. Brown, ACNS (A), reported back to Naval Staff in September 1953, he called for action. He wanted approval to form an operational squadron, as distinct from a trials and evaluation squadron, consisting of six Piasecki H-21 helicopters, instead of the HUP-2.[1] While he supported the RCN's policy of not entering into new fields or projects until the larger navies of the UK and U.S. had completed their own investigations, he believed that this stage of the process was over, and that the time had come for action.[2] Commodore Brown warned that because operational training and the development of tactics would take at least two years it was necessary to get an early start. Two things in particular inspired his recommendation: the USN's completion of its report on the "Evaluation of Helicopter AN/AQS-4 (XN-2) Dipping Sonar", and the availability of the Piasecki H-21 helicopters.

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[1] Minutes of the 565th Naval Staff Meeting, 24 September - 9 October 1953, DHist 1000-100/3.

[2] The RCAF would use this policy against the RCN later in the year.

According to Brown, the successful trials of the dipping sonar proved beyond a shadow of a doubt that there was a role for the helicopter in ASW.[3] The A/S helicopter could now augment the limited number of available surface escorts. Early organization of A/S helicopter squadrons with full complements of trained personnel and support facilities would enable a comparatively inexpensive, speedy and efficient re-inforcement of screening capacity on the outbreak of hostilities. This was good news, for "the economic load required to build, maintain and preserve a fleet of surface escorts in peacetime sufficient to protect wartime sea communications was beyond the resources of any nation".

Until now, the poor engine performance had deprived helicopters of the endurance and weapons carrying capacity needed for hunting submarines. Commodore Brown reported that the Piasecki H-21 helicopter was capable of carrying both the dipping sonar system, and

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[3] The USN had conducted a number of trials to evaluate both equipment and tactical doctrine. Those reports helped shape Commodore Brown's opinion as to the value of the helicopter in the ASW role, and that information is contained in the following reports: OP/V91; reports on ComOpDevFor Project OP/V109 and OP/32 "Combined Helicopter CVE, DD and Convoy Escort and Contact Investigation Exercises," (dated 2 December 1952) and; Final Report on Project OP/V109/S68 "Evaluate the Combination HO4S-1," and AN/AQS-4 (XN-2) "Helicopter Dipping Sonar System in A/S Operations" (dated 1 December 1952). See Commodore M.A. Medland, Naval Member, Canadian Joint Staff to the Naval Secretary, NMWS 1115-230, 4 May 1953, RG 24 83-84/167, vol. 11, file 1115-39 vol. 1, NAC.

the Mark 43 Active Homing Torpedo.[4] He pointed out that the H-21 helicopter had been used extensively by the U.S. Army and Marines, and that the RCAF had plans to purchase a number of these aircraft for rescue operations. Another selling point was the fact that Piasecki intended to set up a plant in Arnprior, Ontario, which would facilitate the supply and maintenance of the aircraft. Unlike most other helicopters of the day, the Piasecki H-21 was a tandem (dual-rotor) aircraft, originally developed for the United States Air Force under the designation YH-21 as an arctic rescue vehicle. The H-21 was ideal, or so it was thought, for the RCN because of its size: it could carry both sonar equipment, and the Mark 43 torpedo. Moreover, reconfigured, it was capable of carrying twelve stretchers which made it an ideal rescue vehicle. The YH-21 was a beefed-up version of the HRP. The overall dimensions of the YH-21 and HRP were almost identical and similar in appearance, but the YH-21 weighed twice as much empty (9,148 pounds), and had three times the horsepower (1,425) and useful load carrying capacity (5,556 pounds), while retaining approximately the same air speed. The USN's version (H-21) of the YH-21 differed little from the USAF's except that it had to fit

[4] The Mark 43 Torpedo, was a lightweight, dual-purpose, torpedo produced in the United States. The torpedo was eight feet, 3 inches in length, ten inches in diameter and weighed approximately 250 pounds. Powered by a high-speed sea-water battery (capable of 20 knots), the torpedo relied upon a built-in active sonar for detection of its target. It had to be dropped in, or directed to, a position close enough to the target where, after carrying out a search pattern, it could acquire it with its own sonar. Consequently, its range was measured in hundreds of yards rather than thousands of yards. Rear-Admiral J.R. Hill, Anti-Submarine Warfare, (London: Ian Allan Ltd., 1984), pp. 85-86; Norman Friedman, U.S. Destroyers: An Illustrated Design History, (Annapolis, Maryland: Naval Institute Press, 1982), p. 198.

the elevator of a CVE-105 Class aircraft carrier, and be capable of being stowed and moved about the hangar deck.[5]

According to Brown, the RCN could purchase the H-21 from the U.S. Army in early 1954 for approximately $5 million dollars. The cost was based on a unit establishment of six aircraft with operating spares to cover eighteen month's attrition. This figure also included the purchase of eleven AN/AQS-4C sonar sets at $45,000 dollars per set.[6]

Commodore Brown then turned to the matter of fleet composition. For the foreseeable future the RCN could use the carrier for flying operations and training purposes. After that time, he envisioned embarking the helicopters on board merchant ships instead of the carrier.

> Opinion was not yet firm on the best method of providing a unit to carry helicopters but at this stage it seemed that merchant ships fitted with a landing platform might be the final answer. Considerable advantage will be gained if helicopters were dispersed throughout the convoy in individual ships in comparison to all the aircraft being embarked in and operated from one aircraft carrier.[7]

This part of the report was controversial. Already, in May 1953 Commodore Medland, Naval Member, Canadian Joint Staff, had reported that the USN was planning:

> to base four A/S helicopters on convoy escort carriers in addition to their normal complement of fixed-wing aircraft. Some consideration is being given to an A/S helicopter carrier which will be capable of carrying 18 helicopters. It is not intended

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[5] See, Lieutenant Colonel Eugene W. Rawlins, USMC, Marines and Helicopters, 1946-1962, (Washington, DC: USMC, 1976), pp. 30-42, and Walter J. Boyne and Donald S. Lopez, eds., Vertical Flight, (Washington, DC: Smithsonian Institution Press, 1984), pp. 60-61.

[6] Minutes of the 565th Naval Staff Meeting, 24 September - 9 October 1953, DHist 1000-100/3. The H-21 helicopter was going to cost $437,000 dollars each.

[7] Ibid.

> to base helicopters in merchant ships for the following reasons: twice the number of maintenance personnel would be required; servicing problems would be increased; problems with the storage of Avgas; dispersal of aircraft would create control and communication problems and; large numbers of CVE's are already available in reserve.[8]

Already, as we have seen, an earlier RCN study had rejected the use of merchant ships in this role because of their slow speed. Nevertheless, the idea persisted.

The Naval Staff accepted the main thrust of Brown's report "[I]n view of the conclusive trials completed by the USN, the RCN was now fully justified in establishing an operational squadron rather than restricting activities on a trials basis." The Staff further agreed that the helicopter "would provide the most economical and practical method of augmenting surface escorts in close and extended screening," and therefore recommended the formation of an ASW squadron consisting of six Piasecki H-21 helicopters in early 1954.[9]

On 16 October 1953, the Naval Board met to consider the Naval Staff's recommendation. After a brief presentation by ACNS (A), considerable discussion took place regarding the type of ship the RCN required in order to operate helicopters. Although little was resolved, the Board did suggest that a portable platform of standard design could be built for outfitting a number of merchant ships in each convoy. There was also discussion about the role of maritime aircraft including long-range reconnaissance, search and rescue, and harbour defence, and which service was responsible for each. Again, nothing was settled, but

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[8] Commodore M.A. Medland, Naval Member, Canadian Joint Staff to The Naval Secretary, NMWS 1115-230, 4 May 1953, RG 24 83-84/167, vol. 11, file 1115-39 vol. 1, NAC.

[9] Ibid.

Commodore Brown was directed to prepare a paper for presentation to the Chiefs of Staff.[10] At this point Admiral Mainguy, CNS, stated he was in favour of the formation of the A/S helicopter squadron and directed that the matter should be referred to the Chiefs of Staff Committee for discussion. The Board then approved the formation of an A/S helicopter squadron consisting of ten H-21 helicopters, recommending that funds be provided in the estimates for this purpose.[11]

Almost immediately the navy's plans ran aground. At the Chiefs of Staff Committee meeting, on 17 November 1953, the Chairman, Lieutenant-General C. Foulkes, noted that the navy's proposal did not contain any information on either the cost of establishing the ASW squadron or the number of personnel required. The Chief of the Air Staff, now Air Marshal C.R. Slemon, attacked the proposal from a different perspective. He believed that the "principle of using helicopters in a maritime role was excellent, but further experimentation and investigation would be necessary before maritime helicopter squadrons could effectively be formed and employed".[12] The CAS suggested that the RCN merely obtain helicopters for experimental purposes in this field. Air Marshal Slemon was no friend of the RCN's aviation ambitions. Like his predecessor, Air Marshal Curtis, he firmly believed that the RCAF was

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[10] See "Formation of Helicopter Anti-Submarine Squadron," CNS to Secretary, Chiefs of Staff Committee, NSS 8885-10 vol. 3 (Staff) and NSS 1115-39 (Staff), 3 November 1953, RG 24 83-84/167, vol. 11, file 1115-39 vol. 1, NAC.

[11] Minutes of the 390th Naval Board Meeting, 16 October 1953, DHist 1000-100/2. It will be remembered that the Naval Staff recommended that the navy purchase ten H-21 helicopters in all (six aircraft plus four spares based on an attrition period of eighteen months).

[12] Minutes of the 549th Chiefs of Staff Committee Meeting, 17 November 1953, RG 24 83-84/167, vol. 11, file 1115-39 vol. 1, NAC; DHist 73/1223, file 1307.

better suited to carry out both inshore (seaward defence) and deep-ocean A/S patrols, and the organization of the RCAF maritime squadrons in 1951 undoubtedly strengthened his confidence.[13]

The Chiefs of Staff concurred with Slemon, and decided that "the RCN would not be given approval to form an ASW helicopter squadron ... but that a small provisional unit for test and experimental purposes could be formed subject to the necessary funds being made available from the Naval Estimates".[14] Apparently, Brooke Claxton's view of the Chiefs of Staff Committee, first articulated in 1947, still rung true: "He found some cooperation, little coordination and no unity".[15]

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[13] To make its case for control of maritime aviation, the air force officers also reminded the navy that the 1946 RCN/RCAF agreement had given the RCAF sole responsibility for the management of all RCN shore-based air activities including supporting services, such as air stores and major aircraft repairs and maintenance as well as procurement. For a detailed history of the earlier arrangement see, "Agreement Governing the Relationship between the RCAF and the RCN and the use of the Royal Canadian Air Force facilities by the Royal Canadian Navy," Draft No. 7, dated 9 March 1946, RG 24 83-84/167, vol. 314, file NS 1550-12 vol. 1, NAC. See also J.D.F. Kealy and E.C. Russell, A History of Canadian Naval Aviation, 1918-1962, p. 49, and; Shawn Cafferky, "Flying High: The Royal Canadian Naval Air Service, 1944-1946," (Unpublished DHist Narrative), pp. 79-86.

[14] Squadron HS-50 would become the navy's experimental ASW helicopter squadron. Minutes of the 549th Chiefs of Staff Committee Meeting, 17 November 1953, RG 24 83-84/167, vol. 11, file 1115-39 vol. 1, NAC; DHist 73/1223, file 1307.

[15] Douglas Bland, The Administration of Defence Policy in Canada, 1947-1985, (Kingston, Ontario: Ronald P. Frye and Company, 1987), p. 150; James Eayrs, In Defence of Canada: Peacemaking and Deterrence, vol III, (Toronto: University of Toronto Press, 1972), pp. 20-28, and 107-119. It will be remembered that ACNS (A) quoted, to the Naval Staff, a figure of $5 million dollars to purchase ten H-21 helicopters, plus eleven sonar sets. What is not known, however, was the squadron's strength, or the personnel costs associated with establishing the unit.

More serious than this bureaucratic setback were the technical problems with the H-21 helicopter, which left the navy scrambling to find another machine.[16] In July 1954 Commodore Medland, in Washington, warned that the USAF had just approved a "modification programme for the helicopter's rotor blades. A metal reinforcement is being installed on the blades trailing edge in an attempt to reduce critical stresses".[17] American authorities, especially the USAF, were very concerned about the effect of stress on the airframe. Despite modifications to the rotor blades, the H-21 continued to be plagued with problems,[18] and Piasecki slowed production of the H-21 to devote more time to research and development. In addition, flying restrictions were placed upon H-21 helicopters already in the inventory of the USAF and U.S. Army. More telling, perhaps, was Commodore Medland's observation that "the USAF had advised the U.S. Army to withhold their 1955 order for 100 H-21 helicopters, and that the USAF had cancelled their order of nine aircraft".[19] Despite the problems with the H-21 helicopter, the USAF and U.S. Army were not prepared to sever ties with the company because Piasecki was the only manufacturer

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[16] It should be noted that once the Chiefs of Staff Committee approved the formation of the squadron, for trials and evaluation, the RCN dropped the dual-purpose capability (Utility and ASW) required by helicopters embarked in the icebreaker. Now the navy could focus on ASW helicopter requirements and the Staff substituted minesweeping, in lieu of the utility role, as a secondary duty. Helicopters were first used in the minesweeping role during the Korean War, and the RCN was actively investigating this role for helicopters, especially in seaward defence.

[17] NMWS to Naval Secretary, Report of Proceedings for July 1954, NMWS 1926-193/139, DHist, Shore Establishments 8000 - HMCS Niagara.

[18] Naval Member, Canadian Joint Staff, Washington, D.C., to the Naval Secretary, 13 October 1954, NMWC 7820-21, RG 24 83-84/167, vol. 3428, file C-7820-102-3, NAC.

[19] Ibid.

specializing in the production of military transport helicopters. The USAF and U.S. Army had little choice but to see this venture to a successful completion.

If the RCN was still interested in procuring the H-21, Commodore Medland informed Naval headquarters in October 1954, it was "obliged to share the cost of the development programme and accordingly, no fixed price is available". Medland passed along the USAF's warning that this "would be a calculated risk".[20] It was a risk the RCN was not prepared to take.

The navy had to find a suitable alternative, and quickly - prior to the establishment of the experimental squadron, now scheduled for 1956. There were five possibilities: the Bell HSL, Bristol 191, Sikorsky HO4S-3 (S-55), Sikorsky HSS-1 (also known as the S-58), and the Piasecki HUP-3. The latter was a re-engined version of the HUP-2. Although it was fitted with the more powerful and reliable Pratt and Whitney 985 engine, it did not meet the RCN's ASW requirements. It was better suited as a transport vehicle for the navy's icebreaker.

The Bell HSL (XHSL-1) had originally been designed as an ASW helicopter. Problems arose during the HSL's development which resulted in an increase in weight and size to the point where it became unacceptable to the USN. Its steep price, $1.3 million dollars per aircraft, put it far beyond the RCN's means. Similarly, the Bristol 191, was beset with technical problems, and because the aircraft was in the developmental stages, its final cost was unknown.

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[20] Ibid.

Of the two Sikorsky machines, the HO4S-3 (hereafter the S-55) stood out for a number of reasons, not the least being its price, and its immediate availability. This was a single-rotor helicopter, designed to carry a crew of two pilots and one sonar operator. Rated at 800 horsepower, it was capable of cruising at 90 knots, and had a range of 150 nautical miles in the attack role. The S-55's endurance was rated at 2.5 hours in the search role. In the attack mode the helicopter was capable of hovering 60% of the time - 40% of that time at 65 knots.[21] The S-55 differed from previous single-rotor helicopters in a number of significant ways. First, by locating the engine forward of the rotor instead of directly beneath it, a clear payload space right below the rotor was obtained, thus achieving minimum center-of-gravity for the range of loads required. In addition, as it turned out, the S-55 achieved a more efficient structure and better engine access for maintenance and replacement than could be obtained with a centrally located engine.[22]

Commodore Brown noted that "while the HO4S-3 [S-55] does not entirely meet the Staff Requirements, it is capable of accomplishing the task of trials and evaluation ... and can be delivered within six months of an order being placed".[23] He therefore recommended the

[21] Commodore W.L.M. Brown, ACNS (Air) to VCNS, Appendix B, NSS 1115-39 (Staff), 22 November 1954, RG 24 83-84/167, vol. 11, file 1115-39, vol. 1, NAC.

[22] Steve Wartenberg, "Solving the Vertical Flight Puzzle: The Early History of the Helicopter," in Walter J. Boyne and Donald S. Lopez, eds., Vertical Flight, pp. 34-35, and; Edward F. Katzenberger and Edward S. Carter, "The Technical Evolution of Sikorsky Helicopters, 1950-1983," in Walter J. Boyne and Donald S. Lopez, eds., Vertical Flight, pp. 193-220.

[23] Commodore W.L.M. Brown, ACNS (Air) to VCNS, NSS 1115-39 (Staff), 22 November 1954, RG 24 83-84/167, vol. 11, file 1115-39, vol. 1, NAC. The Sikorsky S-55 had been in service with the RN and USN for eighteen months, and this fact alone almost certainly convinced Commodore Brown to choose this helicopter over the other contenders.

purchase of six Sikorsky S-55 helicopters, in lieu of the Piasecki H-21 helicopters. In addition to those machines for the experimental squadron, there was a demand for five additional HO4S and three HTL helicopters. These supplementary requirements came from the commands which wanted to take advantage of the helicopters proven performance in the utility and SAR roles.

The Naval Staff was reluctant to approve the eight additional aircraft, noting that it was "not desirable for the RCN to undertake new SAR and training commitments at this time, when strict economy of funds and manpower will be necessary in the future to meet the overall Naval commitments already approved. Moreover, it was possible that these new commitments in the helicopter field might prejudice the provision and operation of A/S helicopters, which were believed to be essential requirements for the RCN".[24] The Naval Staff recommended that the paper be submitted to the newly established Policy and Projects Coordinating Committee (PPCC) for further study.[25]

In the interim, the navy still had to resolve the fundamental issue of fleet composition. In May 1954 the Naval Staff met to prepare a proposal to the COSC for the acquisition of a second aircraft carrier and helicopter ships. The navy had been trying since the Second World War to acquire a second light fleet carrier. Like other navies of the world, the RCN wanted to build its fleet around what it perceived to be the capital ship of the future with two.

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[24] Minutes of the Naval Staff, 27 August 1954, DHist 1000-100/3. DCNA (P) also proposed that the RCN assume responsibility for conversion training of fixed-wing pilots to helicopters. At that time the USN was providing the training. He also suggested that the RCN provide full helicopter pilot training. The cost to procure the eight helicopters was $1,950,000 dollars.

[25] See below for a description of the Policy and Projects Coordinating Committee.

rather than the existing single carrier task force. Limited budgets and manpower shortages had always frustrated this ambition, and would continue to do so. Nevertheless, proponents of naval aviation refused to let the dream die.

Commodore Brown reviewed the operational arguments for the second carrier at the meeting. The commitment to NATO to provide a carrier could not be met with one carrier only, as it would be operational only 50 per cent of the time, given the need for refits, aircrew training and exchanges of squadrons. Moreover, if the carrier was damaged the entire RCN air arm would be grounded. Brown then pointed out that operating two carriers was more economical than operating a single carrier, as all the overheads were required for one unit. He was also quick to note that the Supreme Allied Commander, Atlantic (SACLANT), required more carriers.[26] Much of the argument was borrowed from staff papers produced over the preceding eight years.

Brown envisioned operating the second carrier as a "Mother Ship" for up to twenty helicopters. He wanted to retain Magnificent as the helicopter ship, and have the more modern Bonaventure operate the fixed-wing aircraft. To do this within the limits of available financial and manpower resources, he recommended reducing the existing fleet by one cruiser

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[26] Minutes of the Naval Staff, 22 April 1954, as cited in Assistant Chief of Naval Technical Services (Air) to CNTS, 30 April 1954, NSS 8000-312, RG 24 83-84/167, vol. 3513, file 8000-RRSM vol. 1, NAC; Minutes of the 573rd Meeting of the Naval Staff, 3 May 1954, DHist 1000-100/3. The Naval Mobilization Plan called for the provision of a second carrier on M plus 15 months, and a third carrier on M plus 27 months. There was some debate on whether or not SACLANT required additional carriers. The Deputy Director Naval Plans and Operations, for example, noted that SACLANT required more fleet carriers for the Strike Force (STRIKEFLEETLANT), not ASW carriers. Commodore Brown's original paper, dated 8 March 1954, can be found in the following file: RG 24 83-84/167, vol. 3513, file 8000-RRSM vol. 1, NAC.

or six escorts. The Naval Staff agreed in principle but it wanted Captain D.G. King, Director of Naval Plans and Operations (DNPO), to conduct an in-depth study of the implications of the change for fleet composition.[27] Although this study would ultimately support the acquisition of the second carrier, it was not completed until the fall of 1954.[28] This delay was one reason why the proposal for a second carrier was not submitted to the Chiefs of Staff as planned. There was a second reason for shelving the proposal: the failure of the RCN and RCAF to resolve the long-standing issue of control of maritime air.

In early 1952, helicopters were just entering the ASW field and its roles were not yet clearly defined. Both branches of the armed forces recognized the importance of helicopters, but were loath to surrender their employment to another service. There appeared to be a land-based role for seaward defence, and a seaborne role aboard carriers and merchant ships.

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[27] Ibid. At the first Naval Staff meeting, held on 22 April 1954, DNPO was somewhat hesitant to recommend retention of Magnificent. Similarly, albeit for different reasons, Rear-Admiral H.F. Pullen, CNP, and his deputy were loath to pay-off one or both of the cruisers. Pullen was against restricting the RCN to a purely A/S role. Captain D.G. King, DNPO, in a letter to VCNS, agreed with Pullen's statement. The Naval Staff noted that if the policy was accepted that the fleet be formed on the basis of two carriers in peacetime. DNPO was instructed to take into account any relevant comments by the Sea/Air Warfare Committee (SAWC) Study Group which was currently considering the future of maritime warfare.

[28] At the Eleventh Senior Officers' Conference, held on 12-14 May 1954, Rear-Admiral R.E.S. Bidwell, Flag Officer Atlantic Coast and CANFLAGLANT, supported the idea of acquiring the second carrier, but he recognized that its acquisition hinged upon the navy's replacement policy. One of the main stumbling blocks was the two cruisers. Insofar as the cruisers were concerned several options were being discussed, including paying them off, converting them to guided missile ships, or retaining them as training vessels. Despite the lack of a clear cut policy Admiral Bidwell believed that a requirement existed for an additional carrier. He also firmly believed that the cruisers should be replaced, or at the very least modernized. Despite support for acquisition of a second aircraft carrier the CNS concluded that nothing could be done in the next eighteen months, and decided that the subject would be reviewed in twelve months. See Minutes of the Eleventh Senior Officers' Conference, 12-14 May 1954, RG 24 83-84/167 vol. 144, file TS 1279-118, NAC.

The question as to who should operate the aircraft used for seaward defence from land bases became a full-fledged fight between the RCN and RCAF for control of all maritime air resources.[29]

The thrust of the RCAF's argument, put forward in a letter by Slemon to the CNS in April 1955, was twofold. Since 1946 the air force had been given sole responsibility for the management of all RCN shored-based air activities, including air stores, maintenance and repairs, and procurement. The RCAF, moreover, "had several years of varied helicopter experience whereas the RCN [had just] recently entered the field".[30] The implication was that the RCN could benefit from sharing in the larger RCAF fund of helicopter experience. To avoid duplication of effort, both in terms of money and manpower, the air force proposed the creation of a joint RCN-RCAF experimental unit to monitor developments in the helicopter

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[29] The Sea/Air Warfare Committee (SAWC), a revival of the wartime RCN/RCAF A/S Warfare Committee, was established in the fall of 1948 to formulate recommendations to the CNS and the Chief of the Air Staff for policy on all matters connected with the control of sea lines of communications. The members of the committee were to investigate and make recommendations to their respective service chiefs. This Committee, whose chairmanship alternated between the senior RCN and RCAF members, consisted of the following naval representatives: Vice Chief of the Naval Staff; Assistant Chief of the Naval Staff; Director of Weapons and Tactics, and the Director of the Naval Air Division. The RCAF members were as follows: Air Member for Air Plans; Director of Air Training; Director of Air Operations, and the Deputy Air Member for Technical Services (Development). See Memorandum "Joint RCN-RCAF Sea/Air Warfare Committee," NSS 11270-78 (STAFF), 26 November 1948, RG 24 83-84/167, vol. 89, file 1270-78-1 vol. 1, NAC.

[30] See Air Marshal C.R. Slemon, Chief of the Air Staff, to CNS, "Employment of ASW Helicopters in Canadian Services," 6 April 1955, RG 24 83-84/167, vol. 11, file 1115-39 vol. 1, NAC. It was a small leap of logic for the RCAF to claim that it alone "was responsible for providing the necessary land-based A/S aircraft for the protection of harbours and in-shore waters, and for the protection of convoys whether coastal or otherwise".

ASW field (ie. tactics, equipment and procurement).[31] Creation of such a unit would ensure that the RCAF maintained control over maritime air, including the helicopters.

The RCN rejected the air force argument. Commodore Brown suggested that the navy should disregard the paternal tone of Air Marshal Slemon's letter. He also challenged the notion that the navy was a newcomer to the field, and dismissed the air force's contention that a suitable ASW helicopter was not available. Brown pointed out that although the HO4S [S-55] was not designed for ASW two specialized machines, the Sikorsky S-58 and the Bristol 191 were scheduled to enter service the following year "No one would suggest that these helicopters represent the ultimate design required for ASW, (even in the sense that the [Tracker] may be regarded as the ultimate ASW fixed-wing aircraft, having no successor in sight). There will naturally be succeeding generations of ASW helicopters, each improving on the last...."[32] Finally, Commodore Brown questioned Slemon's reading of the 1946 agreement:

> while this agreement may be binding where duplication of effort between the two services can be avoided by its application, it should not be applied in cases where it actually introduces duplication of effort. For the RCN and the RCAF both to enter the ASW helicopter field would introduce complete duplication of effort.[33]

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[31] The RCAF was fighting a rear-guard action to wrest control from the navy, despite the fact that the Chiefs of Staff Committee had already approved, on 17 November 1953, the RCN's plan to form an experimental ASW helicopter squadron.

[32] Commodore W.L.M. Brown, ACNS (A) to VCNS, "ASW Helicopters - Experimental Squadron," NSS 1115-39 (STAFF), 15 April 1955, RG 24 83-84/167, vol. 11, file 1115-39 vol. 1, NAC.

[33] Ibid. Commodore Brown concluded his memorandum with the following analogy: "I would be most reluctant to see the institution of a Joint RCN/RCAF Experimental Unit. The cuckoo has a persuasive note, but it has rather unpleasant habits".

The maritime air issue would remain unresolved for another three years, because of the changing Soviet threat and NATO's response to that threat.

Until 1954, Canada's maritime forces prepared to fight a conventional A/S war, similar to the one that had been waged in 1939-1945. The changing strategic environment, however, prompted both the U.S. and Canada to reassess the measures to defend North America in the event of a global war. The combination of the hydrogen bomb and the intercontinental bomber, coupled with a more technologically sophisticated and longer-ranged Soviet submarine fleet and the development of submarine-launched missiles, meant that North America was more vulnerable.[34]

The Soviet detonation of an atomic bomb in 1949 led some Western analysts to predict that the Soviets could produce a nuclear-tipped, submarine-launched missile, similar to the air-breathing German V-1 rocket of the Second World War, by 1951. However, given the size and weight of the first generation nuclear weapons, this seemed unlikely. A conventionally armed (ie. high explosive) V-1 missile attack launched against cities on the eastern seaboard was much more plausible. More worrisome for the West was the Soviet detonation of a hydrogen bomb in 1954, and the development of the first-generation submarine-launched ballistic missile, comparable to the V-2 of the Second World War. This generation of Soviet missiles was expected to resemble the USN's Regulus II missiles which were capable of supersonic flight and had a range of 450 nautical miles. These same analysts

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[34] Michael A. Hennessy, "The Rise and Fall of a Canadian Maritime Policy, 1939-1965: A Study of Industry, Navalism and the State," p. 271 and; Sean M. Maloney, "Parry and Thrust: Canadian Maritime Forces and the Defence of North America, 1954-1962," A Paper Presented to the Conference on Cuban Missile Crisis-era Navies, Moscow, 6-8 September 1994, pp. 3-4.

expected the Soviets to employ its submarine-carried missiles against more or less the same types of strategic land targets as the USN had selected in its own plans.[35]

Not only did Soviet submarines have the ability to launch short-range nuclear missiles, but the boats themselves were becoming more advanced. The "Whiskey" class submarines were conventionally powered diesel-electric boats which incorporated some features of the German Type XXI submarines. These submarines first entered service in the early 1950's, and went through a number of modifications, the most important of which was the installation of a schnorkel in 1955, and external missile launchers located on either side of the deck in 1957.[36] By the latter year a total of 236 had been built. The next class of Soviet submarines, designated "Zulu" by NATO, was much more streamlined and all were equipped with a schnorkel. A total of 26 boats were built between 1952 and 1957, of which six were

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[35] Jan Breemer, Soviet Submarines: Design, Development and Tactics, pp. 88-91, and; Robert E. McKeown and David Robinson, "Submarines," in The Soviet Navy: Strengths and Liabilities, eds., Bruce W. Watson and Susan M. Watson, (Boulder, Colorado: Westview Press, 1986), pp.57-72. "None of the declassified issues of the ONI Review of the 1950's hint at any suspicion that the Soviets might take missiles to sea for anti-ship purposes. Yet, a significant Soviet anti-ship missile programme was in existence throughout the 1950's".

[36] The fifth and final variant in the "Whiskey" series had the following specifications: displacement - 1,355 tons (submerged); length - 249 feet; speed - 18.5/13.5 knots (submerged); endurance - 6,500 nautical miles at 5 knots (schnorkel); armament - 6 x 21-inch torpedo tubes (12 torpedoes or 24 mines); diving limit - 656 feet and; carried a complement of 50-60 men. Jan Breemer, Soviet Submarines: Design, Development and Tactics, Table 12, p. 85.

converted to carry the Soviet navy's first ballistic missiles, housed in the fin.[37] Despite these advances in Soviet submarine technology not all Western naval officers viewed the threat in the same light.

Admiral of the Fleet R.R. McGrigor, RN, Britain's First Sea Lord, told senior Canadian naval officers that U.S. authorities "placed too much emphasis upon atomic bombardment from the air and by guided missiles from submarines to the exclusion of progressing plans to keep shipping lanes open and fight a submarine threat".[38] In fact the bulk of the Soviet submarine fleet was tasked to defend the seaward flanks and to interdict approaching U.S. carrier battle groups. Regardless of the differences of opinion between some officers of the RN and USN, the shift in NATO's strategic doctrine would have far-reaching implications for the RCN.

The adoption of the so-called "New Look" strategy in December 1954, codified in the NATO Military Committee's planning document MC-48, formally recognized for the first time the destructive potential of thermonuclear war, marking a shift away from the more traditional concepts of warfare. Canadian and American planners envisioned a conflict in which the

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[37] The series IV "Zulu" class submarines had the following specifications: displacement - 2,500 tons (submerged); length - 295 feet; speed - 18.5/16 knots (submerged); endurance - 9,500 nautical miles at 8 knots; armament - 10 × 21 torpedo tubes (22 torpedoes or 44 mines); diving limit - 750 feet and; carried a complement of 75 men. Initial intelligence estimates credited the submarine with an endurance of 26,000 nautical miles at an average speed of 10 knots. The missiles housed in the fin of the Zulu V's was a modified R-10, believed to be a second-generation V-2 adapted for air ejection from the submarine launch tube. The missile was 42 feet in length, weighed 30,000 pounds, carried a 2,000 pound nuclear warhead, and had a range of 350 nautical miles. Ibid. pp. 86-95.

[38] Minutes of the 423rd Naval Board Meeting, 9 November 1954, DHist 1000-100/2; Sean M. Maloney, "Parry and Thrust: Canadian Maritime Forces and the Defence of North America, 1954-1962," p. 9.

successful prosecution of the war primarily depended upon the protection of Strategic Air Command's (SAC) bases, which housed the long-range intercontinental bombers, and the protection of the industrial resources of North America. Deterrence became the primary function of the armed forces. This concept led to a number of major projects, including the building of radar installations in the Canadian north (known as the DEW Line), the Mid-Canada Line aircraft detection system across the Canadian Shield, additional fighter squadrons to intercept long-range Soviet bombers, point missile defences around command and control centres or industrial targets, and a sea-based radar picket system to cover gaps in the land-based system.[39]

MC-48 brought significant changes for the Canadian navy. Reliance on NATO's possession of nuclear weapons promised to decrease the costs associated with defence by reducing the need for large reserve forces and the maintenance of an industrial base from which to mobilize. It was no longer deemed essential to maintain an industrial capacity to build in war something in the order of 100 frigates. Rather, MC-48 placed greater emphasis on the fleet-in-being and forward defence.[40] This, in turn, meant that, instead of planning to refight the "Battle of the Atlantic," the navy's primary role would be to protect the approaches

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[39] Canada chose not to contribute to the sea-based picket system because of budgetary constraints. See Joseph T. Jockel, No Boundaries Upstairs: Canada, the United States and the Origins of North American Air Defence, 1945-1958, (Vancouver: University of British Columbia, 1987), ch. 4.

[40] It should be pointed out, however, that the planners of MC-48 envisioned a war scenario consisting of two distinct phases. The first stage involved an exchange of nuclear weapons, lasting for approximately thirty days. This would be followed by a conventional war (referred to as a "Broken Back War" by the British) in which manpower and equipment would be mobilized for operations according to the ability of each nation to rebuild.

of North America, that is, to interdict Soviet submarines before they could launch their missiles against the SAC bases and industrial targets. To carry out this role, the navy would have to devote more resources to projects which contributed to deterrence, and also to programmes which provided more offensive punch in the ASW field. This would prove to be a difficult task indeed, especially when one considers that the Canadian armed forces were having to do more with less: diminishing budgets and escalating costs personnel, operations and maintenance (PO&M) were the order of the day.[41]

One of the most important programmes for the navy in the prosecution of the ASW war was the development of Low Frequency Analysis and Recording (LOFAR) techniques to track Soviet submarines. The results of this research were eventually applied to ship and submarine sonar and aerial-delivered sonobouys. More importantly, perhaps, the British and Americans laid two underwater passive sonar arrays. These arrays, commonly referred to as Sound Surveillance Systems or SOSUS, were basically a series of underwater listening posts. The British system (CORSAIR) was a shallow water array which was capable of detecting transiting submarines up to 100 miles away. The American system (CAESAR) was a deep water array capable of long-range detection. The construction of the SOSUS net and the 12

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[41] As Michael Hennessy has pointed out, the Department of National Defence's budget in 1955-56 was $1.8 billion dollars. Approximately $920 million - nearly 52% - was devoted to personnel, operations and maintenance costs. This was the first post-war fiscal year in which PO&M costs took more than 50% of the budget, and this was the beginning of a trend that would see those costs rob more and more from the capital portion (ie. equipment and construction) of the budget. See Michael A. Hennessy, "The Rise and Fall of a Canadian Maritime Policy, 1939-1965: A Study of Industry, Navalism and the State," pp. 284-285. See also Dan W. Middlemiss, "Economic Considerations in the Development of the Canadian Navy since 1945," in W.A.B. Douglas, The RCN in Transition, 1910-1985, (Vancouver: UBC Press, 1988), pp. 254-279.

shore-stations (nine on the Atlantic coast and three on the Pacific), completed by 1958, had a profound impact upon Canadian naval planning.[42]

The "New Look" Strategy adopted by the Canadian armed forces in 1955, embraced the possibilities of the SOSUS system. Naval planners recognized that naval strength no longer remained simply a function of hulls in the water. To exploit SOSUS contacts, the navy required a surface fleet capable of greater endurance, speed and hitting power. Greater reliance would have to be placed upon naval aviation, including short and long-range patrols.

In addition to procuring more advanced weaponry, NATO forces, including the RCN, adopted new tactics designed to thwart the Soviet submarines. Operations in the North Atlantic, in support of SOSUS, required RCN ASW forces to patrol an area approximately 700 x 300 miles. The patrol area was supposed to be sufficiently far from land-fall to nullify the range of Soviet missiles. To cover such an expansive area, ships were to operate in pairs, with 24 ships required to cover the search area. Studies conducted by the RCN concluded that it would take one-hour and fifty minutes for the 27 knot St. Laurent class destroyers operating in a patrol area to reach the datum point, and two-hours and fifteen minutes for the

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[42] See, Sean Maloney, "Parry and Thrust: Canadian Maritime Forces and the Defence of North America, 1954-1962," A Paper Presented to the Conference on Cuban Missile Crisis-era navies, Moscow, 6-8 September, 1994. The hoped for performance (detection ranges of approximately 1000 miles) of the CAESAR system was never realized. This is due to a number of variables, including: changes in salinity and temperature gradients, and lack of high-speed data processing equipment. Reports on the systems capabilities showed that SOSUS had difficulty tracking the Soviet trawler fleet never mind Soviet submarines. In fact, some studies indicated that the system would not be operating properly until 1965, if not later.

18 knot Prestonian class frigates.[43] These operational requirements highlighted some of the deficiencies of the current destroyer escort forces, and these deficiencies in turn underscored the value of ship-borne helicopters. If there was one helicopter per two ships, then not more than forty minutes was required to reach a datum point.[44]

To meet the challenges of effective operations against missile firing submarines within existing budgets, the RCN had to sharply focus its effort. The Naval Board decided to pay-

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[43] See, "Some Factors Pertinent to the MC-48 War Concept," Annex I - Force Requirements for the Support of Sound Surveillance Systems," Director of Naval Plans to ACNS (Plans), 14 February 1956, RG 24 83-84/167, vol. 457, file 1650-26 vol. 15, NAC, and; Michael A. Hennessy, "Fleet Replacement and the Crisis of Identity," (Kingston: RMC, 1994). The datum point was the last known position of a contact (submarine). In September of 1958, the SOSUS chain (HMCS Shelburne station) detected what was believed to be a Soviet submarine operating off Halifax. According to the report filed by Rear-Admiral R.E.S. Bidwell, Canadian Maritime Commander Atlantic, there was "no break in the air patrol with the second aircraft taking over the sonobuoy pattern three hours and eleven minutes after initial contact. The order to sail ships was given two hours and twenty minutes after initial contact and the ships arrived in the vicinity of the datum seven hours and thirty minutes after initial contact. The time of arrival of ships at the datum point is not subject to significant improvement. Any improvement would have to be in the direction of making more ships available and using intelligence information to limit the search area". The report noted that the search requirements for the area (400 square miles) is 6-10 ships with a hull-mounted sonar range of 2,000 yards, or two ships equipped with Variable Depth Sonar (VDS). "The six-ship sweep is considered to be a minimum requirement (because they could provide an unbroken sweep of 12 miles) since a submarine that detects a sweep of five ships at ten miles could evade by using 10 knots for thirty minutes in the direction at right angles to the line of advance of the sweep". See Rear-Admiral R.E.S. Bidwell, Canadian Maritime Commander Atlantic, to the Naval Secretary, "Analysis of the Operation 7-8 September 1958, Involving Contact B-86," 15 December 1958, MCACS: 1650-166/10, RG 24 83-84/167, vol. 455, file 1650-1, NAC.

[44] As for maritime patrol aircraft, maintaining three on continuous patrol would give a response time to the datum point of forty minutes. A fleet of 40 Neptune patrol aircraft was required to furnish twenty-four hour patrol. See "Some Factors Pertinent to the MC-48 War Concept," Annex I - Force Requirements for the Support of Sound Surveillance Systems," Director of Naval Plans to ACNS (Plans) 14 February 1956, RG 24 83-84/167, vol. 457, file 1650-26 vol. 15, NAC.

off the two cruisers, HMCS Ontario and Quebec, which did not have an A/S capability. For the same reason, the navy also turned over its only icebreaker, HMCS Labrador, to the Department of Transport in 1958. In the name of economy, the RCN declined to participate in the American plan to extend the Distant Early Warning radar system at sea, and refused to take part in ASW barrier operations in the Greenland-Iceland-United Kingdom gap (G-I-UK gap) to permit greater concentration of ASW resources in the western Atlantic.[45]

Despite this trimming, competition with the RCAF for diminishing resources and the unresolved issue of control of maritime air continued to stymie the navy's acquisition of helicopters. In January 1955, the government announced that the armed forces could not undertake any new capital programme without some previously accepted programme being dropped. Equally troublesome for the navy was the declaration by L.M. Chesley, Assistant Deputy Minister (Requirements), on 2 February 1955, that the department would avoid ordering unproven equipment. This announcement stemmed, in part, from cost overruns and delays in commissioning the new St. Laurent class destroyers.[46]

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[45] For a detailed discussion, see "RCN Position Regarding G-I-UK Study Group Recommendations," Appendix A, 26 September 1960, RG 24 83-84/167, Box 89, file NSS 1270-78-1 vol. 6, NAC.

[46] See Michael A. Hennessy, "The Rise and Fall of a Canadian Maritime Policy, 1939-1965: A Study of Industry, Navalism and the State," (University of New Brunswick, Unpublished Ph.D. Dissertation, 1995), pp. 271-278. In this instance, at least, L.M. Chesley, ADM (R), was not very supportive of the navy's plans. In fact, in late 1953, he questioned the RCN's plan to establish an experimental helicopter squadron given that the RN and USN were already well established in the field. Chesley also challenged the navy's numbers, arguing that the helicopters used for experimental work would be unsatisfactory in operations and therefore the numbers must be kept to a minimum. Obviously, the Minister regarded helicopters as unproven aircraft. See Extract of Minutes of the 59th DND Estimates Screening Committee, 14 December 1953, RG 24 83-84/167, vol. 3427, file 7820-102 vol. 1, NAC.

The RCN's frustration over its inability to garner support at higher levels for its projects, coupled with the government's reluctance to approve any new capital programme, led to the creation of a new committee in the summer of 1954. The Policy and Projects Coordinating Committee was tasked by the Naval Board to consider all matters requiring coordination between the Staff, Personnel and Technical Services branches before matters were forwarded to the CNS or Naval Board. The new committee "was responsible for ensuring that there is coordination of such matters and that they are brought to expeditious execution by the appropriate authorities concerned".[47] One of the committee's first assignments was to evaluate the navy's proposal to acquire the five S-55 and three HTL helicopters. Only the former concerns us here.

It took the committee several months to complete its study of the helicopter programme. This is explained by the fact that the "PPCC was an entirely new concept with no established procedures for carrying out its business, no permanent Naval Coordinator, and

[47] See Minutes of the 407th Meeting of the Naval Board, 17 June 1954, DHist 1000-100/2. The members of the PPCC was as follows: VCNS (Chairman); ACNS (Warfare); ACNS (Air); ACNS (Plans); Deputy Chief of Naval Personnel; Assistant Chief of Naval Technical Services (ACNTS), and; the Naval Coordinator (Director of Naval Organization).

adequate secretarial staff".[48] However, by late 1954, the PPCC reported back to the Naval Board, approving the acquisition of six S-55 helicopters. This settled the acquisition of aircraft for experimental purposes, but had not resolved the larger question of forming an operational unit.

In the climate of constraint on resources, the last issue turned more than ever on settlement with the RCAF of control of maritime air. On 26 January 1955, Commodore Brown tabled the draft of a paper entitled, "The Control of Helicopters in Maritime Warfare," for presentation by CNS to the Chiefs of Staff Committee. Brown, who as ACNS (A) sat on the Sea/Air Warfare Committee, wanted early comments from the Naval Board on the draft to establish the position he should take at the committee's upcoming meeting. The Board suggested that the operational section of the report be expanded, paying particular attention to the strategic implications of helicopter operations. Brown's original draft had noted that "so far only the problems of employing helicopters in a general war have been discussed. The possible recurrence of local wars in any part of the world makes it necessary to be able to deploy helicopters anywhere at short notice. If all our helicopters are capable of operating from a carrier, then sending them abroad in an emergency to back up United Nations action

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[48] See, Assistant Chief of the Naval Staff (W) comments to the Naval Board, Minutes of the 409th Naval Board Meeting, 23 July 1954, DHist 1000-100/2. At that meeting ACNS (W) succeeded in replacing the original Naval Coordinator (Director of Naval Organization) with Acting-Captain F.W.T. Lucas, Deputy Director of Naval Plans and Operations. The benefits were twofold. First, it increased the likelihood that the committee would become a permanent fixture in the naval hierarchy. Second, appointing Captain Lucas to the position of Naval Coordinator ensured that one of the most important directorates (DNPO) would play a key role in the decision-making process. In the proposed terms of reference the committee was created on a trial basis, lasting perhaps one year. At that time the Naval Board would review the situation.

in a local war will be a much easier task".[49] The report also highlighted the capabilities of shore-based helicopters in the minesweeping and seaward defence role. Demonstrating flexibility was crucial to the RCN's argument. The navy needed to show, once and for all, that naval aviation met such highly specialized requirements, and that it did not duplicate the efforts of the RCAF.

Unlike the RCAF, the Canadian navy believed that one type of helicopter was capable of carrying out both shore-based and ship-borne duties.[50] Basically, the air force position was that the tandem rotor helicopter operating from shore was better suited to carry out minesweeping and seaward defence duties, while a single rotor helicopter was required for ship-borne operations. Following this line of thinking, the air force concluded that, "the [joint experimental] unit should be equipped with various types of helicopters, eg. H-21A, S-55, S-58, etc., with due regard to economy, rather than with quantities of any one type".[51] From

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[49] See, Draft Memorandum to Chairman, Chiefs of Staff Committee, "The Control of Helicopters in Maritime Warfare," NSS 1115-39 (Staff), January 1955, RG 24 83-84/167, vol. 11, file 1115-39 vol. 1, NAC, and; Minutes of the 435th Naval Board Meeting, 26 January 1955, DHist 1000-100/2.

[50] To compare and contrast the RCAF's position with that of the RCN's, see: Memorandum to Chairman, Chiefs of Staff Committee, "The Control of Helicopters in Maritime Warfare," NSS 1115-39 (Staff), January 1955, in RG 24 83-84/167, vol. 11, file 1115-39 vol. 1, NAC, and; Air Marshal, C.R. Slemon, Chief of the Air Staff to CNS, "Employment of ASW Helicopters in Canadian Services," S1038-180 (CAS), 1 April 1955, in RG 24 83-84/167, vol. 11, file 1115-39 vol. 1, NAC.

[51] Air Marshal, C.R. Slemon, Chief of the Air Staff to CNS, "Employment of ASW Helicopters in Canadian Services," S1038-180 (CAS), 1 April 1955, RG 24 83-84/167, vol. 11, file 1115-39 vol. 1, NAC. The RCAF's ideas regarding helicopter procurement appears to contradict the governments directive to keep costs down. Common sense dictates that procuring limited numbers of various types of helicopters is not cost effective, especially when one considers the unit costs associated with certain helicopters. On the other hand, large production runs of one type of helicopter tends to bring down the overall costs.

the outset, the navy was determined to steer clear of acquiring too many different types of machines. As Commodore Brown stated in his report, "it is both economical and operationally desirable to employ one type of helicopter... the role of the ship-borne and shore-based helicopter being the same, their main items of equipment will be identical. In production, logistics and operations there are advantages to be gained by using the same type [of helicopter]. Logistically, it is clearly more efficient to have one type to support and for which to provide spares and reserves".[52] From an economic and operational perspective the argument had merit, but it remained to convince others, the first step being to win over the RCAF in the Sea/Air Warfare Committee. This the navy could not do; perhaps it was an impossible job. As a result, when the topic came before the Chiefs of Staff Committee, in February 1955, the Chairman withdrew the paper, and instructed the CNS and the CAS to resolve the matter themselves. This did not bode well for the navy's plans. In the interim, headquarters focused on completing a revised staff requirement for an ASW helicopter, and continued with its preparations for commissioning the experimental helicopter squadron.

The Directorate of Naval Aviation began work on a Revised Staff Requirement because the S-55 helicopter was not designed as an ASW helicopter, and therefore did not fully meet the 1953-1954 Staff Requirements. As stated previously, helicopters of the day were underpowered, lacked proper navigational equipment, and had limited weapon and sensor carrying capabilities. Moreover, they could not operate at night or in difficult weather conditions such as high winds that are frequently encountered over the sea, and especially in

[52] Memorandum to Chairman, Chiefs of Staff Committee, "The Control of Helicopters in Maritime Warfare," NSS 1115-39 (Staff), January 1955, RG 24 83-84/167, vol. 11, file 1115-39 vol. 1, NAC.

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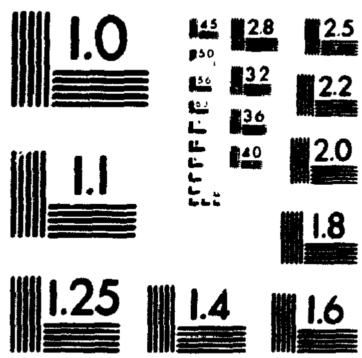
PM-1 3½"x4" PHOTOGRAPHIC MICROCOPY TARGET
NBS 1010a ANSI/ISO #2 EQUIVALENT



the north-west Atlantic. The revised Staff requirement would eventually become the navy's 1960 Staff Requirement. As yet, however, no helicopters met this standard, and the navy was forced to seek an interim solution.

By the spring of 1955 the RCN had narrowed the choice to two helicopters: the Sikorsky HSS-1 (S-58) and the Bristol 191. The latter was an updated version of the Bristol 173, which had been plagued by mechanical difficulties. Despite many modifications, the Bristol 191 proved to be unsatisfactory in the ASW role. The original 173 was designed:

> with a low undercarriage and level fuselage with windows along both sides, became a short fuselage design - necessary to fit an aircraft carrier's lift wells - with minimum headroom, a nose-up configuration to permit easy loading of torpedoes, and a huge undercarriage designed to absorb the shock of deck landings.[53]

The three-bladed rotor found on the Bristol 173 (Mk 1) was changed to four blades (Mk 2) and the transmission was modified to absorb the additional power available from the gas turbine engines, but there were technical problems. The Royal Navy "was beginning to have doubts that it was too heavy for current aircraft lifts and that the rotor blades would have to be removed to fit. After hovering trials, which were unsatisfactory from the RN's point of view, they cancelled their order...."[54] As early as February 1955, some British officers were convinced that the Sikorsky S-55 was the largest helicopter that could be accommodated in

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[53] Richard E. Gardner and Reginald Longstaff, British Service Helicopters, (London: Robert Hale Limited, 1985), p. 27.

[54] Ibid., p. 28; Jack Lowell Nixon, "Helicopter Development in Europe, 1940-1980," in Vertical Flight: The Age of the Helicopter, edited by Water J. Boyne and Donald S. Lopez, (Washington, DC: Smithsonian Institution Press, 1984), p. 154, and; HMCS Niobe - Report of Proceedings for May 1955, Report No. 152 (dated 21 June 1955), NUKS: 1926-193/96, DHist, Shore Establishments 8000 - HMCS Niobe. The Bristol 191 was severely underpowered for its size and weight.

a light fleet carrier. Similarly, the sheer size of the Bristol 191 helicopter, coupled with the fact that it did not have power-folding rotor-blades, made the S-58 that much more attractive to the RCN.

The Sikorsky S-58 differed from the S-55 helicopter in a number of ways. Fitted with a more powerful piston engine, the S-58 was capable of higher speeds and had greater endurance. Because the S-58 had a greater payload, it was able to carry one additional crewman and an extra externally mounted ASW torpedo.[55] In either configuration (ie. S-58 or T-58), however, the helicopter did not quite meet the 1960 ASW Staff Requirement. The original Staff Requirement, first promulgated in late 1954, was for a machine that could carry a crew of four and be capable of cruising at 80 knots, with a maximum speed of 100 knots. It had to have an endurance of four hours, a range of 150 nautical miles, and be capable of carrying one torpedo when assigned to screening, and three torpedoes when employed in the search and attack mode. Finally, the aircraft had to be outfitted with power-folding rotor-blades, anti-icing, and auto-pilot equipment.[56]

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[55] The Sikorsky S-58 had the following specifications: maximum speed - 115 knots; cruising speed - 90 knots; endurance in the ASW mission - 3 hours; weapons - 2 Mk 43 (Mod 1) torpedoes; sonar gear - AN/AQS-4C; gross weight - 12,600 pounds; useful load - 4,607 pounds, and carried a crew of four. See, Memorandum "Choice of ASW Helicopter for 1957 Procurement," Appendix A, Commodore H.P. Sears, ACNS (Air) to VCNS, NSS 7820-102 (Staff), dated 8 November 1955, RG 24 83-84/167, vol. 11, file 1115-39 vol. 2, NAC. It should be noted that the Sikorsky T-58 helicopter was outfitted with two General Electric gas-turbine engines and promised even better performance. Experiments with gas-turbine engines began in 1930, and by the early to mid-1950's manufacturers were producing the first generation of gas-turbine helicopters.

[56] See, Memorandum "Choice of ASW Helicopter for 1957 Procurement," Appendix A, Commodore H.P. Sears, ACNS (Air) to VCNS, NSS 7820-102 (Staff), dated 8 November 1955, RG 24 83-84/167, vol. 11, file 1115-39 vol. 2, NAC.

These last three conditions were particularly important, given the confined space in the Canadian navy's small light fleet aircraft carrier, and the extreme weather conditions found on the east coast.[57] In so far as anti-icing and auto-pilot equipment was concerned, the Royal Navy and the Royal Aircraft Establishment (RAE) had been conducting experiments with both systems for at least a year, with promising results. From the available documents, it appears that the anti-icing trials were carried out with the RCN's trials, test and development squadron (VX10), through the National Aeronautical Establishment (NAE) detachment in Ottawa. Experiments may have also been conducted at the Winter Experimental Establishment (WEE) in Edmonton, Alberta, using a Sikorsky S-55 helicopter.[58]

The auto-pilot system, developed by the Royal Aircraft Establishment in Farnborough, was:

> a three-axis system which provides automatic control or stabilisation of the helicopter by applying appropriate movements to the cyclic stick and yaw pedals. Three rate

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[57] Kealy and Russell state that the aircraft carriers could carry a total of thirty-four aircraft. However, Bonaventure underwent a number of modifications which included the building of an angled flight-deck, installation of a steam catapult and mirror-landing aid, and increased AVGAS stowage facilities. All of these modifications taken together reduced the aircraft complement from 34 to 21 aircraft. A mixed complement designed to carry out trade protection and fleet air defence would consist of twelve Trackers, eight F2H-3 fighters (Banshees) and one S-55 helicopter. Seven Trackers, four Banshees and one helicopter would be parked on the flight deck, while five Trackers and four Banshees would be stowed in the hanger. With this arrangement 15 feet wing-tip clearance is provided to well forward of the island and Hangar C is clear. More aircraft could be carried by altering the distance between aircraft wing-tips on the flight deck and in the hangar. See, Extract from Minutes of the 36/55 Meeting of the Naval Staff, 16 November 1955, RG 24 83-84/167, vol. 3496, file 8000-CVL 22, vol 12, NAC, and; Memorandum "HMCS Bonaventure - Aircraft Complement," Commodore H.P. Sears, ACNS (Air) to VCNS, NSS 8000-312/3 (Staff), 24 October 1955, RG 24 83-84/167, vol. 3496, file 8000-CVL 22, vol. 12, NAC.

[58] See, Peter Charlton, Nobody Told Us It Couldn't Be Done: The VX10 Story, (Ottawa: Published Privately, 1993), ch. 5.

> gyros mounted in the fuselage detect the angular motions of the fuselage about its pitch, roll and yaw axes. Signals from the gyros are amplified and control autopilot servomotors connected to the flying control system. Thus in response to any change in fuselage attitude, control is applied automatically to counteract the disturbance.[59]

The Commanding Officer of RN Air Station, Gosport, was so impressed with the system he concluded his report by stating that "the introduction of this equipment is the first real step in solving the problem of helicopter instrument flight".[60] Acting-Commodore Jeffrey Brock, Naval Member Canadian Joint Staff (London), informed naval headquarters that the trials were so successful that the RN was considering a limited production run to equip the anti-submarine helicopter squadron (No. 845) with the auto-pilot system, and that production models were expected to be available in six months time.

Despite great strides forward in the helicopter field, the S-58 did not meet the 1960 ASW helicopter staff requirement. It did, however, meet the earlier 1953-1954 ASW helicopter staff requirement, and therefore became the navy's choice as the interim helicopter for the fleet.

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[59] See, "Evaluation of the Experimental AutoPilot Type "K" Installed in Sikorsky S-55 Helicopter WV202," Commanding Officer, RN Air Station, Gosport, to Flag Officer Air (Home), 7 December 1954, in Naval Member Canadian Joint Staff (London) to Naval Secretary, NUKS 7807-1, 19 January 1955, RG 24 83-84/167, vol. 3403, file S-7807-102, vol. 1, NAC.

[60] Ibid. According to the Commanding Officer of RN Air Station, Gosport, the introduction of the auto-pilot system would increase the operating efficiency of helicopters for the following reasons: pilot fatigue as a result of prolonged hovering is greatly reduced, thereby enabling longer sorties to be flown without any depreciation of hovering accuracy; improved navigation with a higher degree of safety, and; under instrument flying, straight and level flight and simple manoeuvres can be achieved without intense concentration previously necessary, thus enabling the helicopter to be flown safely under marginal weather conditions.

In May 1955, the Naval Staff met to discuss the navy's 1956-1957 procurement programme, which included both utility and ASW helicopters. The Staff approved a plan by Captain A.B. Fraser-Harris, Director of Naval Aviation, and Commodore Brown which called for the acquisition of twenty-one ASW helicopters, three utility helicopters (Bell HTL), and four Bell HUL-1 helicopters for the icebreaker.[61] Fraser-Harris observed that by 1957 the S-55 helicopter would have been in service for two years, and its use in test and experimental work would have been fully exploited. He therefore sought approval to form, in 1957, an operational anti-submarine helicopter squadron with a complement of 21 ASW helicopters, including spares, that would meet the 1953-1954 Staff Requirement. He also pointed out that the helicopter would have a service life of approximately five years, and that a suitable helicopter to meet the 1960 requirement would not be available until 1962. Fraser-Harris suggested that a three year programme be initiated to purchase 21 ASW helicopters at a cost of $12 million dollars of which $5 million dollars should be made available in the 1956-1957 Estimates.[62] The Naval Staff concurred with DNA's entire plan, including designating squadron HS-50 as an operational squadron.[63] The Staff then referred the whole matter to the PPCC for consideration and recommendation.

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[61] Captain A.B. Fraser-Harris became Director of Naval Aviation in March 1955. The position of DNA lapsed in September 1951, and ACNS (Air) was given the additional title of Chief of Naval Aviation with a Deputy CNA and an Assistant CNA to help him. The arrangement of a CNA and two Deputies lasted until March 1955, when it was abolished and DNA re-instituted.

[62] Minutes of the 15/55 Naval Staff Meeting, 17 May 1955, DHist 1000-100/3.

[63] It will be recalled that the Chiefs of Staff approved the navy's plan to form an experimental helicopter squadron (HS-50) on 17 November 1953.

Within two days the Policy and Projects Coordinating Committee recommended approval of the 1956-1957 helicopter programme to the Naval Board.[64] On 25 May 1955, the Naval Board met to discuss the matter. At that meeting the Board approved the procurement plan for ASW and utility helicopters, noting that funds were included in the 1956-1957 Estimates for the purchase of 12 Sikorsky S-58's, and seven utility helicopters. The remaining nine Sikorsky helicopters were to purchased over a two-year period.[65] Almost immediately the navy was struck broadside. At a meeting of the DND Screening Committee the funds were deleted from the Estimates because the whole question of ASW helicopter control and responsibility had not been resolved by the three Services. This decision was a real blow to the RCN's plan. Little did the navy know that this was the calm before the storm. The only thing that the naval aviators could look forward to now was the commissioning of the experimental helicopter squadron, scheduled for the summer of 1955.

In the two-year period covered by this chapter, the RCN had undergone a number of significant changes, due in part, to external pressures and global events, advancing technology (what Friedman has termed the "post-war naval revolution"), diminishing budgets, and ever-present inter-service rivalries. The trend towards the RCN's specialization in ASW was driven by political pressure, fiscal concerns, and Soviet advances in submarine and ballistic-missile technology. Convincing the RCAF and the politicians of the merits of the helicopter

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[64] See, Extract from Minutes of the 27th Meeting of the Policy and Projects Coordinating Committee, 19 May 1955, in RG 24 83-84/167, vol. 3427, file 7820-102, vol. 1, NAC. That the PPCC was able to approve the programme so quickly is explained solely by the membership of that board.

[65] Minutes of the 445th Naval Board Meeting, 25 May 1955, DHist 1000-100/2.

to counter the Soviet threat was another matter. After more than eleven years of playing a minor role in the helicopter field, acting mainly as observers, naval aviators in the RCN were ready to conduct their own trials.

CHAPTER SIX

"BY EAR WE CONQUER"

(Motto of Squadron HS-50)

The Royal Canadian Navy's ASW experimental helicopter squadron, HS-50, commissioned on 4 July 1955, at HMCS Shearwater, the navy's air station on the east coast. Early in the month four officers, including the commanding officer Lieutenant-Commander G.H. Marlow, flew to Bridgeport, Connecticut, to test fly and accept the first of the unit's six S-55 helicopters.[1] Because of delays in the installation of the dipping sonar equipment, the aircraft was not available and the men had to return to Shearwater. On 19 July, the four officers departed once again to Bridgeport to pick up the first two helicopters and ferried them back to the naval air station. During the course of the month, much preparatory work had to be done around the hangar building (No. 108). According to the Commanding Officer, "as the men were drafted to the squadron they were employed in the hangar, until the arrival of the first aircraft. Two weeks of steady work put the hangar in fairly good shape to

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[1] Lieutenant-Commander George Herbert Marlow, originally an aircraftsman and later a pilot with the RCAF, transferred to the RCNVR in 1945. After flying fixed-wing aircraft with the navy, he was sent to USNAS Ellyson Field, Pensacola, Florida, for helicopter training in 1951. Following postings to Lakehurst, New Jersey, HMCS Shearwater, and naval headquarters, he was appointed commanding officer of HS-50. See, John MacFarlane and Robbie Hughes, Canada's Naval Aviators, (Victoria, BC: Maritime Museum of British Columbia, 1994), pp. 106-107.

commence operations".[2] In addition to the pilots of the squadron, one Chief Petty Officer (CPO), and eight LSTD2's (Observers) from the Torpedo Anti-Submarine School (Stadacona), were drafted to the squadron as sonar operators, along with twenty-eight maintenance personnel. Chief Petty Officer Jamieson had some experience with ASW helicopters having served for six months with Helicopter Anti-Submarine Squadron No. 3 of the USN. As the TD's had no previous flying experience, Jamieson set up an indoctrination course in the Observer School for their training while the hangar was being made ready and squadron aircraft procured. By the end of the month the CO was able to report that, "despite a shortage of ground handling equipment, office furniture, publications, flying clothing, and other stores items, the squadron commenced training during the last week of July".[3]

During the early days of the squadron's existence, it encountered several problems, not the least of were a shortage of pilots and aircraft. This, in turn, slowed training of the sonar operators. Despite these difficulties, the squadron was able to begin limited exercises in August. Among these were runs against the British submarine HMS Alderney in the approaches to Halifax harbour under the control of the Seaward Defence Headquarters (SDHQ). According to Lieutenant-Commander Marlow, the "helicopters were able to hold contact on the submarine at all times, passing the information on its position and movements

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[2] Squadron Reports, HS-50, "Monthly Report of Proceedings for July 1955," 1926-223/24, dated 1 August 1955, Lieutenant-Commander G.H. Marlow, Commanding Officer, Squadron HS-50, to Commanding Officer RCN Air Station, Shearwater, DHist, 1700-219/50, HS-50 (Report of Proceedings, 1955-1960).

[3] Ibid.

to SDHQ".[4] Wartime experience had shown that submarines could lurk in the complex waters off Halifax, and shore-based helicopters, because of their ability to hover and dip sonar, were much better suited than fixed-wing aircraft to the precision work of tracking submarines close inshore.

Shortages of pilots continued to hinder the squadron. The Commanding Officer noted that "while manning of lower deck personnel is about 70% of complement, the pilot shortage, with only four of a complement of 18 on strength, remains critical.... Unless pilot strength reaches twelve by 1 January 1956, effective use of HS-50 in operational exercises will be impossible".[5] The situation was remedied somewhat the following month when two additional pilots, who had just completed their elementary helicopter training with Squadron HU-21, joined the squadron.

In September, two of the squadron's helicopters, working with a group of surface escorts and two Avenger aircraft from Squadron VS 881, were able to "search, locate and hold a submerged submarine [HMS Alderney] until such time as a warship could arrive in the

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[4] Squadron Reports, HS-50, "Report of Proceedings for August, 1955," 1926-223/24, dated 6 September 1955, CO of Squadron HS-50 to CO, RCN Air Station Shearwater, DHist, 1700-219/50, HS-50 (Report of Proceedings, 1955-1960).

[5] Ibid. During the month of August a total of 74.3 hours were flown as compared to 30.2 hours for July. Of this, approximately 30 hours was ferrying time. The squadron received the remaining four helicopters during the last week of August.

area to sink the target submarine. This was the first A/S exercise of this type for the squadron, and all concerned were impressed with the helicopters capabilities".[6]

The following month, the squadron would have the opportunity to participate in the large-scale annual seaward defence exercise. The seaward defence role was a response to the difficulties the Allies had had with German schnorkel U-boats in the last year of the war in Canadian and British waters, and to a lesser extent, off the United States. Naval planners in Canada and the United States feared a renewed inshore campaign, particularly since the Soviet Union had taken over German submarine technology. By the mid-1950's, because of the development of submarines that could fire missiles from several hundred miles offshore, the focus of ASW was already shifting to barrier operations far out to sea, and when the SOSUS chain became operational in the late 1950's, the role would become less of a priority.[7]

Exercise "Cordex IV" was held from 3-8 October 1955 with Squadron HS-50 furnishing two helicopters, a spare, and two complete crews. The helicopters were employed in three basic types of patrols: box, to confirm a suspected submarine position; convoy escort, and; mine hunting. The first two patrols were used extensively with fair results, although poor sonar conditions existed throughout the exercise due to temperature gradients, shallow water effect and shoals - normal conditions off Halifax in the fall and winter.

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[6] Squadron Reports, HS-50, "Report of Proceedings for September 1955," 1926-223/24, dated 3 October 1955, CO Squadron HS-50 to CO, RCN Air Station, Shearwater, DHist, 1700-219/50, HS-50 (Report of Proceedings, 1955-1960). The exercise was witnessed by officers of the Joint Maritime Warfare School.

[7] See, Sean M. Maloney, "Parry and Thrust: Canadian Maritime Forces and the Defence of North America, 1954-1962," pp. 1-20.

These were familiar problems, as Lieutenant-Commander D.M. McLean demonstrated in his study of the failure by the RCN to sink any of the German schnorkel submarines that hunted at the mouth of Halifax harbour in the winter of 1944-1945. "Off Halifax local variations rendered asdic all but ineffective in winter. Climatic conditions produced a 'positive velocity gradient,' which allowed only a small proportion of the asdic beam to penetrate to the bottom, and then only for a short range; most of the transmission was bent back toward the surface".[8] Submarines operating at less than 200 feet should in theory have been detected, but as McLean points, out the rough waters disrupted and dissipated the refracting sound beams. To make matters worse, the ocean bottom in the Halifax approaches was extremely rocky, with ridges and pinnacles. "This type of bottom in shallow water gave strong, confused returns and generated a tremendous amount of noise... which often sounded like a possible submarine or was so loud that it drowned out valid echoes".[9] The numerous ship wrecks in the area only compounded the problem. "Every contact demanded a time-consuming assessment to determine whether it was a submarine or some long-abandoned hulk. The time lost in classifying contacts often disrupted search patterns.... Conditions in shallow water are notoriously variable, changing rapidly both with time and location because of tidal influences and local currents".[10]

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[8] Douglas M. McLean, "The Battle of Convoy BX-141," The Northern Mariner, vol. III no. 4 (October 1993), p. 27.

[9] Ibid.

[10] Ibid., pp. 27-28.

Little had changed between the end of the war and the mid-1950's to improve A/S searches in these waters. Dipping sonar, which could be lowered below the thermal layer, promised better results. However, the cable could only be lowered to sixty feet below the surface, which meant that submarines could still evade detection. According to the Squadron's Commanding Officer:

> as a result of the poor sonar conditions a great number of non-sub contacts were reported. On one occasion, however, a helicopter detected a submarine after it made an attack on the stern-most ship of an outbound convoy. It was held on sonar for a distance of 2,400 yards as it proceeded submerged up the channel. As maximum sonar range was reached, the helicopter changed station to a position 1,200 yards ahead of the submarine. Contact was regained at 1,000 yards and the submarine's course and speed plotted continuously until it surfaced 200 yards from the helicopter.[11]

There were some communication problems because of overloaded circuits and poor Very High Frequency (VHF) ranges between ships and the hovering helicopters. More generally, "control and direction procedures left a lot to be desired, but" Marlow was optimistic that "they will improve with experience and with the publication of the doctrine on helicopter

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[11] Progress Report on Operations, HS-50, 1926-102, dated 26 January 1956, Appendix A, "Report of HS-50 Participation in Exercise Cordex (3-8 October, 1955)," CO of HS-50 to the Commanding Officer, RCN Air Station, Shearwater in RG 24 83-84/167, vol. 11, file 1115-39, vol. 2, NAC, and; Squadron Reports, HS-50, "Report of Proceedings for October 1955," 1926-223/24, dated 1 November, CO of HS-50 to CO, RCN Air Station, Shearwater, DHist, 1700-219, HS-50 (Report of Proceedings, 1955-1960).

control".[12] This was, after all, the first time that RCN helicopters took part in such an exercise.[13]

Later in the month, the squadron took part in another seaward defence exercise with HMCS Iroquois, fixed-wing aircraft from squadron VS 881, and a British submarine. The purpose of this exercise was to train sonar operators, hone the skills of the squadron in flying search patterns, and improve upon tactical communications between fixed-wing aircraft and the helicopters. The fixed-wing aircraft of VS 881 laid sonobuoy patterns and vectored the helicopters to a datum established by the sono-buoys. Marlow was not entirely happy with the results, and he attributed the poor showing "to faulty communications and water temperature gradients. However, the unrestricted submarine was located during the last day of the exercise and tracked for a considerable distance by the squadron's helicopters".[14]

From October until the end of the year the Squadron took part in two more seaward defence exercises. "Operating in the approaches to the harbour with fixed-wing aircraft, surface warships and one target submarine, the squadron obtained similar results. During the final days of the last exercise, HMC Ships Portage and Wallaceburg ... were successfully led

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[12] Ibid. According to the Squadron's Commanding Officer procedures were being prepared by the N.D. School, Stadacona. During the six day exercise 28 sorties were flown for a total of 34.3 hours.

[13] "Progress Report, HS-50," Appendix A, "Report of HS-50 Participation in Exercise Cordex (3-8 October 1955)." CO of HS-50 to the Commanding Officer, RCN Air Station, Shearwater, 1926-102, 26 January 1956, RG 24 83-84/167, vol. 11, file 1115-39 vol. 2, NAC.

[14] See, Squadron Reports, HS-50, "Report of Proceedings for October 1955," 1926-223/24, 1 November 1955, Lieutenant-Commander G.H. Marlow, Commanding Officer, Squadron HS-50, to Commanding Officer, RCN Air Station, Shearwater, DHist, 1700-219/50, (Report of Proceedings, 1955-1960).

to attacks by helicopter contacts and reports".[15] Communications between the helicopters and SDHQ were also improving. Lieutenant-Commander Marlow was able to report to the Commanding Officer of Shearwater that "information passed to SDHQ [from the helicopters] resulted in submarine movements being appreciated well in advance, and that the operators at SDHQ were prepared for loop crossings by the enemy".[16] In Marlow's opinion, these exercises demonstrated beyond a shadow of a doubt that A/S helicopters had major roles to play in seaward defence: sanitizing the harbour channels, screening inbound and outbound convoys in the harbour approaches, and investigating harbour penetrations.[17]

While Squadron HS-50 conducted A/S exercises, the Joint Maritime Warfare School (JMWS) was preparing a paper on the cooperation of helicopters with surface units and fixed-wing aircraft in A/S operations. The aim of the paper, "The Employment of Helicopters in Anti-Submarine Warfare," August 1955, was to compile provisional tactical instructions pending the promulgation of Allied helicopter tactical doctrine and procedures. The paper

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[15] Progress Report, HS-50, 1926-102, 26 January 1956, Commanding Officer HS-50 to Commanding Officer, RCN Air Station, Shearwater, RG 24 83-84/167, vol. 11, file 1115-39 vol. 2, NAC. According to the Squadron's CO, the track plot of the submarine and range and bearing records of the helicopters on comparison showed that the range and bearings gained by the helicopters were extremely accurate and one contact was held to 3,800 yards when the ASR was 1,200 yards

[16] Ibid.

[17] Ibid. According to Lieutenant-Commander Marlow, the helicopter was able to perform these duties because of the performance of the airborne sonar equipment (AN/AQS-4), which compared most favourably with ship-borne sonar.

drew on RN, USN, and Squadron HS-50 material, and is of special interest as a "snapshot" of the state of the art.[18]

The AN/AQS-4 dunking sonar equipment carried by the S-55 helicopter could operate in three different kilocycle bands, with three distinct range scales, 1,500, 3,000 and 6,000 yards. The equipment had two modes of operation, active echo ranging and passive hydrophone effect listening sweep. The transducer or "ball" which was housed below the cargo cabin contained the azimuth indicator and range recorder. The transducer was lowered electrically on a cable to 60 feet below the surface, while the helicopter hovered in a stationary position ten to twenty feet above the surface of the water. Since the transducer remained motionless in the water, the noise level was negligible, and a sonar range of 1.6 times that attained by surface ships was possible. To relay sonar tracking information, a ten-channel Very High Frequency (VHF) Radio was carried in the aircraft. It appears that the

[18] The RN had been conducting their own A/S exercises in Mediterranean since 1954, with helicopters of Squadron No. 845. The RN reports were passed via the Naval Member Canadian Joint Staff at HMCS Niobe, in London, to the Naval Secretary in Ottawa, and finally made their way to the Joint Maritime Warfare School. Similarly, information from the United States was passed via the Naval Member Canadian Joint Staff at HMCS Niagara, in Washington, D.C. See, "Helicopter Dipping Asdic - Operational Progress Report, No. 1, (May-August, 1954), Lieutenant-Commander H. Phillips, Commanding Officer, Squadron No. 845, to Captain (Air), Mediterranean, HMS Falcon, 30 September 1954, in RG 24 83-84/167, vol 11, file 1115-39 vol. 1, NAC. The similarities between the RN and RCN papers are certainly evident.

main drawback of the sonar equipment was the inability to lower the transducer below 60 feet.[19]

The limitations of the Sikorsky S-55 helicopter caused greater concern. The aircraft could not be operated when cloud cover fell below 300 feet and visibility was less than half-a-mile, nor when there was even the slightest risk of ice forming on the rotor-blades. The S-55 was capable of hovering in steady winds up to 45 knots, but it became inoperable in gusty and turbulent weather. Take-offs and landings created other difficulties. "In operations from carriers, starting and stopping rotors cannot be safely accomplished in winds in excess of 25 knots, whereas the folding and spreading of rotor blades is restricted to wind conditions of 22 knots and less".[20]

The low altitude of helicopters on sonar dipping operations created fundamental problems in essential communications with supporting ships, and even in the ships' ability to track the aircraft by radar to acquire basic information needed to co-ordinate a hunt. A helicopter hovering between ten and twenty feet above the water could be held by the ship's "Sperry radar to only seven miles. That was also the maximum VHF communication range. In ships equipped with SPS6C, SPS10, and SPS12, the range increased to approximately 9-11 miles."[21] For operations beyond those ranges, the helicopter would have to climb to a higher

[19] Memorandum, "The Employment of Helicopters in Anti-Submarine Warfare," Maritime Warfare Project AI-5/54, NMW 1670-2/178, 31 August 1955, Captain P.F.X. Russell, RCN, Director of the Maritime Warfare School, and Wing Commander J.E. Creeper, RCAF, Director of the Maritime Warfare School to Flag Officer Atlantic Coast, RG 24 83-84/167, vol. 11, file 1115-39, vol. 2, NAC.

[20] Ibid.

[21] Ibid.

altitude when relaying information, a procedure that significantly slowed the pace of the ASW search, and gave the advantage to the submarine. The helicopter's limited navigational equipment compounded the problem, for at ranges beyond five miles or in screening operations a surface ship would have to be in regular communication to provide navigation assistance.[22]

Although weather often interfered, HS-50 continued with exercises in the early months of 1956. In retrospect, one of the more significant events was one participants scarcely noticed at the time.[23] At 1525 hours, on 23 January 1956, a Bell HTL helicopter landed on the mortar well hatch of the destroyer St. Laurent, and disembarked Lieutenant-Commander Pat Ryan, the ship's Executive Officer. From the available documents, it is not possible to determine whether the helicopter was simply ferrying personnel, or whether it was participating in a test to determine the suitability of operating helicopters from destroyers. At any rate, the idea of constructing a flight deck to operate helicopters from the stern of a

[22] The helicopter could navigate to a datum with some degree of accuracy, providing it did not have to fly complicated search legs. In some search patterns errors could occur, but this would be limited in clear weather. In screening operations where a series of short legs must be flown, precise navigation became difficult, and a surface warship had to provide navigational assistance.

[23] Squadron Reports, HS-50, "Report of Proceedings for January 1956." 1926-223/24, 31 January 1956, Lieutenant-Commander H.R. Welsh to the Commanding Officer, RCN Air Station, Shearwater, DHist, 1700-219/50, (Report of Proceedings, 1955-1960).

destroyer, must fall, in part, to Lieutenant-Commander Ryan.[24] As an aviator, and former commanding officer of Squadron VF 871, he was acquainted with all aspects of naval aviation. According to Commander R.W. Timbrell, Commanding Officer of St. Laurent, "there was sufficient space and strength to carry this smaller type [Bell HTL]. However, I do not consider the hatch presently fitted in St. Laurent strong enough to hold the heavier Sikorsky craft [S-55]".[25]

Within a month of landing a helicopter on board St. Laurent, Detachment No. 2 of Squadron HU-21 was conducting landing and take-off exercises for its new pilots on the newly commissioned icebreaker, HMCS Labrador, in Chedabucto Bay. It remains unclear

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[24] It would be erroneous to give sole credit for this idea to Lieutenant-Commander Ryan. Rather, credit for the concept must be shared with a number of individuals and institutions, going back as far as 1943. In that year, Lieutenant D.W. Overend, Staff Officer (Fuel) suggested that some of the frigates could be built as baby aircraft carriers to accommodate helicopters. Other important contributors included Commander Fraser-Harris, then Commander, Canadian Destroyers Far East, in HMCS Nootka, who was so impressed with the helicopter's abilities that he recommended to NSHQ, in 1951, that all warships larger than corvettes be equipped with flight decks. The following year, Captain W.M. Landymore, CO of Iroquois, after witnessing an A/S exercise, off the coast of Japan recommended that the RCN give serious consideration to operating helicopters from escorts. In 1955, the Naval Staff recommended that the Improved St. Laurent Class destroyers "must be capable of accepting and refuelling a helicopter". See, "Staff Requirements - Improved St. Laurent Class," 16 December 1955, Captain C.P Nixon, DTSD, to ACNS (W), DHist, 79/246. The concept of operating helicopters from small warships was evolutionary rather than revolutionary.

[25] HMCS St. Laurent, "Report of Proceedings for January 1956," 1926-365/1, dated 7 February 1956, Commander R.W. Timbrell, CO of St. Laurent to Flag Officer Atlantic Coast. DHist, 8000, HMCS St. Laurent II, (Report of Proceedings, 1955-1960). See also, HMCS St. Laurent, Ship's Log for the Month of January 1956, RG 24, vol. 9022, NAC. It will be remembered that in 1952, during the Korean War, two Sikorsky H-5 helicopters, one of which was carrying an injured soldier, landed on top of HMCS Sioux's squid handling room. This was the first time a helicopter landed on a Canadian destroyer.

what type of helicopter was used in these particular exercises.[26] At that time Detachment No. 2 consisted of one Bell HTL and one HUP-3 helicopter, and in all likelihood it was one of these aircraft that was used. Even though Sikorsky helicopters were available for these trials their size, and the dimensions of the landing platform on Labrador prevented them from being used.[27] It would not be long before Detachment No. 1 of Squadron HU-21 was conducting its own trials off a temporary flight deck rigged to HMCS St. Laurent. The utility squadron would play a significant role in testing the concept of operating helicopters from destroyers.

The winter months of 1956 proved to be very busy for both Squadrons HS-50, and VX-10. In February, Squadron VX-10 was engaged in the installation of equipment designed to improve HS-50's performance in A/S exercises. This included installing a flashing red light on the cabin roof of one S-55 helicopter to enhance identification by supporting ships and aircraft of a helicopter in sonar contact. In addition, all of the squadron's helicopters were

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[26] Squadron Reports, HU-21, "Report of Proceedings for Detachment No. 2, for the period 18-29 February 1956," 1926-408/1, dated 29 February 1956, Lieutenant-Commander Edward Fallen, Officer-in-Charge Detachment No.2, to the Commanding Officer HMCS Labrador, DHist, 1700-219/21-2, HU-21, (Report of Proceedings, 1955-1958). See also, Royal Canadian Navy Aviation Monthly State for February 1956, DHist 85/427. At that time Detachment No. 2 of the Helicopter Utility Squadron was embarked in HMCS Labrador. Following the one-day trial Labrador departed for a two week oceanographic and ice survey of the Gulf of St. Lawrence.

[27] It should be noted that the flight deck was smaller than D'Iberville's, being limited at the forward end by the positioning of a workshop and store space and at the after end by the requirements fo the towing apparatus. The position of deck houses was such that with one HUP helicopter stowed, limited landing space was available. HMCS Labrador was not outfitted with a hangar until 1955. Finally, Labrador could not accommodate a helicopter weighing over 10,000 pounds. The aircraft fuselage could not exceed 40 feet, possess a track-width of 12 feet, height of 13 feet six-inches, and have a rotor diameter over 42 feet. See, "Staff Requirements for Helicopters Operating from Icebreakers, 1954-1955," NSS 8885-408 (Staff), no date, RG 24 83-84/167, vol. 4024, file 8885-AW-50 vol. 1, NAC.

fitted with tail-rotor servo units, just one of the important components of the auto-pilot system. This was particularly important given the inherent difficulty of flying the early helicopters.[28]

For a considerable portion of March, the squadron was embarked in HMCS Magnificent, conducting A/S exercises while enroute to Trinidad. During the cruise, the squadron carried out control procedures, screening, and submarine tracking operations. Lieutenant-Commander Marlow was altogether satisfied with the squadron's performance during these exercises, noting that "the normal problems associated with control procedures and screening exercises were alleviated to some extent by the presence of a Squadron Liaison Officer in one or more of the participating ships". He was disturbed, however, about the fact "that a single submarine was allotted to the force [which] meant far less pinging time than was necessary for HS-50 to carry out a satisfactory training and evaluation programme".[29] The squadron continued to operate in the Caribbean area during April, but flying was limited because of the task force's operational schedule. What little time the squadron did have for

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[28] Squadron Reports, HS-50, "Report of Proceedings for February 1956," 1926-223/24, dated 5 March 1956, CO of HS-50 to the Commanding Officer, HMCS Magnificent, DHist, 1700-219/50, HS-50 (Report of Proceedings, 1955-1960).

[29] Squadron Report, HS-50, "Report of Proceedings for March 1956," 1926-223/24, dated 3 April, 1956, CO of HS-50 to the Commanding Officer, HMCS Magnificent, DHist, 1700-219/50, (Report of Proceedings, 1955-1960). Similar concerns were voiced by Commander R.W. Timbrell, CO of St. Laurent, who reported "the major drawback in the evaluation programme is one, common throughout the ASW navies - the lack of submarines. I have had it explained that the entire Operational Development Force, Atlantic, can expect only five submarines daily. Of these, Key West has three". See, HMCS St. Laurent, "Report of Proceedings for February 1956," 1926-365/1, dated 5 March 1956, CO of St. Laurent to Flag Officer Atlantic Coast, DHist, 8000, HMCS St. Laurent (II), (Reports of Proceedings, 1955-1960).

flying was maximized as more submarines were allocated to the exercises. This meant that the squadron's pilots and sonarmen could spend more time on station, tracking multiple targets.

Marlow's final report on the exercises remarked that during "screen re-orientings the helicopters proved valuable as a means of protecting the exposed flank while the surface screen was re-orienting....[30] He also noted that during the initial stages of the exercise, when surface ships were responsible for controlling helicopter operations, "it became apparent, particularly in those ships with older less adequate equipment, that positive control placed a very heavy load on the operations room staff". In later exercises, the helicopters assumed control of their own operations. "In this method the helicopters did their own navigation and station keeping, and the helicopter control ship only intervened to give corrective vectors if the helicopters moved more than 300 yards out of station".

Turning navigation and station keeping over to the helicopters, however, highlighted other problems, such as crew fatigue and the need for increased complements. This was especially true for the sonar operators. In order to achieve maximum endurance, only one sonar operator was embarked, but two were required to maintain maximum efficiency. According to the Squadron CO:

> [Two sonar operators] allows periodic relief and provides a plotter. At present, on getting a contact, the sonarman operates his gear, reports range and bearing to [the] pilot every two minutes, plots range and bearing on a plotting chart and keeps a timed

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[30] "An Interim Report on the Employment of HS-50 in Task Force 301 during the Period 1 March - 12 April 1956," NSS 1115-39 (Staff), 21 April 1956, Commodore E.P. Tisdall to Flag Officer Atlantic Coast, RG 24 83-84/167, vol. 11, file 1115-39 vols. 2 and 3, NAC. A summary of that report was presented to the Naval Staff, on 12 June 1956, by the then Deputy Director of Naval Aviation, Commander H.J. Hunter.

> narrative. Although this system worked the workload seems exorbitant. The opinion was advanced that interchange between pilot and sonar positions bordered on being essential.[31]

Marlow nevertheless found that "the results of helicopter self-control have been most gratifying and encouraging".[32] His overall conclusion was more enthusiastic still: "the inherent capabilities of the helicopter provide a most effective complement to those of the surface escort and the value of its presence in any anti-submarine force was considered to be beyond question".[33]

Senior naval officers in headquarters agreed with the findings of the report, and despatched a team of officers and an operational research scientist to Halifax immediately to collect more information.[34] In meetings on board HMCS Magnificent, on 10-11 May 1956,

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[31] Appendix B, "Some Details of Discussions with HS-50," in "An Interim Report on the Employment of HS-50 in Task Force 301 during the Period 1 March - 12 April 1956," NSS 1115-39 (Staff), 21 April 1956, Commodore E.P. Tisdall to Flag Officer Atlantic Coast, RG 24 83-84/167, vol. 11, file 1115-39 vol. 2, NAC. It was also pointed out that the dunking sonar should be lowered to at least 150 feet, and preferably 200 feet, in order to get below the first layer.

[32] Ibid. Problems with communications, led, in part, to the shift away from the helicopter control ship supervising all aspects of helicopter operations. According to Lieutenant-Commander Marlow "invariably the helicopters in a hover have been unable to maintain radio contact at ranges greater that 1-3 miles. As a result ships or other aircraft were forced to revert to broadcasting in the hope that the helicopters were able to receive. This inadequacy in communications has served to illustrate the need for helicopters to be capable of self-control".

[33] Ibid.

[34] The team consisted of the following individuals: Commander H.J. Hunter, Deputy Director of Naval Aviation; Lieutenant-Commander J.D. Lowe, Staff Officer (Helicopters); Lieutenant-Commander J.M. Steel, on the staff of DTASW, and Dr. E.L. Whitney, Directorate of Operational Research (Naval).

the team sought the views of the carrier's CO. Captain A.H.G. Storrs, the CO of Squadron HS-50, and the officers of several destroyers.[35]

Discussions on the first day about how A/S helicopters should be added into the carrier air groups emphasized stowage problems in the limited space of the light fleet carrier. Tactically, helicopters, with their ability to hover and make careful sonar sweeps, functioned much like warships -thoroughly scouring waters when hunting, or providing a sonar fence around a convoy when screening. To achieve the continuous and complete coverage needed to allow reductions in the number of warships in a hunting or screening group, however many machines were needed, at least eight and ideally as many as sixteen. That, however, would leave limited space for the fixed-wing A/S aircraft, which had the different, but equally important, role of providing coverage in depth, using their long-range and great speed to suppress or attack submarines approaching, shadowing or preparing to fire missiles from a distance. A sufficient, but less than optimal number of both helicopters and fixed-wing A/S aircraft would leave little or no space for the bulky Banshee fighters required for defence against enemy aircraft.[36]

According to Commander H.J. Hunter, Deputy Director of Naval Aviation and a member of the team from Ottawa, "opinion was unanimous and forceful that helicopters had proved themselves valuable, that they would become even more valuable, and that the navy

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[35] See, "Report of Visit to HMCS Magnificent and HS-50, 10-11 May 1956," NSS 1115-39 (Staff), 18 May 1956, Commander H.J. Hunter, Deputy Director of Naval Aviation to Director of Naval Aviation, RG 24 83-84/167, vol. 11, file 1115-39 vol. 2, NAC.

[36] Ibid. A survey of the figures reveals that the carrier would embark 22-28 aircraft depending upon what combination was used, and allowances were made for attrition.

should place far greater emphasis on the provision of ASW helicopters for the Fleet".[37] Hunter then turned to the destroyer captains and asked their opinion on the feasibility of operating helicopters from escorts. "The idea was received with some lack of enthusiasm, with all the obvious difficulties being brought out. In the end, however, they suggested that there was no other way to find out but to try it".[38] The Commanding Officer (Air), HMCS Magnificent, believed that "with the space limits of Bonaventure, she could well do with helicopters on the escorts in her screen".[39]

At this time St. Laurent, the innovative lead ship of Canada's new A/S fleet, was undergoing the final week of an important three-month evaluation with the USN's Surface Anti-Submarine Development Detection Unit (SADD), a unit of the Operational Development Force, Atlantic. In addition to exercises against fast conventional submarines, St. Laurent had a chance to track USS Nautilus, the world's first nuclear submarine. This particular A/S exercise showed the limitations of the existing surface warships in detecting and tracking nuclear submarines. USS Nautilus could sustain 23.3 knots indefinitely, and avoid making cavitation noise merely by going deep. Moreover, unlike conventional submarines nuclear-powered submarines did not have to surface to replenish their air supply. Anti-submarine

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[37] Ibid.

[38] Ibid.

[39] Ibid. From the available documents it is difficult to determine with any degree of certainty whether or not the Commanding Officer (Air) was concerned with the issue of fleet air defence, and was therefore hesitant to recommend embarking the helicopters, at the expense of the fighters.

warfare would never be the same.[40] Even though the St. Laurent was among the most advanced A/S ships in the world, its speed, and the range of its SQS-II sonar and weapons had been outstripped by the quantum leap forward in submarine technology.[41] It became clear that new weapon systems were required for the next generation of warships and that certain systems would have to be retro-fitted on the St. Laurent class destroyers.[42] To that end, additional tests using helicopters were scheduled for the spring of 1956.

On 3 May 1956, a helicopter from Squadron HU-21 landed and took off from the quarter deck of St. Laurent when the destroyer was in the peaceful confines of Halifax

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[40] Norman Friedman, Submarine Design and Development, (Annapolis: Naval Institute Press, 1984), pp. 71-82.

[41] See, "Evaluation of ASW Capabilities of St. Laurent," NSS 1680-50-OP/S372/ASW vol. 2, (Staff), dated 3 April 1957, Captain P.F.X. Russell, Director of Torpedo Anti-Submarine and Mine Warfare to Officer-in-Charge, Torpedo Anti-Submarine School, RG 24 83-84/167, vol. 3502, file 8000-DDH 205, vol. 2, NAC. See also, "Future Required Characteristics of Surface A/S Escorts," NSS 8000-DDE/SL (Staff), 4 October 1956, Captain C.P. Nixon, Director of Tactics and Staff Duties to Members of the Naval Warfare Study Group, RG 24 83-84/167, vol. 3497, file 8000-DDE/SL, NAC. Finally, see, "Staff Requirements - Improved St. Laurent Class," NSS 8885-365 (Staff), 16 December 1955, Captain C.P. Nixon, Director of Tactics and Staff Duties to ACNS (W), DHist 79/246, and; Appendix A, "Proposed Ships' Characteristics," in "A/S Vessels - Role, Mission and Tasks," NSS 8885-12 (Staff), 17 November 1958, DHist, 79/246, Project D-4.

[42] According to St. Laurent's CO, "in our trips South, we started to meet up with the nuclear submarines, and as you know, the nuclear boats enjoy unlimited speed, far in excess of what a surface ship could do.... So we started to put some thoughts together, and it was from here that we conceived the idea of embarking a helicopter". See, Transcript of Interview with Rear-Admiral Robert W. Timbrell, 2 November 1984, DHist, 90/292, "Navy 75", folder 12. On 24 April 1956, the Naval Staff proposed that consideration would be given to embarking a helicopter in St. Laurent. See, Minutes of the Naval Staff, 24 April 1956, DHist 1000-100/3.

harbour.[43] According to the Commanding Officer of the helicopter detachment (No. 1), "under ideal conditions in Bedford Basin, no difficulties were experienced". The results of the experiment confirmed Commander Timbrell's earlier opinion that "the helicopter [a Sikorsky S-55] could be carried in this class of ship, and usefully employed to investigate distant submarine contacts, and increase screen protection".[44] In July 1956, Lieutenant-Commander Ryan, Timbrell's executive officer, completed a detailed report for the Flag Officer Atlantic Coast on the operation of helicopters from St. Laurent class destroyers.

Certainly a number of technical matters had to be resolved. Lieutenant-Commander Ryan's list included the landing platform structure, airflow around the ships, the ship's movement in the water, aircraft stowage, fuel stowage and workshop facilities. He was optimistic. By redesigning the hatch covers of the A/S mortar to withstand the landing loads

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[43] Squadron HS-50 was unavailable for these tests as the squadron was then embarked in HMCS Magnificent, which was participating in the annual NATO exercise New Broom V. During that exercise the squadron logged 90 hours in 23 sorties. According to Lieutenant-Commander Marlow, only one submarine kill was awarded. However, "the small number of daylight attacks made on the convoy and her escorts proved that the aircraft justified their existence by keeping the submarines down and thereby restricting their manoeuvrability". During the exercise the squadron spent the bulk of its time conducting screening and helicopter control procedures. See, Squadron Reports, HS-50, "Report of Proceedings for May 1956," 1926-223/29, 4 June 1956, CO of Squadron HS-50 to the Commanding Officer, HMCS Magnificent, DHist, 1700-219/50, HS-50 (Report of Proceedings, 1955-1960).

[44] Squadron Reports, HU-21, "Report of Proceedings for May 1956," 25 June 1956, CO of Detachment No. 1, to the Commanding Officer, RCN Air Station, HMCS Shearwater, DHist, 1700-219/21, HU-21, Detachment No. 1, (Report of Proceedings, 1955-1960); HMCS St. Laurent, Ship's Log for May 1956, RG 24, vol. 9022, and; HMCS St. Laurent, "Report of Proceedings for May 1956," 1926-365/1, 4 June 1956, CO of St. Laurent to Flag Officer Atlantic Coast, DHist, 8000, HMCS St. Laurent II, (Reports of Proceedings, 1955-1960). According to Commander Timbrell complete arrangements had previously been made to ensure that there was ample clearance, strength of deck and good communications for landing the helicopter on the quarterdeck.

of the heavier S-58 helicopter, and eliminating the guardrails around the quarter deck, sufficient space could be created for landing a helicopter.[45] Nor did airflow around the ship seem to be an obstacle, because in the two landings that had taken place "neither pilot had any difficulty with turbulence".[46] Ryan was more concerned with the fact that "St. Laurent class vessels as presently equipped have a rather high rate of roll.... The tactical requirements for launchs [sic] may not allow enough time to alter the ship's course, and launch would be dangerous when nearly beam on to the swell".[47] Moreover, pitching and vertical movement might prevent flights on many occasions. Without further experience, however, "no accurate quantitative deductions can be made...."[48]

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[45] "Operation of Anti-Submarine Helicopters from St. Laurent Class Escorts in the North Atlantic." DST 8885-365/1, 16 July 1956, Lieutenant-Commander Pat Ryan to Flag Officer Atlantic Coast, and the Naval Secretary, RG 24 83-84/167, vol. 3827, file B260-11, NAC. This report was then passed to the following directorates: Directorate of Naval Aviation; Directorate of Tactics and Anti-Submarine Warfare, and the Naval Constructor-in-Chief (NCC). Constructing guardrails which were hinged, as opposed to fixed, would allow them to be lowered to the horizontal position thereby removing the obstacle, and at the same time provide a safety net for the crew. Other alterations included relocating the rocket flare launcher, inflatable life rafts, hawser reels, accommodation ladder, and sundry lockers. Finally, two mushroom vents would have to be redesigned to be less obtrusive. All calculations, including the structural requirements for the landing platform were based upon embarking the more modern, larger, and heavier Sikorsky HSS-1 (S-58) helicopter. Ryan suggested that the navy could use the S-55 helicopters for another three years, and then replace them with the S-58 machine.

[46] "Operation of Anti-Submarine Helicopters from St. Laurent Class Escorts in the North Atlantic." DST 8885-365/1, 16 July 1956, Lieutenant-Commander Pat Ryan to Flag Officer Atlantic Coast, and the Naval Secretary, RG 24 83-84/167, vol. 3827, file B260-11, NAC.

[47] Ibid.

[48] Ibid.

Ryan rather glossed over the problems of aircraft and fuel stowage, as well as workshop facilities. The destructive effects of weather on an embarked helicopter could be reduced by covering the machine with a nylon tarpaulin, and by erecting a small coaming to deflect the salt spray. "Protection from the sea is not a great handicap, because of the increased freeboard (16 feet) of these vessels. To-date, St. Laurent has experienced seas from every quarter including traversing a hurricane with wind gusts of 70 knots and 35 foot seas, and has not shipped green water".[49] These comments are somewhat curious especially considering that Ryan himself observed in the same report that one of the main handicaps to operating a helicopter from a destroyer was the incomplete protection from the weather. Even more surprising, he did not go beyond the clearly stop-gap proposal for a tarpaulin to discuss the possibility of constructing a hangar, the only effective means for stowing a ship-borne aircraft.

A further advantage of a hangar was that it would create a single convenient space for repair and other support facilities. By contrast, Ryan suggested the use of existing facilities spread throughout the ship. Similarly, he proposed using No. 6 salt water ballast tank for storing fuel, instead of building separate AVGAS facilities. Ryan may well have intentionally proposed jury-rigged short-term measures, for his paper was a call for early action. His conclusion that the St. Laurent's could embark helicopters with minimum expense and disruption in the equipment and design of these brand new ships ignored fundamental questions that could well have stalled or terminated the project.

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[49] Ibid.

Meanwhile the two helicopter squadrons, HS-50 and HU-21, kept up intense personal and unit training, and participated in more Canadian and NATO A/S exercises. During the course of those exercises, the squadrons continued to hone their skills in screening, search patterns, helicopter control procedures, improving communications with surface units, vectoring fixed-wing aircraft to the datum point, and launching and recovering dummy torpedoes. Despite important progress, both squadrons continued to suffer from a shortage of pilots and ground crew. Lieutenant-Commander Marlow noted in his monthly report for April 1956 that the work load shouldered by both aircrew and maintenance personnel was too great. This situation was alleviated somewhat at the end of June when additional pilots joined the squadron, bringing its strength to twelve, but this was still well below the authorized complement of eighteen pilots.[50]

In the twelve months since Squadron HS-50 had formed, it had played a crucial role both in the development of helicopter tactics, and in testing and evaluating the helicopter's capabilities for the ASW mission. Unfortunately, as autumn approached the squadron was temporarily relieved of its primary responsibilities, and the helicopters stripped of their sonar equipment to carry out the ignominious role of ferrying men and equipment to sites along the Labrador section of the Mid-Canada Line. Although the squadron was not able to contribute to the next phase of helicopter trials, it would make its presence felt in the near future. In the interim, responsibility for carrying out the next set of trials fell to the Helicopter Utility Squadron.

[50] See, Memorandum, "RCN Helicopter Situation as of 18 May 1956," NSS 1115-35 (Staff), 22 May 1956, Captain G.C. Edwards, Director of Naval Aviation to ACNS (Air), in RG 24 83-84/167, vol. 11, file 1115-35, NAC.

The early achievements of the A/S experimental squadron were crucial to building momentum within the navy to integrate the helicopter into the fleet as a primary weapon system. Larger events, however, accounted for the very existence of the unit. The navy had to innovate. Diminishing budgets ruled out another round of fleet expansion despite the emergence of the nuclear-powered, missile firing submarine which threatened to render the fleet obsolete. The priority the navy had given to aviation since the latter part of the Second World War, and the care with which it had monitored aviation developments in allied navies, had meanwhile provided the information and expertise to pursue an aviation solution to the services' problem, and had created the constituency within the navy to support it. Lieutenant-Commander Ryan was himself a product of the navy's dozen years of commitment to aviation. Within six weeks of the submission of his report on helicopter operations from destroyers, plans were underway to conduct a thorough investigation, sponsored by Commander Operational Evaluation (COMOPVAL).

CHAPTER SEVEN

TESTING A BETTER MOUSETRAP?:

HMCS BUCKINGHAM AND SQUADRON HU-21

As early as 13 January 1956, Captain C.P. Nixon, Director of Tactics and Staff Duties (DTSD), called for the fitting of a helicopter platform on a frigate. He was concerned about the inability of existing escorts to counter nuclear submarines, and pointed out that the draft requirements for the Improved Restigouche class approved by the Naval Board called for facilities to land and service a helicopter. "This gives recognition to helicopters being an essential partner in the ASW team; there is, in fact, no question that an escort with its own helicopter would be a far more efficient anti-submarine vessel".[1] Because of Bonaventure's numerous commitments, the RCN would have limited opportunities to develop helicopter tactics; it made perfect sense to install an "experimental helicopter landing platform in an Atlantic Command frigate now fitting, and to have this ship allocated to helicopter sea trials"[2]

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[1] Memorandum "Helicopters in Escorts," NSS 1115-39 (Staff), 13 January 1956, Captain C.P. Nixon, Director of Tactics and Staff Duties to ACNS (A), ACNS (W), and VCNS, RG 24 83-84/167, Box 3827, file S-8260-11 vol. 1, NAC.

[2] Ibid.

Commodore R. Baker, Naval Constructor-in-Chief (NCC), believed that "a platform could be fitted to the stem of a frigate without interfering with any existing function".[3] Baker added that "no arrangements are made for fuelling or anything else but landing and hopping off. In NCC's view these operations would seem quite practicable".[4] Little discussion ensued, because there was already wide-spread support among most members of the Naval Staff for this project, and the Staff recommended that the Naval Board approve the plan.[5]

At the Naval Board on 15 February Commodore Harold P. Sears, another RN officer on loan who had succeeded Commodore Brown as ACNS (Air), explained that the arrangements were minimal and inexpensive:

> there will be no requirement for helicopter maintenance or refuelling facilities in the trials frigate. If the operation of helicopters from small ships is proven to be practical

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[3] Memorandum, "Helicopter - Frigate Feasibility Tests," NS 1115-39, 20 January 1956, Commodore R. Baker, Naval Constructor-in-Chief to ACNS (A), RG 24 83-84/167, vol. 11, file 1115-39 vol. 2, NAC. It is important to note that Commodore Baker was responsible for designing the St. Laurent class destroyers, and would play a role in converting them to carry helicopters. Commodore Baker, on loan from the Royal Corps of Naval Constructors, served with the RCN from July 1948 until June 1956. For a detailed discussion of Baker's role in designing the St. Laurent class destroyers see, S. Mathwin Davis, "The St. Laurent Decision: Genesis of a Canadian Fleet," in The RCN in Transition, 1910-1985, (ed.) W.A.B. Douglas, (Vancouver: UBC Press, 1988), pp. 187-208.

[4] Ibid. Interestingly Commodore Baker noted in his memorandum that "a similar platform could be fitted in a destroyer (not Crusader).

[5] In early February Rear-Admiral H.N. Lay, VCNS, recommended, and Vice-Admiral H.G. DeWolf, Chief of Naval Staff, approved that the matter be reviewed by the Naval Board. Admiral H.G. DeWolf was also a long-time supporter of naval aviation. In 1943, Acting-Captains DeWolf, Director of Plans, and Acting-Captain Lay, Director of Operations, wrote a joint memorandum which recommended the creation of the Royal Canadian Naval Air Service. Both officers were instrumental in the founding of the RCN's fleet air arm. See, Shawn Cafferky, "Towards the Balanced Fleet: A History of the Royal Canadian Naval Air Service, 1943-1945, (Victoria: University of Victoria, Unpublished M.A. Thesis, 1989), pp. 90-100.

> there will be a requirement for refuelling, re-arming and some maintenance for helicopters in the Improved Restigouche class, the full extent of which will be thoroughly investigated after completion of the frigate trials.[6]

Sears then turned his attention to the technical issues in the upcoming trials, such as securing the helicopter to the platform when operations were conducted in rough weather. He described some of the devices that the RN were currently testing, but noted that these were in the preliminary stages, and that no firm recommendation could be made. It was one of the many things to be investigated during the trials.[7] In the end, the Board decided that the refit of the frigate would take place in September 1956, in order not to interfere with the fleet's summer training programme.[8]

Unlike the helicopter platform fitted to HMCS St. Laurent - a plywood deck fitted over the aluminum mortar well hatch, and shored-up from below with heavy timbers - this platform was all-steel, supported by stanchions, and welded to the quarter deck of Buckingham. On 23 August 1956, the quarter deck was prepared by reinforcing the structure and fitting the centre line stanchions that would support the flight deck. This job was completed on the 24th, and three days later the flight deck was landed on the ship for

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[6] Minutes of the 477th Meeting of the Naval Board, 15 February 1956, DHist 1000-100/2, and; Extract of Naval Board Minute, 15 February 1956, RG 24 83-84/167, Box 3827, file S-8260-11 vol. 1, NAC.

[7] Ibid.

[8] Commodore Duncan L. Raymond, ACNS (Plans), suggested that HMCS Outremont be designated as the trials ship. A subsequent investigation by Raymond revealed that Outremont's numerous commitments, during the summer, precluded her from being selected. Consequently, HMCS Buckingham was chosen as the trials ship.

installation, a task that took some three weeks' work.[9] At 0800 hours, on 13 September 1956, Buckingham, sporting the completed platform, slipped and proceeded to Bedford Basin, with Rear-Admiral R.E.S. Bidwell, Flag Officer Atlantic Coast, embarked, to commence a rigorous programme of helicopter trials.

Preparation of the schedule and activities had been underway for months. On 28 May 1956, Captain G.C. Edwards, Director of Naval Aviation, submitted a formal request for operational evaluation of the feasibility of flying S-55 helicopters from Buckingham, and that the Operational Evaluation Organization (OEPC) assign the project to COMOPVAL. According to Edwards, the object of the test was to determine the feasibility of landing and taking off, maintaining, and operating and controlling an S-55 helicopter from HMCS Buckingham in various sea states, weather and wind conditions. "The trials should be conducted in the most unfavourable conditions of sea state, weather and wind that can be safely accepted".[10] In addition, Captain Edwards sought approval to conduct "simultaneous

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[9] Commodore J. MacGillivray, (E), to Flag Officer Atlantic Coast, and the Naval Secretary, CSAC 8000-381/44, 10 October 1956, RG 24 83-84/167, Box 3827, file S-8260-11 vol. 1, NAC, and; HMCS Buckingham, Report of Proceedings for August and September 1956, 1926-381/44, 11 September 1956, and 11 October 1956 respectively, RG 24, vol. 11,380, file 1926-381/44 vol. 1, NAC. A total of 854.25 man hours - based on an eight hour day - were spent on the alterations and additions. The breakdown of the work was a follows: fabrication work - 500 hours; preparation and fitting - 100 hours; internal strengthening - 60 hours, and; fitting platform to the quarter deck - 194.5 hours. In addition, 43 man days were spent on painting, while 95 were required to complete work on the safety nets and staging.

[10] Memorandum "Formal Request for Operational Evaluation of the Feasibility of Operating HO4S Helicopters from HMCS Buckingham." NSS 8260-11 (Staff), and NSC 1680-50 (Staff), 28 May 1956, Captain G.C. Edwards, Director of Naval Aviation, to DTSD, RG 24 83-84/167, Box 3827, file S-8260-11 vol. 1, NAC. Edwards wanted Squadron HU-21 to furnish the aircrew, maintenance personnel and helicopter, and wanted Commander J.D. Lowe, Deputy Director of Naval Aviation to be the project officer.

motion measurements of Buckingham and St. Laurent. Comparative data should be of value in assessing St. Laurent as a helicopter platform".[11] This was beyond the scope of the original evaluation, and required scientific support. Accordingly, the Naval Staff arranged for the Naval Research Establishment (NRE) to take over this portion of the trials.[12]

By the end of July, the scope of the programme had expanded once again. Because of the helicopter's limited range, the trials were originally to have been conducted within thirty miles of the naval air station. Rear-Admiral H.L. Quinn, Chief of Staff to Flag Officer Atlantic Coast, objected that "this distance restriction will limit the sea and swell conditions under which tests may be carried out due to the normally short duration of winds blowing from directions with unrestricted fetch. In order to carry out operations under typical mid-

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[11] Ibid.

[12] See, Captain G.C. Edwards, DNA, to DTSD, NSS 8260-11 (Staff), 29 June 1956, RG 24 83-84/167, Box 3827, file S-8260-11 vol. 1, NAC. See also correspondence between the Chief Superintendent, Naval Research Establishment and the Scientific Advisor to Chief of the Naval Staff, 3-3-0, 8 May 1956, RG 24 83-84/167, Box 3827, file S-8260-11 vol. 1, NAC. In that letter the Chief Superintendent noted that he had discussed the matter with the Engineering Development Section and could confirm that "NRE could undertake a limited amount of comparative measurements... although the project could not be tackled with thoroughness on a quantitative basis. [Moreover], it may not be possible to extrapolate the comparative measurements to cover a wide variety of sea and wind conditions with any assurance". These problems would lead to additional tests, beyond those scheduled for Buckingham, as we shall see later. On 1 January 1948, the RCN turned the NRE over to the Defence Research Board (DRB). The Naval Research Division at the DRB and the RCN's Scientific Research and Development section was staffed by the same personnel, with the Board acting as the employing agency. The naval portion of the defence research vote was administered by the DSS through normal navy channels while the finances of the NRE and the headquarters staff was administered by the DRB. For a detailed discussion of operational research and the RCN's relationship with the DRB during this period see, D.J. Goodspeed, A History of the Defence Research Board of Canada, (Ottawa: Queen's Printer, 1958), chs. 7, 11, and 14.

ocean conditions it is desired to extend trials to seaward for prolonged periods".[13] To carry out the simultaneous motion trials in the mid-Atlantic, it was necessary to employ either HMC Ships Magnificent or Labrador to act as an alternate landing facility.

While the various directorates and commands struggled to keep up with the ever expanding parameters of the trials, certain details were beginning to crystallize. By 27 July 1956, Lieutenant-Commander K.L. Gibbs, on the staff of Director of Naval Aviation as Staff Officer (Helicopters) was appointed Liaison Officer, and the following month Lieutenant-Commander R.V. Bays, Commanding Officer, Squadron HU-21, was appointed the Project Officer.[14] Detachment No. 3 formed on 10 September, with Lieutenant-Commander Bays and Lieutenant-Commander G.J. Laurie, pilots who had trained with and served in USN ASW

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[13] See, "COMOPVAL Project Staff/SE 18 Helicopter Platform - HMCS Buckingham," ACC: 1680-50 Staff/SE 18, 4 July 1956, Rear-Admiral H.L. Quinn to the Commanding Officer HMCS Cornwallis, RG 24 83-84/167, Box 490, file 1680-50-Staff/SE 18, NAC.

[14] See, "Formal Request for Operational Evaluation of the Feasibility of Operating Anti-Submarine Helicopters from Escort type Ships," NSC 1680-50 Staff/SE 18, 27 July 1956, RG 24 83-84/167, Box 490, file 1680-50 Staff/SE 18, NAC, and; Lieutenant-Commander, Commander Operational Evaluation Organization to the Commanding Officer, HMCS Shearwater, OEOHC 1680-50 Staff/SE 18, 31 August 1956, RG 24 83-84/167, Box 3827, file S-8260-11 vol. 1, NAC. Rodney Victor Bays was born on 24 May 1924, in Kenora, Ontario. In 1943, he enrolled in the Royal Canadian Air Force Special Reserve as an aircraftsman 2nd Class. In 1944, he won his wings, and by the end of the Second World War had reached the rank of flying officer. In April 1945, he transferred to the Royal Canadian Naval Volunteer Reserve as Sub-Lieutenant (P). He transferred to the regular navy in 1947, as Lieutenant. That same year he was posted to the 18th Carrier Air Group as a pilot in Squadron 883. In 1949, he was serving in Squadron 743. In 1950, he was posted to Naval Headquarters as the Assistant Staff Officer Air Personnel. The following year he volunteered for helicopter pilot training, and was sent to USNAS Pensacola, Florida, for training, in 1953. After completing his training he served with Helicopter Squadron Two (HU-2) in USS Siboney, a light-fleet aircraft carrier, for Operation Mariner. In 1954, Lieutenant-Commander Bays was posted to VH-21, as Senior Pilot. Two years later he was the Commanding Officer of HU-21, in HMCS Magnificent.

helicopter squadrons, nine maintenance personnel, one S-55 helicopter, and ancillary equipment.[15]

Under the final schedule, the helicopter would operate from HMCS Shearwater to a maximum range of thirty miles. Following the introductory trials, tests were planned under increasing sea states and wind until the maximum acceptable degree of pitch and role was ascertained. In addition, three days were scheduled to conduct mid-ocean trials with Magnificent. The trials consisted of seven distinct tests: ALFA, BRAVO, CHARLIE, DELTA, ECHO, FOXTROT, and GOLF. The first, a familiarization trial for both squadron personnel and Buckingham's crew, was to include marking the flight deck for helicopter operations, landings and take-offs, deck handling, and examination of stowage requirements.

In the next four tests (BRAVO, CHARLIE, DELTA, and ECHO), more time was to be spent on landings and take-offs, "including engaging, disengaging and securing the rotor blades in sea states varying from 0 to the maximum considered feasible and advisable". In

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[15] See, "Operation Order #22/56," PA 1680-50 Staff/SE 18, 25 August 1956, RG 24 83-84/167, Box 490, file 1680-50 Staff/SE 18, NAC, and; HMCS Buckingham, "Report of Proceedings for September 1956," 1 October 1956, Lieutenant-Commander R.V. Bays, Commanding Officer HU-21, to the Commanding Officer, RCN Air Station, HMCS Shearwater, RG 24, vol. 11,380, file 1926-381/44 vol. 1, NAC. John Greenwood Laurie a pilot with the RCAF transferred to the Royal Naval Volunteer Reserve in 1946. In 1947, he transferred, on a short service appointment, to the RCN. Lieutenant Laurie was among the second group of Canadian naval pilots, sent in 1951, to receive their helicopter pilot training at USNAS Pensacola, Florida. By 1955, Lieutenant-Commander Laurie was serving with Squadron HU-21, in HMCS Labrador. The following year he was posted back to Shearwater for duty with HU-21, as Senior Pilot. Following Lieutenant-Commander Bays stint with Detachment 14 of Helicopter Squadron Two (HU-2) of the USN in 1953, the Commanding Officer wrote: "Lieutenant-Commander Bays is considered an excellent naval officer. He has exhibited a great deal of enthusiasm in rotary-wing aircraft and in the operational and maintenance procedures employed at this activity. His efforts to increase his knowledge have been outstanding".

addition, certain operating parameters were imposed upon these particular tests. During the landings and take-offs, "the relative wind must be placed at about 30° degrees on the port bow. While undertaking the engaging, disengaging and securing of the blades, the ship must turn out of the wind so as to decrease the relative wind over the deck to less than 20 knots".[16] Test FOXTROT, like the previous tests, focused almost exclusively upon take-offs and landings, but with further modifications.

Squadron HU-21 was to embark in both Buckingham and Magnificent for the mid-ocean portion of the trials. "After each landing the helicopter will be stopped, a simulated fuelling made, shifted to a new spot on the deck and flown off".[17] The final test in the series (GOLF), was designed to ascertain the ship's ability to home the helicopter in the event of poor weather and reduced visibility. The project team "hoped that optimum procedures for homing the helicopter [would] be developed as a result of the frequent carrying out of this test".[18] Throughout these tests the Project Officer, Lieutenant-Commander Bays, was to make detailed notes paying particular attention to landings and take-offs (including estimates of roll and pitch during these operations), engaging, disengaging and securing the rotor blades, deck handling, personnel, maintenance and stowage requirements, fuelling arrangements, weather conditions and sea states, and finally, the ship's ability to control

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[16] "Project Plan - COMOPVAL Project Staff/SE 18: Operation of Anti-Submarine Helicopters from Escort Type Ship," 27 August 1956, Prepared by Commander, Operational Evaluation Organization, RG 24 83-84/167, Box 490, file 1680-50-Staff/SE 18, NAC. In each of the tests the team planned to make 6-10 take-offs and landings. After a few landings the aircraft was to be secured and moved about the deck.

[17] Ibid.

[18] Ibid.

helicopter operations. After each test, the Project Officer was required to despatch a message to COMOPVAL indicating the progress made to date. A photographer was drafted to the ship to record salient events and details with still photographs and movies.

During the first phase of the trials (ALPHA, BRAVO, CHARLIE, DELTA and ECHO), from 13 September to 11 October, the squadron logged more than 20 hours, and made 93 landings under conditions ranging from ideal to very marginal.[19] During this portion of the trials, the helicopter was never more than thirty miles from the naval air station, as Buckingham conducted trials in the approaches to Halifax harbour, St. Margaret's Bay and Bedford Basin. Despite the relative security from the elements, the helicopter suffered a number of mechanical problems, and began to show signs of corrosion, despite the fact that the aircraft was disembarked and flown to Shearwater at the end of every day.[20] Following the completion of the first phase of the trials the frigate returned to harbour for a brief respite in order to carry out various repairs.

On 29 October Buckingham, St. Laurent, and the carrier Magnificent departed for a three-day mid-ocean trial (FOXTROT). This was a continuation of the previous tests, but would give the navy a chance to evaluate both the ship and the aircraft's ability to operate in

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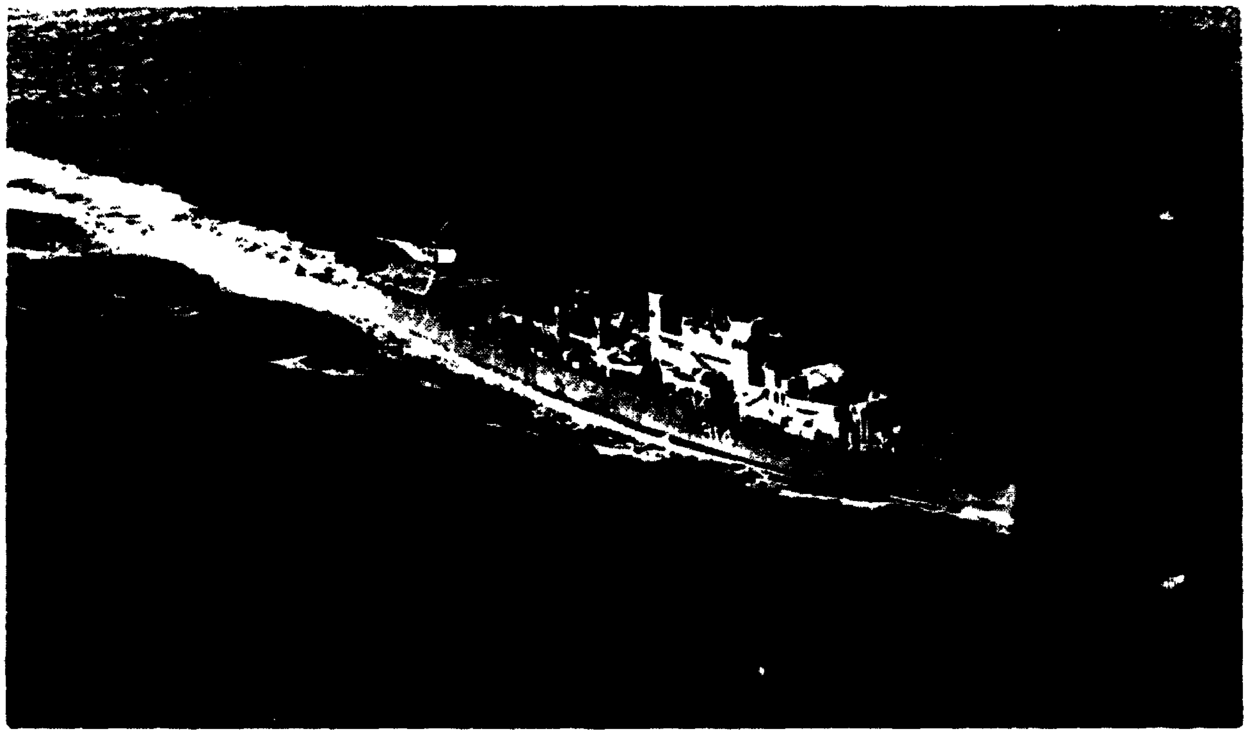
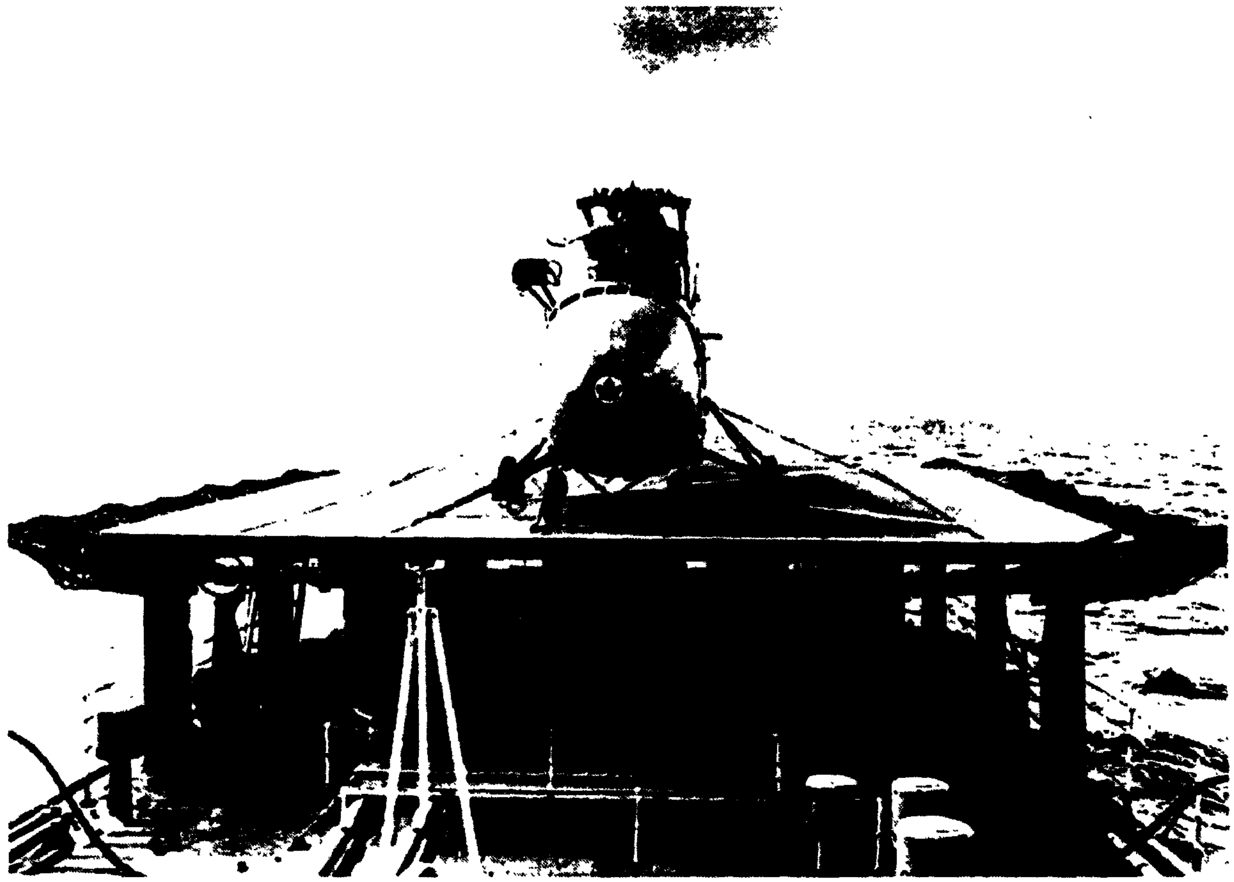
[19] During the trials the weather conditions ranged from winds of 0-40 knots, with the frigate pitching anywhere from 0-12 feet. The degree of roll ranged from O-4° degrees. See, HMCS Buckingham, "Report of Proceedings for September and October 1956," 1926-381/44, 11 October 1956 and 1 November 1956, RG 24, vol. 11,380, file 1926-381/44 vol. 1, NAC, and: "Final Report on COMOPVAL Project Staff/SE 18," prepared by Commander, Operational Evaluation Organization, 1 February 1957, RG 24 83-84/167, Box 3827, file S-8260-11 vol. 2, NAC.

[20] From 13 September to 15 November 1956 the aircraft only spent four nights on board Buckingham.



Sikorsky S-55 helicopter landing on board the frigate HMCS Buckingham in the fall of 1956. (Public Archives of Canada, hereafter PA-133127)

The Landing Signals Officer (LSO) directing a Sikorsky S-55 helicopter to the flight deck of HMCS Buckingham. Note the aircraft handlers around the platform, ready to secure the aircraft to the deck, immediately upon touch-down. (PA C-142768)

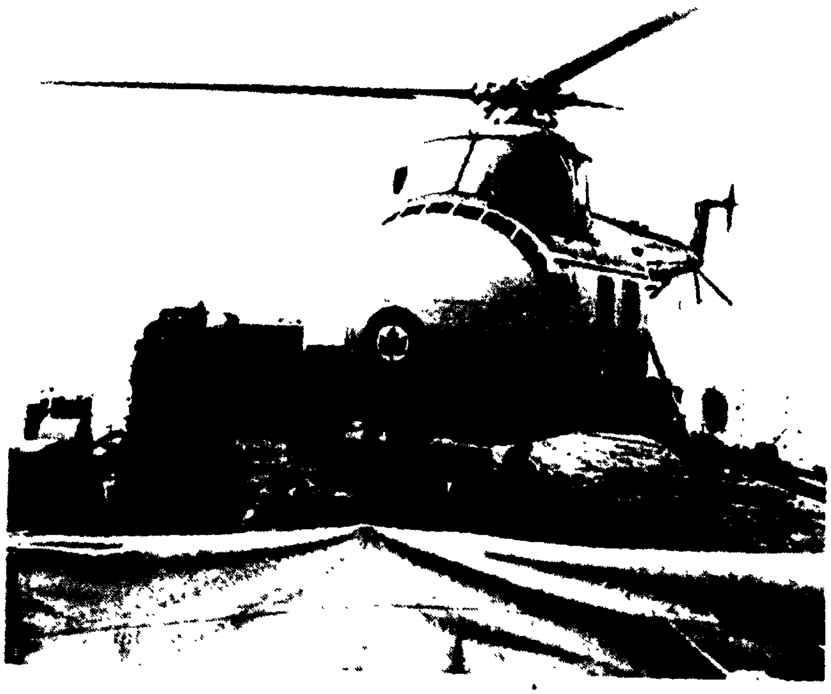


Sikorsky S-55 helicopter firmly lashed down to Buckingham's temporary flight deck. (PA-193229)

Sikorsky S-55 helicopter conducting sonar dips during seaward defence exercise. Note the external Mk. 43 torpedo. (Department of National Defence, DNS 24078)

Temporary shoring under the after mortar well of HMCS St. Laurent. (PA C-142784)

Sikorsky S-55 helicopter about to land aboard HMCS St. Laurent, during the Buckingham trials. (PA C-142788)



Sikorsky S-55 helicopter just after it has touched down on St. Laurent's temporary flight deck. Note the small dimensions of the flight deck. During take-offs or landings there was little room for pilot error. (PA C-142795) the severe weather conditions frequently encountered in the north Atlantic. During this phase of the trials NRE began preliminary comparative motion trials of the frigate and destroyer. The navy also hoped to run the GOLF test during the three-day trial, but had to cancel it because of the poor performance of Buckingham's air warning radar. The mid-ocean phase of the trials were not as successful as the navy would have liked because of inclement weather and poor visibility; on the second day, flying operations had to be cancelled because of a storm. Having said that, the helicopter made a total of 47 landings, sometimes under marginal conditions. The frigate returned to Halifax at the end of October, and for much of November carried out additional local exercises.

On 28 November Buckingham - with a replacement helicopter on board - in company with St. Laurent departed Halifax for Bermuda. For the next two weeks, the NRE conducted detailed comparative motion trials of the two ships, while the squadron's pilots practised additional landings and take-offs from both Buckingham and St. Laurent.[21] During the two week period, the HO4S-2 helicopter only managed ten landings: the aircraft proved to be grossly underpowered, especially for the conditions it encountered.[22] Analysis of the three

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[21] The S-55 helicopter had to be disembarked because of continuing mechanical problems and corrosion. During the mid-ocean phase of the trials the helicopter was embarked in the carrier. During the flying operations the helicopter operated from the frigate, the carrier, and from a temporary platform rigged over St. Laurent's mortar well. From 13 September to 12 December, 175 successful landings - with only 15 wave-offs - were carried out in weather conditions ranging from very good to very marginal. It is important to note that prior to the Buckingham trials all tactical evaluations had been conducted while the helicopter was embarked in the carrier.

[22] The Sikorsky HO4S-2, an earlier version of the S-55 helicopter, was rated at 550 horsepower, while the S-55 was rated at 800 horsepower.

month long experiment highlighted a number of difficulties which had to be addressed if the navy was to operate large ASW helicopters from small warships.

Chief among those concerns was the inability of the aircraft handlers to secure the aircraft quickly once it landed on the deck to prevent it from overturning. Failure to develop rapid securing methods would, warned Lieutenant-Commander C.J. Benoit, Commander of the Operational Evaluation Organization, threaten the entire programme. "The question of an instantaneous securing arrangement as the helicopter makes contact with the deck, requires investigation, as success in this whole programme may greatly depend on overcoming the danger to the aircraft and personnel during these few precarious seconds".[23]

From the pilot's perspective, the most dangerous time during any landing was immediately following touch-down, when the ship experienced lateral displacement. This motion was made up of two distinct movements - yaw and roll. Yaw was the failure to hold a straight course because of steering conditions or inadequate skill on the part of the helmsman. The degree of roll was dependent upon a number of factors, such as wind and sea conditions, relative course to the swell, state of loading, the design of the ship and the height of the platform surface. Taken together, these conditions could produce a perilous situation

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[23] "Final Report on COMOPVAL Project Staff/SE 18," 1 February 1957, Lieutenant-Commander C.J. Benoit, Commander, Operational Evaluation Organization, RG 24 83-84/167, Box 3827, file S-8260-11 vol. 2, NAC. Aircraft handling problems were also partially attributable to the unsuitability of the landing gear arrangement in the S-55 helicopter because the nose wheel tread was insufficient to give the required stability. The aircraft's high centre of gravity only added to the problems as it had a tendency to fall towards either bow. Benoit forcefully argued that the S-55 helicopter was entirely inadequate for A/S operations from an escort vessel except under limited weather conditions, and called for the acquisition of the Sikorsky HSS-1 (S-58) aircraft which possessed a lower centre of gravity, and a wider undercarriage. Acquisition of this machine would ensure that useful data was collected in any subsequent trials.

for both the pilots and the aircraft handlers. Other movements of the ship, namely pitch and vertical acceleration, also had to be considered.

The latter presented a problem only in so far as the structural strength of the helicopter was concerned.[24] Vertical acceleration of a ship is the lifting of the entire ship, fore and aft. When a descending aircraft and a ship that is rising collide, the vertical acceleration of the ship is transferred to the helicopter at the point of contact with the deck. The coming together of the ship and the helicopter creates G-forces which can be extreme. The mass of a light fleet aircraft carrier is ten times that of a frigate, and it is therefore a much more stable platform, less liable than a frigate to bob up and down in a swell.[25]

Despite the fact that a St. Laurent class destroyer had a higher rate of roll than a frigate, the comparative motion experiments, conducted during the second stage of the mid-ocean trials, showed that helicopter operations were possible.[26] The Commander of the

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[24] A helicopter slamming onto the flight deck was likely to damage a number of components, not the least of which included broken or bent oleos (struts), and punctured tires. This was attributed, in part, to the S-55's weak undercarriage. The Sikorsky helicopter was designed for operation from land and though it had been modified for use at sea, it suffered from the usual shortcomings of such adaptations.

[25] HMC Ship Magnificent was light-fleet aircraft carrier with the following specifications: displacement - 18,000 tons full load; length overall - 694' 3"; beam - 80 feet; draught - 23 feet; speed - 25 knots, and; breadth of flight-deck - 112' 5". Compare these specifications to HMCS Buckingham: displacement - 2,360 tons full load; length overall - 301' 6"; beam 36' 7"; speed - 19 knots, and; breadth of flight-deck - 34 feet. See, J.D.F. Kealy and E.C. Russell, A History of Canadian Naval Aviation, Appendix F, p. 138; Ken Macpherson and John Burgess, The Ships of Canada's Naval Forces, 1910-1981, Appendix 7, p. 210, and; "Brief History of HMCS Buckingham," Naval Historical Section, 24 October 1957, RG 24 83-84/167, vol. 3504, file 8000-DE 314, NAC.

[26] For a detailed discussion of the comparative motion trials see, "Comparative Ship Motion Trials: HMCS St. Laurent and HMCS Buckingham," PHx-104, December 1956, prepared by the Naval Research Establishment, Defence Research Board, DHist 93/110 Item

Operational Evaluation Organization firmly believed that "while it may present certain difficulties it should be offset to some degree by the provision of a more stable helicopter and the additional topweight of the platform".[27] Moreover, although the helicopter platform would interfere with the operation of Limbo "it appear[ed] that the advantages to be gained from the helicopter will outweigh the disadvantages from such a fire arc reduction".[28] The siting of the helicopter platform in a St. Laurent class destroyer presented some difficulties. Adding a hangar would only exacerbate the problem.

Although the Buckingham trials were the first extensive trials in the operation of helicopters from such a small vessel, the central problem of rapid securing had been anticipated, and development work was already underway. It was the Royal Navy that had had the most experience in operating manned helicopters from the smaller types of warships, but the British trials were somewhat episodic. Still, the RN help provide context to Canadian approaches to rapid securing.

British interest in the helicopter, it will be remembered, dated back to the Second World War. In 1943, the RN was exploring the idea of operating rotary-wing aircraft from merchant ships, but by 1946 had abandoned that concept. In that same year, Lieutenant Alan

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080. The trials were carried out locally and while enroute to Bermuda, from 28 November until 12 December 1956. This project was undertaken by personnel of the Hydrofoil Group. The Group Leader, L.J. Payzant was responsible for the direction and conduct of the trials. E.A. Jones oversaw the design, assembly and maintenance of all instruments, while Mr. M.C. Eames was responsible for analyzing the data.

[27] See, "Final Report of COMOPVAL Project Staff/SE 18," 1 February 1957, RG 24 83-84/167, Box 3827, file S-8260-11 vol. 2, NAC.

[28] Ibid. Benoit suggested that for the next set of trials a reduction of 180° degrees in the Limbo arc of fire was acceptable.

Bristow, RN, carried out flying trials in the River Class frigate HMS Helmsdale. The experiment was deemed a failure because of the unsatisfactory performance of the Sikorsky R-4B, and the trials were put on hold.

By the early 1950's A/S exercises in the Mediterranean had clearly demonstrated a need for helicopters to assist in the detection and tracking of submarines, especially during the summer months when asdic conditions were poor. In early 1951, the Flag Officer Flotillas, Mediterranean, struck a committee to investigate the operation of helicopters from a Loch class frigate and the cruiser HMS Surprise. The committee concluded, without the benefit of trials, that with minor modifications to the ship a helicopter, in this case a Westland Sikorsky S-51 Dragonfly, could be operated from a temporary platform fitted over the quarter deck.[29] For helicopter operations and aircraft handling, the committee relied upon the advice of two pilots from the USN, since there were no qualified British pilots on the station during the investigation. The American pilots stressed the great danger to both aircraft and handling party of attaching any securing lines until the aircraft was firmly on the deck. To avoid

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[29] The Flag Officer Flotillas, Mediterranean, to the Commander-in-Chief, Mediterranean Station, 18 December 1951, ADM 1/23064, and; "Investigation FAIR COP" 14 December 1951, Lieutenant-Commander Russell (E), to the Office of the Flag Officer Flotillas, Mediterranean, ADM 1/23064. Mr. C.J. Stunden, of the Constructive Department, HM Dockyard, Malta, was responsible for the technical aspects of the report. Trials, with either a frigate or HMS Surprise, were delayed for a number of reasons including a shortage of helicopters. Moreover, the Director of Naval Air Warfare believed that there was too much movement on a Loch class frigate to operate an S-51 helicopter efficiently, and therefore it made little sense to conduct trials. These stability problems forced the RN abandon their plans, albeit temporarily, to operate helicopters from frigates. The Royal Navy now planned to operate the larger and more modern S-58 A/S helicopters from cruisers. See, Minute Sheet, 16 February 1952, Director of Naval Air Warfare, in ADM 1/23064. The committee concluded that HMS Surprise was unsuitable for conversion because of stability problems. However, by 1959 she embarked, and was operating four S-58 helicopters for A/S exercises.

potential disaster, the USN pilots suggested to the British that they follow a set routine: land with wheel brakes locked, place wheel chokes, stop the engine and brake the rotors, and finally hook on the securing lines. The British, and later the Canadians, were adamant, however, that the tie-downs should be secured first and then the wheel chokes placed into their proper position.[30] Nevertheless, this was really only a stop-gap measure.

The Royal Navy began experiments with a rapid securing device as early as 1948. In that year, Lieutenant-Commander Sproule, RN, submitted an idea to the Admiralty, supported by sketches, to fit four interconnected sucker pads to a helicopter's undercarriage. These were to be powered by an engine-driven vacuum pump controlled by a valve which the pilot operated to release the helicopter from the flight deck. Nothing came of this idea at the time, but it would resurface years later.[31] By 1955, Sproule, commanding the Search and Rescue (SAR) Flight at the Royal Naval Air Station (RNAS) Ford, had created an even more ingenious device for securing helicopters to a flight deck - a harpoon-grid system.

In this system, a barbed harpoon attached to the helicopter engaged a grid suspended six inches above the deck. Upon landing, the harpoon shaped probe on the underside of the aircraft penetrated the mesh, and the flukes on the probe attached themselves to the wires.

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[30] The American pilot's opinion was based upon helicopters operating from aircraft carriers, and not from the small pitching and rolling flight deck of either a frigate or destroyer. See, "Investigation Fair COP," 14 December 1951, Lieutenant-Commander Russell (E), to Flag Officer Flotillas, Mediterranean, ADM 1/23064, and; "Final Report on COMOPVAL Project Staff/SE 18," 1 February 1957, Lieutenant-Commander C.J. Benoit, Commander, Operational Evaluation Organization, RG 24 83-84/167, Box 3827, file S-8260-11 vol. 2, NAC.

[31] Captain L.B. Bryson et al, "Helicopters in the Royal Navy," The Aeronautical Journal, (vol. 76, no. 740, August 1972), p. 475.

securing the aircraft to the deck. The harpoon was fitted to a Dragonfly helicopter and a temporary grid was constructed at the naval air station. In March 1955, a demonstration of this system was arranged at Ford. The trials were so successful that a patent was filed shortly afterwards. However, as there was no immediate requirement for arresting gear in small ships no follow-up action took place.[32] The harpoon-grid system, like the suction-cup device, would reappear.

In 1957, the Naval Air Department of the Royal Aircraft Establishment (RAE), Bedford, began to give serious consideration to the problem of operating helicopters from small ships. "It was becoming clear that if their ASW capability was to be fully utilised, it was essential that they should be able to operate from frigates in all conditions within which anti-submarine operations were practicable".[33] That same year, trials using a Fairey ultra-light

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[32] Ibid. pp. 475-476.

[33] Ibid. p. 475. Se- also Captain D. Dalley, "The Marriage of the Small Ship and the Large Helicopter," Maritime Warfare Bulletin, (Commemorative Edition, 1985), pp. 71-72. The USN's success, during the mid-1950's, in vectoring manned helicopters in for ASW attacks eventually led to the drone helicopter. In 1956 the Atlantic Destroyer Force proposed an alternative means of stand-off delivery, a drone helicopter, initially referred to as DAT (Drone Assisted Torpedo). The Chief of Naval Operations approved development in August 1957, as DASH (Drone A/S Helicopter). The first experiments were made with a small manned helicopter; a Bell HUL-1 (Bell 47) first landed on the fantail of the USS Mitscher in February 1957. Additional trials soon followed using a modified HTK-1 training helicopter. During the late 1950's the USN began experimenting with a constant-tension (Eddy Current Clutch) winch to bring the drone helicopter down to the deck. However, the failure of the DASH programme forced the USN to return to a manned helicopter programme, LAMPS (Light Airborne Multi-Purpose System), in 1968. See, Norman Friedman, U.S Destroyers: An Illustrated Design History, (Annapolis, Maryland: Naval Institute Press, 1982), pp. 280-284. See, also, Minutes of the United States Navy Anti-Submarine Plans and Policies Group, 5 February 1957, Op-312, Commodore O.S.C. Robertson, Naval Member, Canadian Joint Staff, Washington, to the Naval Secretary, NMWS 8100-2, 2 May 1957, in RG 24 83-84/167, Box 3827, file S-8260-11 vol. 2, NAC.

helicopter were carried out in the English Channel in which there were more than seventy landings and take-offs from the frigate Grenville. Despite the success of these trials, the RN still had to determine the limits of ship motion and undercarriage design which would allow the helicopter to land without damage, and the limits of ship motion after touch-down within which it would be possible to secure and handle the helicopter. To better understand these problems, the Royal Navy constructed a rolling platform at RAE Bedford to simulate the motion of a ship.

Meanwhile, the RCN was struggling with the very same problems. As early as the summer of 1954, Genaire Company Limited, of St. Catherines, Ontario, submitted a proposal to the Department of Defence Production, Aircraft Branch, for landing a helicopter on a ship in rough seas and high winds. Although Genaire's proposal was written with the icebreaker in mind, the design held wider applications for the Canadian navy. H.B. Picken, Genaire's president and aeronautical engineer, suggested that a cable could be fitted to the helicopter which would be lowered as the aircraft hovered over the deck. Directly below the deck where the helicopter was about to land would be a piece of electronic equipment which would consist of a gyro and accelerometer. The gyro would determine the variations in relationship between the plane determined by the pitching and rolling axis of the ship and the level plane of the earth's surface. The accelerometer would measure the accelerations of the vertical axis which are caused by the heaving motion of the ship. Integrating the equation of motion electronically would determine the amount of travel or the actual distance the deck moved up and down in the vertical axis. This information would be fed into the cable and to the helicopter's automatic pilot, so as to synchronize the movement of the ship and aircraft.[34] Once the motion of the ship and helicopter were harmonized, the pilot would override the auto-pilot system and land the helicopter.

The success of this particular system depended upon the immediate transmission of information (signals) from the ship via the cable to the auto-pilot. Any lag-time between the original signal and the helicopter's response to that signal could spell disaster. In this situation the helicopter "never quite catches up in its manoeuvring to the signals it is receiving from the ship... [and] could cause the helicopter to crash".[35] In addition, the auto-pilot controls had to be more sensitive than those fitted in existing fixed-wing aircraft. Picken was aware of the potential problems with the system, but he believed it warranted further study.

In January 1955, the navy's senior technical advisors sat down with representatives from the Defence Research Board to evaluate Genaire's proposal.[36] The conclusion soon

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[34] Report No. 112, Prepared by H.B Picken, "Suggested Technique for Landing Helicopter on Boat in Rough Seas and High Winds." 3 August 1954, W. Symmons, Senior Production Officer, to Commander C.G.H. Daniel, A/CNTS (Air), 16 September 1954, RG 24 83-84/167, vol 11, file 1115-35 vol. 1, NAC. Mr. Picken was also a helicopter pilot. He held the patent for this invention, which was also considered by the Royal Navy. Finally, Genaire Limited represented Kaman Aircraft Company of Canada Limited. Kaman Helicopters played a key role in the development of the drone helicopter concept, which was undergoing investigation by the USN.

[35] Ibid.

[36] The following representatives attended the meeting: Dr. F.H. Sanders, Scientific Advisor to the Chief of the Naval Staff; Commander H.W. Isaac (E), Assistant Electrical Engineer-in-Chief [EEC] (Air); Lieutenant-Commander J.H. Johnson (E), Deputy Director of Air Engineering (DAE); Lieutenant-Commander G.H. Marlow (P), on the staff of the Directorate of Naval Aviation as Staff Officer (Helicopters); Mr. A.W.R. Gilchrist, AERO/Defence Research Board; Dr. W.L. Ford, Director of Scientific Services (DSS), and; Mr. D.P. Hoyt,

emerged that the system was probably too complicated to warrant development. At that point Lieutenant-Commander (E) J.H. Johnson, Deputy Director of Air Engineering (DAE), suggested not attempting the communications link and synchronization of movement at all, but simply dropping a strong cable from the helicopter, engaging it in a winch on the ship's deck, and pulling in the aircraft with brute force.[37] This remark is in fact the earliest mention in the records of the idea that would produce the successful Canadian haul-down and rapid-securing system. The other members of the meeting recognized that the very simplicity of the approach might make it practicable. In the interim, however, Dr. Ford, Director of Scientific Services (DSS), sought a fuller appraisal of the Genaire proposal, and the Directorate of Naval Aviation was instructed to approach the RN and USN for any information on helicopter landing aids.[38]

Assistant Director of Scientific Services.

[37] Minutes of Meeting on Helicopter Landing Proposal submitted by Genaire Company Limited, NSS 1115-35 (DSS), 25 January 1955, RG 24 83-84/167, vol. 11, file 1115-35 vol. 1, NAC.

[38] The National Aeronautical Establishment (NAE) was approached to conduct an evaluation of Genaire's proposal. The NAE was created in 1950 under the direction of the National Aeronautical Research Committee and administered by the National Research Council (NRC), on behalf of the committee, as a separate agency. Funds for the operation of the establishment were included in the estimates of both the DRB and of the NRC. This new establishment consisted of the NRC's aeronautical research facilities in Ottawa, the test flight facilities in Arnprior (later moved to Uplands), and aircraft and personnel from the RCAF who were attached to Uplands. In 1951 a Flight Research Laboratory was built at Uplands. The scope of the NAE's work embraced several branches of aeronautical engineering and included basic research, applied investigations, development and tests. See D.J. Goodspeed, A History of the Defence Research Board of Canada, (Ottawa: Queen's Printer, 1958), pp. 102-107.

The trials onboard Buckingham had also shown the need for aircraft stowage. "Corrosion and general deterioration to the helicopter located in such an exposed condition" on the frigate had confirmed experience "will not be acceptable over prolonged periods and hangar facilities must be made available".[39] Moreover, the provision of a hangar would allow the navy to carry out far more extensive maintenance and repairs on the helicopter. During the course of the trials, the helicopter had to be disembarked for repairs on nine separate occasions because of inclement weather, the motion of the ship and the lack of adequate equipment. In his final report Lieutenant-Commander Benoit noted that the "only sure way of providing adequate protection is through the use of a hangar. It is not thought that a steel hangar, similar to that fitted in Labrador would be suitable, considering the small size of the platform and the resultant `wooding' of the ship's armament". He proposed, instead, that a collapsible hangar of semi-circular design be constructed, noting that "such a hangar would afford complete protection against salt spray, wind, snow and ice and also a shelter for maintenance".[40] Benoit suggested several alternatives for the location of the platform, only to conclude that:

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[39] "Final Report on COMOPVAL Project Staff/SE 18," 1 February 1957, RG 24 83-84/167, Box 3827, file S-8260-11 vol. 2, NAC. The navy relied on canvas covers and protective coatings to protect the helicopter from the elements. The aircraft had certain components painted with "Paralketone," a heavy tar-like substance. The parts treated included the undercarriage legs, mountings, castings for some engine parts and electrical junctions. The entire aircraft was also waxed to protect the finish and prevent salt water corrosion of the skin. Six coats were applied before the trials, and the aircraft was waxed twice a week thereafter. The covers proved to be useless, as a fine salt spray invariably found its way under the cover.

[40] Ibid.

> the correct solution to this problem may only lie in trial and error, but whenever the question becomes a deciding factor in the choice of two positions, the one that is located further aft and hence further away from the superstructure is undoubtedly the best.[41]

Serious as difficulties posed by hangar installation were, the early trials proved to be so successful that the Commander of the Operational Evaluation Organization recommended that additional tests with a more suitable helicopter in a St. Laurent class destroyer be carried out to determine the tactical effectiveness of the helicopter/destroyer combination in ASW operations.

The leisurely pace of the trials with Buckingham stood in contrast to events at headquarters. Even before Lieutenant-Commander Benoit submitted his final report ,the navy began to act upon many of his recommendations, which he had presented in a preliminary form to the staff in Ottawa on 21 December 1956. The small size of the RCN facilitated the sharing of information and quick action.[42] Inter-service wrangling at the Chiefs of Staff

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[41] Ibid. Having said that, Lieutenant-Commander Benoit noted that a raised platform would emphasize the lateral displacement due to the roll and a compromise should be sought between this and the deck level platform. He ruled out the possibility of landing a S-58 helicopter forward of Limbo for lack of space. "In order to avoid any danger of the main rotor blades striking the superstructure, the S-58 helicopter would have be landed so far aft that the tail wheel would overlap the Limbo well". A platform aft of the funnel, atop the superstructure, would have to be placed at an unacceptable height to clear such unremovable obstructions as the davit heads and main air intakes, and the funnel haze would be a constant hazard to flight operations. What was known, however, was that the platform had to be larger in order to accommodate the S-58 helicopter and that it had to be strong enough to support the 13,000 pound aircraft.

[42] The navy organized the Helicopter/Escort Development Committee in early 1957 to consider various ideas for the operation of helicopters from escort vessels. On 17 January 1957, Commander J.H. Johnson (E), DAE, wrote a memorandum to the Director of Tactics and Staff Duties calling for the creation of a committee to evaluate various schemes and recommend the best course for designing and testing a rapid securing device for ASW helicopters. Commander Johnson recommended that the following directorates sit on the

Committee level over the RCN's estimates for naval aviation for the fiscal years 1956-1958 provided the impetus for speed in this case.

Only a week after Lieutenant-Commander Benoit's presentation, a special meeting was held in ACNS (Air's) office to discuss the helicopter/escort trials.[43] The officers quickly reached a fundamental decision about the future of ASW in the Canadian navy: "helicopters would operate from St. Laurent class [destroyers] as a permanent addition to the ship rather than the previous requirement of an escort just catering for refuelling and re-arming a helicopter".[44] Captain Nixon, Director Tactics and Staff Duties, was instructed to produce a staff requirement for NCC for the production of working drawings for a helicopter platform in a St. Laurent class ship. Equally important, Commodore Sears, ACNS (Air), informed the

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committee: Directorate of Tactics and Staff Duties; Directorate of Naval Aviation; Naval Constructor-in-Chief, and; the Directorate of Air Engineering. Captain G.C. Edwards, then Director of Naval Aviation supported Commander Johnson's proposal, albeit with minor revisions. Edwards suggested that the committee be expanded to include the Directorate of Torpedo and Anti-Submarine Warfare, and that representatives of the Directorate of Operational Research (Naval) and the Defence Research Board be invited to attend meetings, depending upon the subject matter being discussed. Finally, DNA suggested that Lieutenant-Commander Gibbs, Staff Officer (Helicopters), could serve as the DNA representative and act as the Secretary. See, Commander J.H. Johnson (E), Director of Air Engineering to DTSD, NS 1115-39, 17 January 1957, RG 24 83-84/167, vol. 11, file 1115-39 vol. 3, NAC, and; Captain G.C. Edwards, Director of Naval Aviation to DTSD, NS 1115-39 (Staff), 31 January 1957, RG 24 84-84/167, vol. 11, file 1115-39 vol. 3, NAC.

[43] The following officers were in attendance: Commodore H.P. Sears, ACNS (Air) (Chairman); Commodore A.H.G. Storrs, ACNS (Warfare); Commodore D.L. Raymond, ACNS (Plans); Captain G.C. Edwards, DNA; Captain C.P. Nixon, DTSD; Captain P.F.X. Russell, DTASW; Lieutenant-Commander K.L. Gibbs, Staff Officer (Helicopters) (Secretary), and; Lieutenant-Commander E.G. Gigg, on the staff of the Directorate of Naval Plans and Operations as Staff Officer (Operations).

[44] Minutes of a Meeting to Discuss Helicopter/Escort Trials held on 28 December 1956, in ACNS (Air's) Office, NSC 8700-8 (Staff), 11 January 1957, RG 24 83-84/167, Box 3827, file S-8260-11 vol. 1, NAC.

committee that Squadron VX 10 would investigate the following problems noted in COMOPVAL's report:

(a) new tie down arrangements and lashing points to be established for ASW helicopters due to their high centre of gravity.

(b) a method for the rapid securing and rapid release of helicopters operating from a shipborne landing platform.

(c) flight deck windbreaks for engaging and disengaging rotors in high winds.

(d) a suitable hangar.[45]

The committee, demonstrating the navy's determination to expedite research and development, immediately delved into the complex question of ship's programmes to ensure that adequate numbers of suitable vessels were available for the next series of trials in the spring.[46] The Director of Naval Aviation pointed out that it would be best to make arrangements to send Squadron HS-50 to Key West, Florida, to work up for the helicopter/escort tactical trials with Canadian ships in that area from mid-March until the end of April.

Finally, the committee decided that the Joint Maritime Warfare School should furnish a guide for the tactical trials. Following the completion of the tactical trials, a report would be "forwarded to CNS showing how helicopters can be operated from escorts and how they will increase the capabilities of those vessels and their associated escort groups. Trials would also show how beneficial helicopters were in exploiting distant datums established by the "Y"

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[45] Ibid.

[46] The committee suggested that the following forces were required for the trials: Third Escort Squadron of St. Laurent class ships (at least two ships), HMCS Crusader, HMCS Buckingham, HM Submarine, and Squadron HS-50.

Service, and the use of helicopters in classifying and delivering a weapon to targets held by long-range sonar".[47] This sense of urgency in the committee's discussions reflected broader worries that went well beyond the immediate problem of inter-service wrangling over budgets for naval aviation.

Despite the fact that the new St. Laurent class destroyers were just entering service, the navy was extremely concerned about block obsolescence of the fleet. The RCN, like other navies of the world, was struggling to keep pace with technology that at every turn threatened to outstrip the most up-to-date vessels, and at the same time jacked up the costs of modifications and of follow-on classes of ships. Many of the war-built frigates and destroyers, although modernized, were due for retirement before 1970 when the hulls became too worn for efficient service. Bi-lateral agreements under the Canada-United States Regional Planning Group (CUSRPG) for the defence of the Pacific coast, and NATO multi-lateral arrangements for the Supreme Allied Command Atlantic (SACLANT) committed Canada to providing 29 anti-submarine warfare escorts to SACLANT and 14 to the Canada-US region. The RCN would have a shortfall of thirty-five warships by 1970.[48]

The RCN responded by developing a ship replacement programme based on Rear-Admiral J.G. Knowlton's (Chief of Naval Technical Services) philosophy of "better ships but fewer ships". To improve performance characteristics, the Naval Technical Services Branch designed a new ASW escort well in advance of the St. Laurents. The proposed Mackenzie

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[47] Ibid.

[48] Privy Council Office (PCO), "Memorandum to the Cabinet, National Defence Equipment Programmes, 1965-1966 to 1969-1970, Inclusive," Cab.Doc. 497/64, 16 November 1964, and; Cabinet Minutes - 8 December 1964.

class was to be fitted with improved machinery, long-range sonar, and guided missiles. Replacing the thirty-five escorts, due to leave the service between 1958 and 1968, on a one for one basis could not be contemplated. The programme proposed in early 1956 therefore called for only twenty-six of these new destroyer escorts. The reduced numbers in the Canadian fleet would be made up for by more capable ships and the introduction of helicopters.[49]

The Mackenzies, however, promised too little in the way of improved ASW capability for the steep costs, estimated conservatively at $30 million per ship as compared to $26 million for the Restigouche class. The programme proposed to the Chiefs of Staff Committee so threatened to exceed the navy's budget that the chairman refused to pass it on for consideration.[50] Nevertheless, throughout 1956 the Naval Board attempted unsuccessfully to gain Cabinet approval for an incremental replacement programme premised on building 26 ships over a fifteen year period. The Cabinet's refusal to approve that plan forced the navy to find an alternative.[51] Designing a new warship was expected to take at least two

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[49] See, Chiefs of Staff Committee Minutes, 588-9, 9 February 1956, DHist 72/1223, files 1308-1309A; Policy and Projects Coordinating Committee Minutes 56-8, 19 March 1956, DHist 79/246, and; Minutes of the Naval Board, 482-2, 10 April 1956, DHist 1000-100/2.

[50] The golden days of military procurement, best summed up by C.D. Howe's famous phrase, "if the military asked for a gold-plated piano, "we buy a gold-plated piano," had long since passed. By 1956 a return to fiscal responsibility was certainly evident. "For Howe and the cabinet the principle of civilian control, especially over money, was all-important". See, Robert Bothwell and William Kilbourn, C.D. Howe, A Biography, (Toronto: McClelland and Stewart, 1979), p. 257.

[51] See, Minutes of the Cabinet Defence Committee, Meeting 111, 13 August 1956, in RG 24 83-84/167, vol. 3549, file 8000-35, Part 2, NAC. For a detailed discussion of maritime and shipbuilding policy in post-war Canada see, Michael A. Hennessy, "The Rise and Fall of a Canadian Maritime Policy, 1939-1965: A Study of Industry, Navalism and the State."

years, and that was far too long. Moreover, the chances of conceiving a warship superior to the Mackenzies at a cost acceptable to the government were slight. Therefore, the Naval Board recommended re-ordering vessels of the Restigouche class, in spite of the limited capabilities of the class. The Cabinet Defence Committee accepted the Naval Board's recommendation on 6 February 1957. Before construction began, however, the Liberal government lost the election and the Conservatives called for a review of the building programme. Authorization to proceed with the next shipbuilding programme was finally given on 8 August 1957. Four Repeat Restigouche class destroyers were ordered, with an additional two ordered the following year.[52] Delays in the procurement process coupled with the limitations of both the St. Laurent and Restigouche class destroyers forced the service to accelerate the helicopter/escort trials. It was now apparent to most Canadian naval officers that the helicopter would be the most cost effective way to upgrade the fleet.

Time was crucial. On 28 December 1956, immediately following discussions in the ACNS (Air's) office regarding the Buckingham trials, Commodore Raymond, ACNS (Plans), instructed Flag Officer Atlantic Coast (CANFLAGANT) to make arrangements to send Squadron HS-50 to Key West, Florida, in February to commence ASW work-ups prior to the arrival of the surface ships in April. According to Raymond, "extensive tactical trials appear most desirable to establish the method of operationally employing escort borne helicopters and any modifications to ships and helicopters.... In order to justify including funds in the 1958/59 estimates to implement the recommendations such trials must be carried out at the

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(Fredericton: University of New Brunswick, unpublished Ph.D Dissertation, 1995).

[52] Ibid.

earliest possible opportunity".[53] To that end, he recommended using the following forces: two St. Laurent ships of the Third Canadian Escort Squadron (CORTRON 3), the destroyer HMCS Crusader, the frigate HMCS Buckingham, one British submarine and Squadron HS-50.

When it became clear that HMCS Crusader could not participate the RCN approached the USN to see if they were interested in taking part. The Americans, who were already conducting their own trials with ASW helicopters from destroyers, responded favourably. To make the most of the trials, the USN also supplied one Guppy fast conventional submarine. Other changes included the addition of one St. Laurent class destroyer from CORTRON 3. Thus, the final units taking part were: HMC Ships Assiniboine (DDE-234), Ottawa (DDE-229), Saguenay (DDE-206), Buckingham (FFE-314), HMS Amphion (S-43), USS Saufley (fitted with SQS-4 long-range sonar) and USS Threadfin (Guppy IIA submarine), and six S-55 helicopters from HS-50.[54]

The purpose of these trials was to determine the tactical procedures for escort borne helicopters in a variety of A/S roles, particularly operations in support of SOSUS, close convoy support, hunter/killer operations in company with a carrier, and surface attack unit operations to exploit aircraft and other datums.[55] On the recommendation of Captain A.G.

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[53] CANAVHED to CANFLAGANT, 282159Z, 28 December 1956, RG 24 83-84/167, Box 3827, file S-8260-11 vol. 1, NAC.

[54] Squadron HS-50 sent six S-55 helicopters, 13 officers, 23 chief and petty officers and 33 men to Key West, Florida, for the work-ups and trials.

[55] See, Naval Secretary to Flag Officer Atlantic Coast, NSS 8260-11 (Staff), 9 January 1957, RG 24 83-84/167, Box 3827, file S-8260-11 vol. 1, NAC.

Boulton, Commander of the Third Canadian Escort Squadron, with the agreement of the Joint Maritime Warfare School, the trials particularly tested the ability of a St. Laurent class destroyer to direct a helicopter to a position over a ship's sonar contact with sufficient accuracy for the helicopter to drop a torpedo. To evaluate properly the efficiency of both the escorts and the helicopters, strict operating procedures were utilized to control the submarines course, speed and depth. At other times the submarines were permitted to take evasive manoeuvres to avoid contact or penetrate the screen. Although the helicopters were usually vectored to the target by the control ship, one segment of the exercise tested the helicopter's ability independently to search, dip, and gain contact with the target submarines. In all cases, the helicopters were either scrambled from the deck of Buckingham and the destroyers or vectored to the target while airborne.[56]

During the thirteen day trial, 5-17 April 1957, Squadron HS-50 helicopter's flew 140 hours, made 109 sorties of which 79 were considered successful, and made 60 of the 97 landings on Buckingham and 37 on the quarter deck of the St. Laurent class destroyers, in weather conditions that ranged from absolute calm to inclement.[57] Unlike the previous trials, the three St. Laurent class destroyers were not fitted with a flight deck. Rather, the mortar

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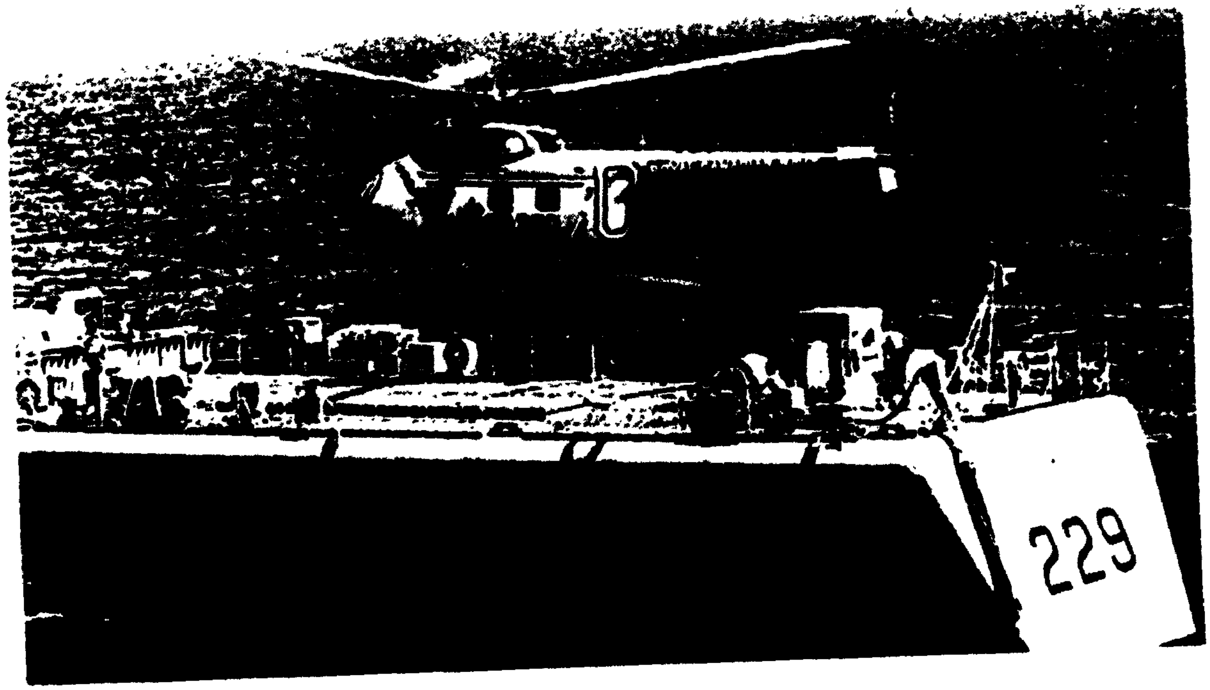
[56] Project Plan, prepared by Commander Third Canadian Escort Squadron, NSS 8260-11, February 1957, RG 24 83-84/167, Box 3827, file S-8260-11 vol. 1, NAC, and; Project OP/CC3/50, Captain A.G. Boulton, Commander, Third Canadian Escort Squadron to FOAC, ESNC 1680-260/3, 26 April 1957, RG 24 83-84/167, Box 3827, file S-8260-11 vol. 1, NAC.

[57] See, Project OP/CC3/50, Captain A.G. Boulton, Commander, Third Canadian Escort Squadron to FOAC, ESNC 1680-260/3, 26 April 1957, RG 24 83-84/167, Box 3827, file S-8260-11 vol. 1, NAC; HMCS Buckingham, Report of Proceedings for April 1957, 1926-381/44, 10 May 1957, RG 24, vol. 11,380, file 1926-381/44 vol. 1, NAC, and; Squadron Reports, HS-50, Report of Proceedings for April 1957, HS: 1926-223/24, 2 May 1957, DHist 1700-219/50 (Report of Proceedings 1955-1960).



Sikorsky S-55 helicoper landing aboard HMCS Ottawa, off Key West, Florida, in April 1957. (Department of National Defence, DNS 17257) wells were shored-up and a temporary platform was provided to accommodate the Sikorsky helicopters. According to Lieutenant-Commander T.E. Connors, CO of Buckingham, the "presence of the ship at these trials, would appear to have been well justified. This feeling was freely expressed by the helicopter pilots, who made no bones about their ease of mind at having a ship with a proper landing platform standing by, when they were operating some fifty miles from the nearest land".[58] Equally important for the squadron pilots was the presence of the Deck Landing Signals Officer, D.J. Thomson, and experienced aircraft handlers on board the frigate. Pilots landing on either of the three Canadian destroyers were not as fortunate because the destroyers did not have any trained landing signals officers or seasoned aircraft handlers.

Despite poor weather and even worse sonar conditions, the tests were considered a success. Captain Boulton noted that "considerable tactical advantage would be gained by employing a helicopter as part of a ship's weapon system to increase the range of present weapons and the range of radar and sonar".[59] The destroyers were more than capable of directing one or more helicopters over the ship's sonar range (short and long-range). When the ships were in contact with the submarine, the helicopters conducted fifteen sonar dips, within 1,500 yards of the submarine, and contact was gained almost immediately, indicating a detection rate of 80 per cent. During the exercise when the ships lost contact with the

[58] HMCS Buckingham, Report of Proceedings for April 1957, RG 24, vol. 11,380, file 1926-381/44, vol. 1, NAC. The Canadian pilots, unlike their American counterparts, tended to operate further afield from the screen.

[59] Final Report on Project OP/CC3/50 prepared by Commander, Third Canadian Escort Squadron, ESN 1680-260/3, 13 June 1957, RG 24 83-84/167, vol. 11, file 1115-39 vol. 3, NAC.

target submarine, "dipping sonar detections were made on 23 helicopter sorties and one single-helicopter sortie out to ranges of from three to eight miles, indicating a detection probability of 81 per cent".[60]

In all attack runs the helicopters dropped their dummy torpedoes at speeds between 40 and 60 knots, and from 300 feet. These limits were imposed because the smoke markers were flight-armed and required speeds of 60 knots and heights of 300 feet to become operative. The S-55 helicopters could carry one Mk 43 torpedo, which was dropped while hovering, providing the torpedo launcher was angled to give a reasonable nose-down entry of the torpedo.

> The helicopters under direction of St. Laurent class destroyers placed 39 of the 39 simulated Mk 43-1 torpedoes that were dropped with acquisition range (400 yards) of a slow moving, non-evasive submarine, twenty of them within 170 yards. Against a nine-knot evasive submarine, the launching error seemed to be the same. [However] there was a significant and constant error, indicating that on average the torpedoes were dropped too early on the attack run.[61]

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[60] Ibid. The AN/AQS-4 sonar outfitted in the S-55 helicopters was credited with ranges of 1.6 times the range for ships, although its performance was severely limited by bottom reverberations when operating in less than 200 fathoms. Despite adverse sonar conditions during the trials 42% of the simulated torpedo drops were made at ranges of more than 1,500 yards, and 58% at shorter ranges.

[61] Ibid. The report noted that the accuracy of weapon delivery against the evasive Guppy submarine seemed as high as it was against a slow, non-evasive A-class RN submarine. The destroyers could place Mk 43 torpedoes within acquisition range of a submarine of characteristics as advanced as the Guppy IIA at least 95 times in 100 drops. Such accuracy was attained out to ranges of 2,100 yards, ie., to more than twice the present weapons delivery range of the St. Laurent class destroyers. In suitable weather, employment of helicopters promises to improve the range at which lethal missiles can be launched by a factor of two or more, with a probability of kill of about 50% which is superior to that of the A/S Mortar Mk 10.

According to Captain Boulton, the present value to DDE's of attack helicopters might be restricted to an extension of range. "For the DDE will travel 3,000 yards in the time it takes to scramble a helicopter from the flight deck and could attack stationary targets at 5,000 yards with the A/S Mortar Mk 10 as rapidly as the helicopter".[62] The problem with Captain Boulton's assessment was that he assumed that a CO of a submarine would choose to remain stationary instead of evading attack. Most submarine commanders would usually adopt the latter course of action, unless he knew for certain that his submarine was below the thermal layer which would provide a certain measure of protection from detection. Boulton rightly pointed out that "as the speed of the submarine approaches that of the DDE the advantage of helicopter attack increases, for at equal speeds the ship could hold but never attack a fleeing submarine that kept just beyond mortar range."[63] The main drawback to helicopter ASW operations, however, was the Sikorsky S-55 helicopter itself. In his final report, Boulton noted that the aircraft was underpowered and experienced some difficulty hovering in the humid conditions off the coast of Florida. He therefore suggested that a larger machine, heavily loaded with sonar, crew and weapons was better suited for single helicopter hunter/killer operations.

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[62] Ibid. It took two minutes to scramble a helicopter from the flight deck if the engine was running, rotors engaged and crews in the aircraft. It took three to four minutes if the aircraft was shut down and the crews at the ready.

[63] Ibid. The effective range of the A/S Mortar Mk 10 (Limbo) was 400 to 1,000 yards. See, Rear-Admiral J.R. Hill, Anti-Submarine Warfare, ch. 4, and; Norman Friedman, The Post-War Naval Revolution, pp. 72 and 124-125; Norman Friedman, U.S. Destroyers: An Illustrated Design History, (Annapolis,Maryland: Naval Institute Press, 1982), p. 242.

Despite the limited scope of the two week exercise, it clearly demonstrated that there was considerable tactical advantage to be gained by employing ASW helicopters in escort ships. Not only did the helicopters have the capacity to improve the range at which weapons could be launched, but they also increased the likelihood of detecting submarines by extending the range of ship-borne radar and sonar equipment from three to eight miles, well beyond the escort screen. Not surprisingly, then, Captain Boulton, recommended that "every effort be made to exploit the advantages that seem likely to be gained by the use of helicopters as part of a ship's weapon system".[64] He urged headquarters to convert a St. Laurent class destroyer to a helicopter carrying ship in order to carry out additional trials, paying particular attention to control procedures, and the problems of care and maintenance of the aircraft. Finally, he called for a study to investigate the probable frequency of favourable operational weather conditions in the north Atlantic. This information would be crucial for the RCN in determining the merits of helicopter ASW operations, especially when one considers that the S-55 and S-58 helicopters did not have all-weather capability, and that no solution had yet been found to the problem of rapidly securing a helicopter to the flight deck during rough weather.

From the outset, beginning in late 1955, the Canadian navy played a key role in testing and proving the helicopter/escort concept. This was due in no small measure to teamwork. The close relationship between the officers and scientists in the various institutions and agencies involved in this project (RCN, DRB, NRE, NAE and Canadian industry) certainly facilitated development. Moreover, the flying skills of the helicopter pilots ensured the early

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[64] Ibid.

success of those trials. Equally important was the willingness on the part of the more traditional elements of the surface navy to try something new. Without the support of those officers, the concept would have never gotten off the ground. In all facets of this relatively new field, the Canadian navy was on the leading edge, and would remain so in the years to come.

Despite the fact that the trials had demonstrated to all concerned that helicopter/escort operations were indeed possible, the navy could not convince the other services of the legitimacy of its naval estimates and that it alone should be responsible for maritime operations.

CHAPTER EIGHT

TROUBLED WATERS: THE NAVY'S FIGHT FOR NAVAL AVIATION, 1955-1958

In the spring of 1955, the RCN's plan to procure twenty-one Sikorsky S-58 ASW helicopters was struck down by the DND Estimates Screening Committee. At that meeting, it was decided to delete the funds from the naval estimates because the whole question of responsibility for ASW helicopters had not been resolved by the three services.[1] This decision was a blow to the navy's plans. The DND Screening Committee's decision was a portent of further setbacks to come.

At a meeting of the Chiefs of Staff Committee on 26 October 1955, General Foulkes and Air Marshal Slemon were extraordinarily blunt in their attack on the navy's programmes. At issue was the RCN's budget and fleet composition, the very essence, in other words, of the navy as a military service. Although the committee recognized the potential threat of Soviet submarines to North America F.R. Miller, the Deputy Minister, asked for clarification about progress in the development of submarine launched guided missiles. The Chief of the Air

[1] The decision of the DND Estimates Screening Committee was confirmed again, on 16 November 1955. See, Minutes of the DND Estimates Screening Committee, DM Sec't 253-3, 16 November 1955, DHist 1000-100/2. The RCN planned to procure 21 Sikorsky S-58 ASW helicopters as well as seven utility helicopters. To acquire the 21 Sikorsky helicopters, plus supporting spares was $12.3 million dollars. The Naval Board approved the procurement plan for ASW and utility helicopters, and set aside $5 million dollars in the 1956-1957 Estimates for the purchase of twelve S-58's and seven utility helicopters. The remaining nine S-58 helicopters were to be purchased over a two year period.

Staff intervened by questioning the navy's intelligence assessments and suggested "it would be well after 1960 before super-sonic missiles with nuclear warheads appeared".[2] Moreover, he believed that aircraft alone, in conjunction with SOSUS, could deal with the incursion of any Soviet submarines. The air force, in short, was better able than the navy to undertake the principal maritime defence mission. Miller was thinking along similar lines. He went so far as to ask "whether both ships and aircraft were required to support CORSAIR and to what extent duplication of effort might be avoided".[3]

General Foulkes, unlike Air Marshal Slemon, was less concerned with doctrinal issues, and focused on more worldly issues like the budget. His overriding concern was escalating costs. Accordingly, he doubted the necessity for reserve aircraft in the RCN, when the air force had none. In particular, he questioned the wisdom of the navy's proposal to have the helicopters partly manufactured and assembled in Canada, given the government's

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[2] "Briefing of the Chiefs of Staff Committee," NSTS 11480-43 (Staff), 26 October 1955, DNPO to ACNS (P), in the Minutes of the Naval Board, 1000-100/2, DHist. Air Marshal Slemon also questioned the need for carrier-borne Airborne Early Warning (AEW) aircraft suggesting that shore-based RCAF aircraft could carry out that role.

[3] Ibid. It is difficult to determine whether the DM's concerns were driven entirely by the budget, his past experiences or a combination of both. Air Vice Marshal F.R. Miller, born on 30 April 1908, graduated from the University of Alberta with a degree in civil engineering, and joined the RCAF in 1931. Trained as a pilot, he served in various flying, training and administrative capacities until the outbreak of the Second World War. During the war he served in numerous senior positions in Canada, commanding specialist training schools. He also served at Air Force Headquarters (AFHQ's) as director of training plans and requirements, and as director of training. In 1944, he was posted overseas and served with No. 6 RCAF Bomber Group as station commander and later base commander. Following the end of the war he returned to Canada and served in a number of key positions at AFHQ, including air member, operations and training. In 1951 he was appointed Vice Chief of the Air Staff. Three years later Air Marshal Miller was appointed Vice Air Deputy at SHAPE Headquarters, but returned to Canada in 1955 to become the Deputy Minister of National Defence.

unwillingness to support a technology that was still so experimental and better left to other countries. He suggested that the navy purchase the helicopters off the shelf. Foulkes even intimated that in the name of economy the government would be prepared to accept helicopters that did not meet the criteria established by the armed forces.

The RCN was not prepared to accept inferior aircraft for its missions. The air force's helicopters were used primarily in a utility or SAR role and operated, for the most part, over land. By contrast, the navy's helicopters had to operate over the vast ocean, where there was little margin for mishap. Any reduction in the helicopter's performance not only endangered the crew but severely limited the helicopter's ability to carry out the exacting role of detecting, tracking and sinking submarines.

When the DND Estimates Screening Committee met in mid-November 1955 to finalize the estimates for the fiscal year 1956-1957, the navy came prepared to defend its programmes. At issue was the navy's budget which promised to exceed its allotment by some $69 million dollars. Every programme was subjected to close scrutiny by the committee including the ship replacement plan and naval air procurement. The Chairman of the Chiefs of Staff pointed out that it would not be necessary to undertake a ship replacement programme of the size proposed by the RCN, if a ship life of longer than 20 years was assumed or the size of the ship commitment was reduced. He also questioned the navy's obligation to provide 42 ships to NATO, noting that "no commitment was given to provide ships in this number. It would appear that, finance-wise [sic], the stage has been reached where the RCN, if it wishes to launch any new programme, must do so at the expense of something else...."[4] With that in mind, the committee turned its attention to naval air matters.

Miller was alarmed that fully one-third of RCN expenditures were devoted to air activities, and he called for justification of those costs. Although the committee focused primarily on the Tracker procurement programme, all facets of naval aviation were subject to review. The committee was particularly concerned about the number of front-line and reserve aircraft in the RCN's inventory, and questioned the requirement for 234 aircraft to support the carrier. Similarly, the navy came under fire for its helicopter procurement programme. The consensus of the committee was that "the RCN basis of provisioning is generous, and should be reviewed further by the RCN pending detailed study by the Committee".[5] To reduce costs, it suggested that the navy eliminate one training squadron and two utility squadrons.

Rear-Admiral H.N. Lay, Vice-Chief of the Naval Staff, responded.

> The RCN operates at a disadvantage because it has only one carrier. Thus, it has to maintain a complete complement of aircraft ashore to operate the carrier in war. To relate aircraft needs solely to the 12 aircraft [Trackers] on the carrier is deceptive and frequently misleading. Aircraft are needed not only for anti-submarine exercises, but also to exercise anti-aircraft crews, for gun calibrating work, to maintain training of

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[4] Minutes of the DND Estimates Screening Committee, DM Sec't 253-3, 16 November 1955, in the Naval Board Minutes, 1000-100/2, DHist. At this meeting the chairman of the committee, F.R. Miller, Deputy Minister of National Defence, told the RCN that the committee "could not pass on the merits of the ship replacement programme and suggested that the RCN refer this matter to the Chiefs of Staff Committee for consideration".

[5] Ibid.

> pilots not attached to the squadrons, etc. The utility squadron on the West Coast meets needs over and above what RCAF finds itself able to extend to [the] RCN.[6]

This argument had little effect. Lay recognized that many of the navy's programmes were on the chopping block and he requested that the RCN be permitted to review its aircraft programme. The committee agreed.

A few days later, the question of ASW helicopters came up in the Chiefs of Staff Committee. It will be recalled that the issue of responsibility for this equipment and role as between the RCN and RCAF had been the subject of unproductive discussion in the Sea/Air Warfare Committee for two years. The reasons for the deadlock were evident when Air Marshal Slemon addressed his fellow chiefs of staff: "until the helicopter, or some suitable alternative machine, had progressed considerably beyond its present capabilities it would be more economical and satisfactory for procurement, maintenance and development of techniques to be carried out on a tri-service basis than for each Service to proceed independently".[7] To that end, he recommended that a joint RCN/RCAF experimental unit be established to evaluate the operational effectiveness of the helicopter, and recommend further requirements. "The unit would consider the problem of operating helicopters for both shore-based and ship-borne operations".[8]

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[6] Ibid. Despite the fact that SACLANT requested that the RCN provide a second carrier on D + 180, the navy was never able to convince the government, because of the budget, to do so.

[7] Minutes of the 585th Meeting of the Chiefs of Staff Committee, CSC 2-1, 21 November 1955, DHist 73/1223 files 1308-1309A. Air Marshal Slemon's proposal differed little from his paper of the previous year.

[8] Ibid. The RCAF and RCN would provide helicopters for the unit, and the Service supplying the helicopters [read RCAF] would be responsible for maintenance and spare

In what must have been a heated exchange, Vice-Admiral Mainguy, CNS, bluntly pointed out that "the Navy's experimental anti-submarine helicopter unit, approved by the Chiefs of Staff, was in operation and he could see no advantage in creating a joint RCN/RCAF unit to duplicate the work it was doing".[9] General Foulkes interjected and reiterated his desire to achieve a degree of unification and standardization of types, training, procurement and maintenance. He suggested that the Army, RCN, and the RCAF "set up a joint helicopter evaluation flight to investigate the capabilities and uses to which helicopters may be put, by each of the Services".[10] The chairman's recommendation was not well received either, and after a lengthy debate the COSC agreed to appoint an ad hoc committee to study the matter.[11]

The COSC met again on 5 January 1956 to review the situation. At that meeting the Deputy Minister remarked that the ad hoc committee's report implied that the RCN's development programme for an anti-submarine helicopter should continue. He then informed the Chiefs of Staff that he and the Department of Defence Production (DDP) "objected to the

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procurement. The RCN did not have any S-58 helicopters in its inventory whereas the RCAF did.

[9] Ibid.

[10] Ibid.

[11] The Ad Hoc Committee consisted of the Coordinator, Joint Staff as Chairman, two members from each of the Services, and one member from the Defence Research Board. The committee was to consider and submit recommendations on the following points: coordination of helicopter requirements by the three Services; determine whether the various helicopter types could be standardized thereby reducing the number of aircraft in their inventory; the possibilities of domestic production; centralization of procurement; coordination of maintenance, and; a joint system of basic training for helicopter pilots.

Navy's procurement plan on financial grounds unless the development programme would result in the ultimate manufacture of 100 or more helicopters".[12] The Deputy Minister also pointed out that all references to domestic production should be stricken from the report, as this decision was the responsibility of the Department of Defence Production. After lengthy debate the Chiefs of Staff Committee approved in principle the ad hoc committee's recommendations with some caveats. Approval in principle did not imply agreement with individual Service requirements for the 1956-1957 fiscal year. Moreover, the Chief of the Naval Staff was instructed to "reconsider the development of an anti-submarine helicopter".

The Chiefs of Staff Committee endeavoured to break the impasse between the navy and the air force by directing the Sea/Air Warfare Committee to "submit recommendations to them regarding the responsibilities for the control and operation of helicopters engaged in maritime warfare".[13] The Sea/Air Warfare Committee struck a working party of two officers

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[12] Minutes of the 586th meeting of the Chiefs of Staff Committee, CSC 2-1, 5 January 1956, DHist, 73/1223, files 1308-1309A. The Department of Defence Production (DDP) was created on 1 April 1951. The department was modeled on the Department of Munitions and Supply. It possessed many of the statutory powers of its predecessor, but was a subordinate purchasing agency for the Canadian armed forces. Despite DDP's subordinate position to the Services it frequently held up the acquisition of equipment. Air Vice-Marshal Frank McGill, a retired airforce officer whom C.D. Howe appointed as his chief of aircraft procurement explained "there was entirely too much civilian interference in Defence Production. When the Department of National Defence submitted its requirements for equipment and its specifications, McGill fumed, they ought to be accepted at face value. Instead, DDP wasted valuable time and money by checking them". To make matters worse many of these civil servants never had any army, navy or air force experience. This sentiment was also echoed by the navy. Regardless, the creation of DDP marked a change away from the command era to that of a management era. See, Robert Bothwell and William Kilbourn, C.D. Howe, A Biography, p. 257.

[13] See, "Brief on the Control and Operation of Helicopters," NSS 1115-39 (Staff), 9 November 1956, in RG 83-84/167, vol. 89, file 1270-78-1 vol. 3, NAC, and; Minutes of the 586th meeting of the Chiefs of Staff Committee, CSC 2-1, 5 January 1956, DHist 73/1223,

to prepare a joint appreciation on the operational employment of the helicopter in maritime warfare. The working party, Captain W.M. Landymore, DNPO, and Group Captain M.M. Lipton, DAPS, was to base its appreciation on NATO's MC-48 concept, which the Canadian armed forces had recently adopted.[14]

When the working party presented its findings to the Sub-Committee of the Sea/Air Warfare Committee on 13 February 1956, the SAWC questioned the performance data on the S-58 helicopter. The working party was instructed to obtain the USN's evaluation report on the Sikorsky helicopter and review their report in light of that information.[15] It would be several more months before the working party was ready to re-submit its report.

Not all policy committees were so reluctant to sanction the navy's programmes. Shortly after the COSC called for a review of the RCN's air programme, the Land/Air Warfare (LAW) Committee approved the navy's procurement plan. The LAW Committee had been originally created by the COSC to discuss tri-service requirements and procurement, with a view to standardization of types, and recommend the minimum number of helicopters required by the services for the next five years. By February, the LAW Committee had

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files 1308-1309A.

[14] Minutes of the Sea/Air Warfare Committee, 1270-78-1, 23 January 1956, RG 24 83-84/167, vol. 89, file 1270-78-1 vol. 3, NAC. The working party undertook its study in two parts. Part One, was an investigation to determine the role of helicopters in maritime warfare, while the second focused on the duties of helicopters and the service best suited for that role. Captain Landymore and Group Captain Lipton were responsible for the first portion of the investigation while Captain G.C. Edwards, DNA, and Wing Commander C.C.W. Marshall, Director Air Operations (DAO), were assigned to carry out the second part.

[15] Minutes of the Sea/Air Warfare Sub-Committee, 1270-78-1, 13 February 1956, RG 24 83-84/167, vol. 89, file 1270-78-1 vol. 3, NAC.

determined that the HUL and HSS-1 helicopters would best serve the needs of the Canadian armed forces, and that the navy should procure six S-58 helicopters in 1956/57, and then fifteen more over the next four years.[16] The Naval Board must have been struck by the irony of the decision. Not only did the LAW Committee recommend procuring the Sikorsky helicopter, a type that the RCAF had argued was unacceptable, but it had arrived at exactly the same figures as had the navy. The Naval Board moved quickly to approve the LAW Committee's report, which appeared promising for the future of naval aviation.

Equally surprising to the navy was the recommendation of the Inter-Service Committee on Joint Training (ISCJT), the following month, that the RCN retain control of basic helicopter pilot training at HMCS Shearwater.[17] Still, the navy had to find the funds to procure the six Sikorsky helicopters. Even before the COSC met to decide the fate of the

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[16] See, "Chronological Review of Helicopter Operations in the RCN," DHist 86/377; Minutes of the 476th Meeting of the Naval Board, 8 February 1956, DHist 1000-100/2, and; Report of the Working Party on Service Helicopter Requirements to the Land/Air Warfare Committee, Brigadier R.W. Moncel, Chairman, to Secretary of the Land/Air Warfare Committee, 27 January 1956, DHist 73/1223, Series 1, File 185. The working party consisted of the chairman, two representatives from each of the services, and one representative from the DRB. Captain G.C. Edward, DNA, and Captain C.G.H. Daniel, ACNTS (Air) represented the RCN.

[17] On 5 January 1956, the Chiefs of Staff Committee directed the Inter-Service Committee on Joint Training (ISCJT) to investigate the feasibility of centralizing all helicopter basic pilot training at the Canadian Joint Air Training Centre (CJATC), Rivers, Manitoba. The training provided in both courses (CJATC and RCN) was similar but the navy's course included water landings and take-offs in a float equipped helicopter. Training RCN pilots at CJATC would entail increased costs and travelling time. For these reasons the ISCJT recommended that the plan not be implemented. The ISCJT noted in its report to COSC that "although the RCN is prepared to join forces at Rivers such a move would be in the interests of inter-service cooperation only". See, "Training - Helicopter Pilots," JST 5-13 (DGT), 15 February 1956, Group Captain F.C. Carling-Kelly, Chairman, ISCJT, to Secretary, Chiefs of Staff Committee, RG 24 83-84/167, vol. 1726, file 4912-2 vol. 2, NAC, and; Minutes of the 590th Meeting of the Chiefs of Staff Committee, DHist 73/1223, files 1308-1309A.

navy's procurement plan, the Naval Board directed the Policy and Projects Coordinating Committee (PPCC) to find the money within the 1956-1957 budget.

On 21 February 1956, the Chiefs of Staff Committee met to discuss the LAW Committee's recommendations regarding service helicopter requirements. General Foulkes declared "there was a limit to the extent that the Chiefs of Staff, as a collective body, could agree on matters which appeared to be of individual service concern".[18] Accordingly, the committee took no action, suggesting instead that the individual service chiefs discuss the matter with the Deputy Minister. Given the Minister's apprehension over the budget, the prospects were not encouraging.

The PPCC eventually decided that the best way to procure the Sikorsky helicopters with the limited funds available was to spread the estimates over a two year period. It proposed, therefore, to acquire three S-58 helicopters during 1956-1957, at a cost of $2 million dollars, and the other three aircraft in 1957-1958, for $1.6 million dollars. On 2 May 1956, the Naval Board approved PPCC's recommendations and instructed Commodore D.L. Raymond, ACNS (P), to draft a letter to the Deputy Minister outlining the navy's procurement plan for both the helicopters and the ship replacement programme.[19] There was no mention of the remaining fifteen aircraft because the RCN was currently reviewing its 1960 staff requirement for ASW helicopters. The six helicopters to be procured during 1956-1957

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[18] Minutes of the 58?th Meeting of the Chiefs of Staff Committee, 21 February 1956, DHist 73/1223, files 1308-1309A.

[19] See, "Chronological Review of Helicopter Operations in the RCN," DHist 86/377, and; Minutes of the 487th Meeting of the Naval Board, 2 May 1956, DHist 1000-100/2.

were seen as replacements for the aging HO4S-3 h... opters. Their acquisition was crucial to continued trials and evaluations to properly develop the helicopter/escort concept.

Questions about the S-58 helicopter by senior officers of the Canadian armed forces, including some in the navy, led to a review of the 1960 staff requirement for ASW helicopters. The S-58 helicopter was certainly the best aircraft of the day, but developments in the aviation field promised even better performance. It should be remembered that the navy had made its decision on the basis of the 1953-1954 staff requirement for ASW helicopters, which called for them to operate from the aircraft carrier. The RCN was now planning to operate helicopters from destroyers, and for that reason alone had to re-examine the staff requirement.

In the spring of 1956, the Director of Naval Aviation called together his staff to discuss the matter.[20] Captain Edwards argued that, because the S-58 came closest to meeting the earlier staff requirement, it should be adopted as the 1960 A/S helicopter. It remained to determine whether or not it was the most suitable helicopter for the new role. Captain Daniel, ACNTS (Air) urged his fellow officers to "carefully weigh the requirements of size, armament, load and range before a final decision was made". He was concerned that "the S-58 had almost reached its maximum capability, and that the RCN might be left with an obsolete machine".[21] There were two other possibilities, the Bristol 193 and the Piasecki PH

[20] The following officers were in attendance: Captain G.C. Edwards (Chairman), DNA; Captain C.G.H. Daniel, ACNTS (Air); Lieutenant-Commander R.E. Bartlett, A/DNA; Lieutenant-Commander J.D. Lowe, SO (Helicopters), and; Lieutenant-Commander J.J. Harvie, on staff of Assistant Chief of Naval Technical Services (Air).

[21] Memorandum, "Report of a Meeting to Discuss Re-Appraisal of 1960 A/S Helicopter Staff Requirement," NSS 1115-39 (Staff) and NSS 7801-102 (Staff), DNA to ACNS (Air).

74, both of which were still under development. The Director of Naval Aviation instructed Lieutenant-Commanders Lowe and Harvie to study the matter, paying particular attention to the limitations and advantages of the three types of aircraft in operations from a St. Laurent class destroyer.

The following week, Lieutenant-Commander Harvie reported on the status of the three helicopter programmes, noting that the RN had cancelled its order for the Bristol 193.[22] He stated that the cancellation came about because the British no longer required the larger machine. This was only partly true. As recounted earlier, the tandem rotor Bristol helicopters (types 173, 191, 192, and 193) were plagued with engineering problems which delayed their introduction and added to their costs. Similarly, the development costs associated with the Piasecki PH 74 were deemed to be prohibitive by the navy, and engineering difficulties would delay its introduction as well. The Sikorsky S-58 appeared to be the best helicopter for the job. Lieutenant-Commanders Lowe and Harvie suggested eliminating one crew member in order to increase the endurance of the machine, but this meant that the sonar could only be operated for one hour while the helicopter was on station. Further discussion among the staff officers rightly emphasized that, if helicopters were to operate from destroyers, engine performance was even more crucial than before. "The smaller the landing platform the greater the need for increased dependability during critical

18 April 1956, RG 24 83-84/167, vol. 11, file 1115-39 vol. 2, NAC.

[22] The tandem rotor Bristol 193 was a smaller version of the 194. The 193 was powered by two Napier Gazelle turbine engines and weighed approximately 18,000 pounds. Because of its size it could not operate from a destroyer.

landing and take-offs".[23] Lowe pointed out that "if only one helicopter was carried in an escort, loss through engine failure of a single-engined machine meant 100% loss of the weapon".[24] This was an important consideration. Unlike fixed-wing aircraft which could glide once it lost engine power, a helicopter dropped like a stone, even when the pilot followed the proper auto-rotation procedures.

Given the potential of the Sikorsky helicopter, Mr. J. Orr, of the Defence Research Board, voiced his surprise that "the helicopter was not yet seen as the main weapon of the escort, but regarded as an extension of its weapon or sonar capability".[25] Commander H.J. Hunter, Deputy Director of Naval Aviation, concurred stating "there was a need for high-powered, high performance helicopters as a concentrated self-contained weapons system...."[26]

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[23] "Minutes of a Meeting held in DNA's Office on 25 April 1956, to Discuss the Re-Appraisal of the 1960 A/S Helicopter Staff Requirement," NSS 1115-39 (Staff), RG 24 83-84/167, vol. 1 i, file 1115-39 vol. 2, NAC.

[24] Ibid. As a trained helicopter pilot Lieutenant-Commander Lowe was certainly qualified to speak on this subject. Engine performance of the early helicopters was always a concern of the pilots as well as the mechanics. To overcome this problem Lieutenant-Commander Harvie suggested that if helicopters were to be carried as part of a ship's command, a minimum of two, and preferably three should be embarked.

[25] Ibid. Captain Edwards, DNA, speaking on behalf of those officers present agreed with Mr. Orr's views, and instructed Lieutenant-Commander Lowe to incorporate his suggestion into the staff paper being prepared on the subject.

[26] Ibid. Commander Hunter envisioned helicopters operating from the carrier where centralized maintenance was possible, while smaller, lighter and cheaper helicopters would operate from the escort ships. The D/DNA, believed that this two-prong approach would extend the usefulness of the obsolete escorts. From the available documents, it appears that the navy always favoured procuring the larger, heavier, all-weather ASW helicopter. Although Commodore Raymond, ACNS (Plans) and chairman of the Naval Warfare Study Group, was not present at this meeting he supported the notion of embarking helicopters in the carrier. The Naval Warfare Study Group, which was created in February 1956 to determine the role of the RCN in Phase I and II of a global war (MC-48), recommended the

This became all the more important, given recent developments in the ASW field. The officers were told that the value of the helicopter, as opposed to fixed-wing aircraft was reduced by the success of Explosive Echo Ranging (EER). Nevertheless, a decision was made to recommend the Sikorsky S-58 as the interim A/S helicopter of the RCN, and that the S-58B version be chosen as the most suitable replacement for the 1960 staff requirement.[27]

Explosive Echo Ranging located a submarine by dropping small explosive charges and recording the intervals between the detonation and the echoes received by a pair of passive sonobuoys. It had been conceived at the U.S. Naval Air Development Center (NADC) at Johnsville, Pennsylvania, and early EER trials were carried out by Squadron VX-1 based at Key West, Florida, in 1955-1956. The technique of turning passive buoys into active buoys became known as "JULIE". The RCN began their own trials in the summer of 1956, with a specially equipped Avenger, and later Tracker aircraft, at the Maritime Proving and Evaluation Unit (MPEU) at Summerside, PEI.[28]

Knowing the accurate location of the buoys and the time difference of the received signals allowed the position of the submarine to be determined from the intersection of elliptical position lines. As Peter Charlton explains, "the plotting technique is complex and

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retention of Magnificent, as a helicopter carrier. Admiral Mainguy, CNS, opposed this idea on the grounds that the capability of the helicopter had not been fully ascertained, and that a case had not been made for operating a second carrier within the present limitations - financial and manpower ceilings.

[27] The Sikorsky S-58B model was powered by two General Electric turbine-engines.

[28] Peter Charlton, Nobody Told Us it Couldn't Be Done: The VX 10 Story, (Ottawa: Privately Published, 1993), p. 91. For a detailed discussion of EER and JULIE see chapter 10.

cannot be done manually in sufficient time and with sufficient accuracy to continually track a fast moving submarine".[29] Some form of plotting assistance was required, and this eventually led to the development of a mechanical-electro-optical plotting and tactical navigation system known as the Julie Attack Search and Plotter (JASAP). This system was superseded by the Anti-Submarine Warfare Tactical Navigation System (ASWTNS), which was an electro-mechanical navigational and tactical computer and display system designed to solve ASW plotting, display and tactical coordination problems. "It incorporated an analog computer and utilized both automatic and manual inputs to compute and display solutions to both navigation and tactical ASW problems".[30] For some naval aviators, Explosive Echo Ranging promised to tip the balance in favour of fixed-wing aircraft. This, however, remained to be proven.

When the Naval Staff and Naval Board met in the spring and summer of 1956 they moved quickly to endorse the recommendations of the Director of Naval Aviation, and seek the Deputy Minister's approval for the procurement of six Sikorsky S-58 helicopters.[31] Despite support in most quarters for the programme, the government decided to postpone the purchase.

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[29] Peter Charlton, Nobody Told Us it Couldn't Be Done: The VX 10 Story, (Ottawa: Published Privately, 1993), pp. 91-92.

[30] Ibid, p. 93.

[31] See, Minutes of the 487th Meeting of the Naval Board, 2 May 1956, DHist 1000-100/2; Naval Board Minute 487-3, 2 May 1956, RG 24 83-84/167, vol. 3427, file 7820-102 vol. 1, NAC; Extract from the Minutes of the 16/56 Meeting of the Naval Staff, 10 July 1956, RG 24 83-84/167, vol. 11, file 1115-39 vol. 3, NAC, and Memorandum, "ASW Helicopter Requirements Fiscal Year 1956-1957," CNS to Deputy Minister of National Defence, n.d. in RG 24 83-84/167, vol. 3427, file 7820-102 vol. 1, NAC.

The navy's unsuccessful bid to acquire the helicopters is explained, in part, by the technology itself. Put simply, the S-58 did not measure up to the service's own staff requirements. More important, perhaps, was the swirling debate about the Canadian armed forces budget and the role of the respective services which distracted the government of the day.[32] The Liberal government was under attack in the House of Commons by the opposition on a number of issues, including the escalating costs of the CF-105 (Avro Arrow), command and control arrangements under NORAD, the increasing cultural and economic influence of the United States generally, and specifically American involvement in the construction of the Trans-Canada Pipeline, and finally the Suez Canal Crisis.

To make matters worse, on 1 April 1956 the federal government approved a general pay increase to military and civilian personnel working in the Department of National Defence. This meant that the navy had to find an additional $7 million within the existing budget. In fact, the situation was so bad that the Naval Board considered, among other things, reducing the reserve fleet, paying off three Algerines and Ontario, reducing the second-line strength of naval air by twenty aircraft, and grounding all McDonnell F2H3 aircraft (Banshee), which were just entering service.[33]

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[32] In 1956, in question period in the House of Commons, the Right Honourable Ralph Campney, Minister of National Defence, stated that "Canada is building and maintaining a defense effort that is really out of all proportion to our status as a middle power." House of Commons Debates, 1956, V, p. 5209.

[33] See, Naval Board Minute, 506-10, 5 October 1956, DHist 1000-100/2. By grounding all Banshee aircraft the navy would save approximately $4.5 million dollars. The Naval Estimates Review Committee suggested grounding the Banshee aircraft because "there had been some thought that we may be trying to do too much with one carrier and that it might be more efficient to concentrate on anti-submarine aircraft and helicopters only". The Naval Board overturned this recommendation noting that the issue would be reviewed when the

It has been argued that the Royal Canadian Navy was able to escape the kind of critical review of its role and equipment which affected the RCAF and the Canadian Army during the period 1957-1964. According to the American political scientist Jon McLin:

> that it did so was probably attributable not so much to enlightened naval policies as to their relative unimportance and the absence of significant change in their broad outlines. As it was the budgetary Cinderella of the services - it received only eighteen per cent of the funds spent on the three services during the decade 1951-1960 - there was not the same incentive for the navy's expenditure, and therefore, its policies to be as closely scrutinized as were those of the air force and army.[34]

This was not the case. The RCN was challenged at every turn over its mission and its choice of equipment to carry out that role. There was, for example, criticism of the acquisition of the new carrier to replace Magnificent. "There is a strong body of opinion in the RCAF", the Ottawa Citizen reported, "that the RCN shouldn't operate an aircraft carrier". Many air force officers argued, the article continued, that the carrier's job - convoy protection - "could be performed just as well and more cheaply by long-range shore-based RCAF aircraft". Moreover, these same officers asserted that "the money being spent on the carrier program is wasteful, and that the navy was planning for the last war".[35] As James Boutilier has correctly pointed out, "cuts in defence expenditures tend to fasten on the most expensive and

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fighters were nearing the end of their operational life.

[34] Jon McLin, Canada's Changing Defense Policy, 1957-1963: The Problems of a Middle Power in Alliance, (Baltimore: Johns Hopkins University Press, 1967), pp. 120-122. See also, Joseph T. Jockel, No Boundaries Upstairs: Canada, the United States and the Origins of North American Air Defence, 1945-1958, (Vancouver: UBC Press, 1987), chs. 2 and 5.

[35] Ottawa Citizen, 1 August 1956, in DHist 1700-219 (Naval Aviation, 1950-1959).

most visible weapon systems".[36] With the postponement of the helicopter acquisition programme the navy prepared its defence of naval aviation.

When the Chiefs of Staff Committee met again in early June 1956 to discuss the service's budget for 1957-1958, General Foulkes questioned the navy's plan to expand the A/S experimental helicopter squadron from six to twelve aircraft. Vice-Admiral H.G. DeWolf, CNS, agreed to review this item and to discuss the practicability of making the squadron a joint RCN/RCAF responsibility with the Chief of the Air Staff. It was the chairman's view that making the helicopter squadron a joint responsibility would eliminate duplication of effort and unnecessary expenditures, and would go a long way towards amalgamating and coordinating the anti-submarine units in the Canadian armed forces.

To further reduce costs, Foulkes asked the navy to cut the number of aircraft in its inventory. He suggested that aircraft in the front line squadrons, when not embarked in the carrier, could undertake some of the duties of the supporting units.[37] Similarly, in an attempt to reduce the number of reserve naval divisions, the committee asked the navy to review the whole issue of employment and training of reserves. After three days of deliberation, at times heated, the COSC finally agreed to support the navy's budget, subject to the CNS pursuing these three cost-cutting measures. On 13 July 1956, before the CNS could respond to the COSC's concerns regarding the A/S helicopter squadron, the Chiefs of Staff formally struck

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[36] James A. Boutilier, "Get Big or Get Out: The Canadian and Australian Decisions to Abandon Aircraft Carriers," in Reflections on the RAN, T.R. Frame et al. (Kenthurst, New South Wales: Kangaroo Press, 1991), p. 385.

[37] Minutes of a Special Meeting of the Chiefs of Staff Committee, 4-7 June 1956, DHist 73/1223, files 1308-1309A.

down the navy's request to increase the number of helicopters from six to twelve. The RCN would have to make do with the six aging Sikorsky S-55 helicopters.[38]

By the fall of 1956, the navy was ready to respond to the Chiefs of Staff Committee's call for strict economies in aviation. The Ad Hoc Committee on Naval Aviation recommended eliminating thirty aircraft from first and second line squadrons and 107 aircrew with additional cuts from the reserve squadrons. In the end, 25 Sea Furies, 45 Avengers, 6 Expeditors, 17 Harvards, one S-55 helicopter, three HUP's and two AEW aircraft were disposed of.[39]

The bulk of the RCN's first and second line aircraft would consist of Trackers, Banshee fighters, AEW Avengers, and S-55 helicopters. This combination of aircraft would allow the navy to meet its commitments to NATO. Notwithstanding NATO's philosophy of a two phase war, SACLANT's plan provided for sustained operations for a period of six months. The RCN envisioned the following role for the carrier and her six escorts in the eastern Atlantic (EASTLANT): A/S offensive (hunter/killer) operations, support for independent shipping, transit and focal area offensives, close-in defence of convoys, and A/S operations in support of attack carrier and other surface force operations. Several of these

[38] See, Minutes of a Special Meeting of the Chiefs of Staff Committee, 13 July 1956, DHist 73/1223, files 1308-1309A.

[39] Report of the Ad Hoc Committee on Naval Aviation, NSTS 1700-913 (Staff), 20 November 1956, Acting Commodore A.H.G. Storrs, ACNS (Warfare), to VCNS, DHist 1700-219 vol. 2 (Naval Aviation - General). According to the committee 207 aircraft, of various types, including those in operating and storage reserve (attrition) were required to meet the requirements of MC-48.

same roles might be carried out in the western Atlantic (WESTLANT), but the RCN group was particularly likely to operate there against Soviet ballistic missile-firing submarines.

These two broad scenarios called for a different mix of aircraft in the carrier. The further east the group operated, the greater the air threat, and thus, the carrier would operate more Banshee fighters. For operations in the western Atlantic, area the fighters would be replaced by additional A/S aircraft. Since it was impossible to prepare for all the various operational scenarios, the committee recommended that the carrier should normally embark 12 Trackers, 8 Banshee fighters, and one S-55 helicopter for planeguard duties. If operational circumstances warranted, the navy could always reverse the ratio of fighters to ASW aircraft. Regardless, the carrier was left without adequate airborne early warning. This was particularly important if the carrier was operating in the eastern Atlantic area.

To overcome this operational deficiency, four possible alternatives were suggested: submarine pickets, surface pickets, large land-based AEW aircraft, and ship tethered early warning (STEW). None of these options were very appealing. "Submarine and surface pickets are expensive, provide insufficient flexibility and the latter are vulnerable. STEW, however attractive, will provide only a partial answer and has obvious drawbacks for use in the vicinity of a carrier". The RCN was also unwilling to rely exclusively upon land-based aircraft for early warning. The committee, recognizing the limitations of the carrier, recommended the acquisition of a second, and larger, aircraft carrier able to embark AEW and fighter aircraft.

Operationally this suggestion made sense, politically and economically it did not. The navy had never been able to sell the idea of a second carrier and to re-introduce the idea during tough economic times threatened to bring even more pressure on the navy to get out of carrier aviation.[40] When it became apparent that there was not going to be a second carrier, the idea of carrying ASW helicopters in Bonaventure was scrapped. Embarking helicopters would "result in an unacceptable reduction in the number of fighter and fixed-wing A/S aircraft, both of which will be carried in very small numbers".[41] Consequently, the PPCC decided to exclude operational helicopters - of any kind - for carrier use until a carrier to take them was available. This decision effectively ended the navy's quest for a second carrier.

The RCN's planned cuts to naval aviation cleared the way for the Chiefs of Staff Committee's approval of the 1957-1958 budget.[42] Naval aviation had been saved, but just barely. The RCAF and RCN still had to resolve the issue of control of ASW helicopters in maritime warfare.

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[40] Ibid. The committee proposed that Bonaventure be equipped with two first-line squadrons of 14 Trackers, eight S-58 helicopters, and one S-55 helicopter for planeguard duties. The second carrier would carry four first-line squadrons, consisting of: 20 Trackers, 12 Banshee fighters, eight S-58 helicopters, eight AEW aircraft (Tracker), and one S-55 helicopter for planeguard duties.

[41] See, Addendum to Report of Ad Hoc Committee on Naval Aviation, NSTS 1700-913, dated 20 November 1956, and: Minutes of the 85th and 86th Meeting of the PPCC, 26 November and 3 December 1956 respectively, DHist 1700-219 vol. 2 (Naval Aviation - General). Moreover, embarking helicopters would reduce the flexibility of the carrier A/S air group.

[42] See, Minutes of a Special Meeting of the Chiefs of Staff Committee, 14 June 1957, DHist 73/1223, files 1308-1309A; Minutes of the 514th Meeting of the Naval Board, DHist 1000-100/2; Minutes of the 113th Meeting of the Cabinet Defence Committee, 6-7 February 1957, DHist 73/1223, file 1331, and; Cabinet Conclusions, 1957, RG 2, vol. 1893. It should be pointed out that formal approval from the Chiefs of Staff was not required as the RCN's budget was set at $320 million dollars, and the navy had to abide by that figure.

The "New Look" (MC-48), which was adopted by the Canadian armed forces late in 1955 had increased pressure on the air force and navy to resolve their differences and come up with a blueprint for joint maritime operations. Concurrent with those discussions the RCN and RCAF were attempting to reach an agreement on control of the helicopters. The Sea/Air Warfare Committee had been struggling with that very issue for years, with little success. From the navy's perspective the COSC's plan to form a joint RCN/RCAF A/S helicopter squadron would only hinder the services in reaching an understanding.

By the end of June 1956, Captain's Edwards, who had replaced Landymore on the working party, and Lipton had completed the first phase of their study. They concluded that under the MC-48 concept the role of the helicopter was twofold: submarine detection, location and destruction and, secondly, mine location and destruction.[43] The chairman of the committee, Air Vice-Marshal C.R. Dunlap, was not entirely satisfied. "It was a valuable report, but not the report requested by the COSC, and it should be expanded to include recommendations on the intended areas of operation for the helicopters".[44] In addition, he wanted to see a clear statement on the suitability of existing helicopters in carrying out these roles. Having said that, the committee approved the working group's report. However, the future of helicopter operations in the navy hinged upon the results of the second phase of the study, which was being prepared by Captain P.F.X. Russell, DTASW, and Flight-Lieutenant

[43] Minutes of the 23rd Meeting of the Sea/Air Warfare Committee, NSS 1270-78-1, 5 July 1956, RG 24 83-84/167, vol. 11, file 1115-39 vol. 3, NAC.

[44] Ibid.

A.I. MacGregor, DAO/AO2, who had taken over the investigation from Captain Edwards and Wing Commander Marshall.

Although the study would not be ready for several more months, in September Captain Russell reported to the VCNS that progress was better than anyone had expected. An agreement had been reached on a concept and plan of operations in Phase I of a global war. Helicopters would operate from ships in the combat zone, and from shore bases in support of SOSUS stations (ie. Cabot Straits, Cape Race, Straits of Belle Isle, Dixon Entrance, etc). Surprisingly, he disclosed that "contrary to opinions expressed earlier in the year the RCAF working members are not challenging the requirement of the RCN to operate helicopters from ships or those required for minesweeping. They have also expressed the opinion that the RCN might operate shore-based helicopters which are required in the vicinity of an already established RCN air activity, ie. Halifax area".[45] Nevertheless, the RCAF would retain responsibility for operating shore-based helicopters in other areas.

Given this change in attitude of the RCAF ' aptain Russell believed that the time had come for the navy to press its case for control of all ASW helicopters. Recognizing that this might not be the wisest course of action, he presented Lay with three other options:

> (a) Agree that the RCAF should be responsible for all shore based helicopters in accordance with the RCN/RCAF agreement of March 1946.

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[45] Memorandum, "Control and Operation of Helicopters," NSS 1115-39, 18 September 1956, Captain P.F.X. Russell, DTASW, to Rear-Admiral H.N. Lay, VCNS, RG 24 83-84/167, vol. 11, file 1115-39 vol. 3, NAC. Captain Russell does not mention names in his memorandum. Is he referring to the air force as a whole or to specific air force officers who sat as members of the Sea/Air Warfare Committee? Without that information it is virtually impossible to explain the RCAF's change of heart. It should be pointed out however, that there had been a change in the membership of the committee during the course of the year.

(b) The RCN operate all helicopters employed in anti-submarine warfare whether based ashore or afloat.

(c) RCN be responsible for helicopters operating from ships and some of those operating from shore where the requirement is convenient to already established Naval Air Facilities. This is a compromise.[46]

Although Rear-Admiral Lay concurred with Captain Russell's inclination to push for more, he proceeded cautiously. In a memorandum to the CNS, Lay furnished an overview of most of the important negotiations, reports, and decisions of the various boards and committees relating to the helicopter since 1953, including creation of the experimental squadron, and training and procurement issues. He paid particular attention to previous papers which had recommended that the navy assume control of all helicopters employed in the maritime role. Lay was quick to point out that the LAW Committee recommended that the Canadian armed forces only procure the Bell 47 and Sikorsky S-58 helicopters. He then informed the CNS of the RCAF's most recent encroachment upon its territory. "The RCAF, without consulting the RCN, has allocated an H-21 helicopter from their SAR Squadron at Greenwood to Arnprior for conversion to the ASW role and has ordered sonar equipment".[47]

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[46] According to Captain Russell the requirement for ASW helicopters afloat would be approximately 4 times the shore requirements (ie. 12 ashore vs 40-50 afloat, not including minesweeping requirements). From a financial perspective it was more economical for the RCN to operate the helicopters thus avoiding duplication of overhead and training faci' ies. The main disadvantage were the additional expenditures which would be required to operate the stations and maintenance facilities, and its affect on the balance of forces in the RCN (ie. possibility of reducing the number of ships in commission).

[47] Memorandum, "Control and Operation of Helicopters," NSS 1115-39 (Staff), 10 October 1956, VCNS to CNS, RG 24 83-84/167, vol. 11, file 1115-39 vol. 3, NAC. The VCNS also pointed out that the H-21 was not being used by the USN for either ASW or minesweeping. Nor is it one of the helicopters recommended by the LAW Committee. It would appear, therefore, that to introduce this type of helicopter into HS-50 would duplicate the work already done by the USN to determine the most suitable helicopter for maritime

Clearly, Rear-Admiral Lay resented what he perceived to be an intrusion upon the RCN's role. He asked the CNS for a decision on whether the navy still wished to pursue control of all maritime helicopters.

Vice-Admiral DeWolf responded the following day. In a particularly revealing comment, he stated:

> I do not [emphasis in original] want to press now for RCN control of all helicopters in ASW. However, I believe the RCN case is sound and am [sic] prepared to argue it when the time comes. I am also prepared to abide by any COSC decision. The time to put our case forward is when we know what we want to do, and what we want to procure. In the meantime we cooperate.[48]

The new CNS certainly had the measure of his opponents. Equally important, he recognized the seriousness of the situation facing the navy given budgetary constraints and opposition to the new aircraft carrier. In the midst of a fight for the very survival of naval aviation it would be foolhardy to press for control of all ASW helicopters. The service could lose all in such a gamble, and at the very least disrupt the ongoing inter-service talks on the joint concept of maritime warfare.[49]

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operations. Furthermore, it would introduce maintenance and other complications.

[48] Minute Sheet, 11 October 1956, CNS to VCNS, RG 24 83-84 167, vol. 11, file 1115-39 vol. 3, NAC.

[49] Eleven years after the end of the Second World War the Canadian navy found itself again in very similar circumstances to those in late 1945. Then, Commodore DeWolf was ACNS, and the RCN was in the middle of negotiations with the RCAF for control of the air bases. At that time the navy agreed that the air force would operate all aircraft normally operating over the land and the sea which are normally based permanently on shore. That agreement, signed in March 1946, was still in effect and continued to haunt the navy. Then, as now, the RCN had the opportunity to pursue single service control of maritime air operations. In both instances the navy choose not to because of the stringent restrictions upon manpower and the budget. See, Shawn Cafferky, "Towards the Balanced Fleet: A History of the Royal Canadian Naval Air Service, 1943-1945," (Victoria: University of

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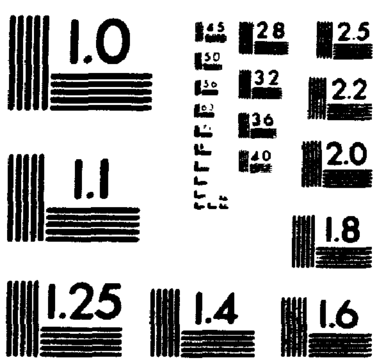
PM-1 3½"x4" PHOTOGRAPHIC MICROCOPY TARGET
NBS 1010a ANSI/ISO #2 EQUIVALENT



As noted earlier, the RCN and RCAF began discussions on the joint concept of maritime warfare in early 1956, following the adoption of MC-48. Those discussions took place on a number of levels, including the Chiefs of Staff Committee, the Sea/Air Warfare Committee, and within various internal boards. Only the first two committees concern us here.

The joint concept of maritime warfare was designed to serve as a basis for force levels and equipment requirements for the RCN and RCAF and, since it was issued during the initial re-organization of maritime forces under a single Maritime Commander on each coast, it served as a planning guide until such time as the integrated Maritime Headquarters could complete their own evaluation of the threat and develop concepts to supersede this basic document.[50] In its final form, the joint concept of maritime warfare was based upon a two phase global war, as postulated by NATO's MC-48 plan, SACLANT's views on Atlantic operations ("Pattern of Naval Forces for NATO Control of the Atlantic during the next Decade") and the Canadian government's preference to contribute to the initial phase of the war, within the MC-48 concept.

The MC-48 concept envisioned a war of short duration, probably less than thirty days, to gain atomic superiority, and a subsequent phase of re-adjustment and follow-up leading to the conclusion of the war. By 1960, according to intelligence estimates, the Soviet Union

Victoria, Unpublished M.A. Thesis, 1989), pp. 180-217, and; Shawn Cafferky, "Flying High: The Royal Canadian Naval Air Service, 1944-1946." (Unpublished DHist Narrative, 1992), pp. 79-88.

[50] "RCN/RCAF Concept of Maritime Operations," CAS to AOC MAC, 7 April 1960, RG 24, Series C, vol. 1, file 098.105, NAC.

would be able to operate 31 submarines off the east coast and 17 submarines off the west coast. A number of these submarines would probably be missile launching types, capable of firing surface-to-surface missiles with nuclear warheads over a distance of 500 miles against land targets.[51] Possible enemy operations included attacks on naval and merchant shipping with conventional and nuclear weapons; the sewing of conventional and nuclear mines in harbour approaches and coastal areas; and the use of missiles against such priority land targets as SAC bases and key industrial areas.[52] Fully 30% of U.S. warmaking capacity was located within 100 miles of the coasts, and:

> It is expected that Soviet naval forces will use modern weapons; the Soviet naval weapons which could be readily deliverable in 1960 pose a most significant threat to that portion of the atomic striking forces of the United States and the combined warmaking potential of Canada and the United States.[53]

Accordingly, Canadian naval authorities noted that "maritime force patterns which will be derived are those necessary for the successful conduct of general nuclear war with the

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[51] "RCN/RCAF Concept of Maritime Operations," NSTS 1279-155 (Staff), 2 April 1957, DHist 74/723. Submarines armed with guided missiles would be able to surface and complete missile launches in 5-15 minutes, and for launches at ranges in excess of 200 miles, an in-shore guidance submarine could provide such guidance from periscope depth. See also, "An Appreciation of the Threat to North America of Submarine-Launched Missiles Carrying Nuclear Weapons," Operational Research Group, 14 August 1958, RG 24 83-84/167, vol. 2043, file S-5151-49-1 vol. 1, NAC, and; "Some Factors Pertinent to the MC-48 War Concept," and "Force Requirements for the Support of Sound Surveillance Systems," DNPO to ACNS (P), 14 February 1956, RG 24 83-84/167, Box 457, file 1650-26 vol. 15, NAC.

[52] See Appendix VII, for a list of possible targets in the Canadian area.

[53] "RCN/RCAF Concept of Maritime Operations," NSTS 1279-155 (Staff), 2 April 1957, DHist 74/723.

Canadian contribution geared to the protection of North American coasts".[54] Strategic surveillance became the watchword of the RCN.

Canadian naval planners envisioned three defensive zones. The "Denial Zone" extended 200 miles out from the coast and met an "Inner Combat Zone", which extended from 200 miles to the maximum effective CAESAR range. The principal submarine destroying forces would operate in this zone. Beyond this was the "Outer Combat Zone", which extended approximately 100 miles seaward from the boundary of the inner combat zone, and was where constant surveillance might give early warning of the approach of Soviet submarines. Tactical operations would force the submarine to traverse this area submerged.[55] Barrier forces would operate in these last two zones. Most of the projected Canadian maritime forces were designed to fight within the Inner Combat Zone on the Atlantic coast and in an equivalent zone off the Pacific coast.

Force structure improvements necessary for the effective implementation of the concept were underway by 1956/1957. Late in 1955, following the ratification of the MC-48 concept, the Canadian Chiefs of Staff Committee affirmed that, given the new threat:

> ...it was considered essential that naval ships and aircraft should be well-armed...both ships and aircraft should have the best that can be provided both in anti-submarine and anti-aircraft weapons...current naval plans have been designed to fit NATO and national commitments. The RCN has considered the implication of nuclear weapons

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[54] Ibid.

[55] It was hoped that, area saturation by air and naval forces employing harassing techniques would: increase crew fatigue, run down the submarine's batteries, reduce his mobility and thus opportunity for attack, and deny the submarine the use of electronic or visual aids. See, "Concept of Anti-Submarine Operations in the North Atlantic," NSS 1270-78, n.d. (probably circa 1955), RG 24 83-84/167, vol. 89, file 1270-78-1 vol. 2, NAC.

> in maritime warfare and as a result has eliminated from their programme ships and weapons which have marginal performance.[56]

Despite this clear recognition of the threat, the Chiefs of Staff Committee only approved the joint concept of maritime warfare on 17 April 1957, with the stipulation that the CNS and CAS consult with their American counterparts to determine U.S. plans.

According to Sean Maloney, another important factor in the overhaul of Canada's maritime fc ces was the 1957 SACLANT Future Capabilities Plan, which incorporated the use of nuclear weapons in ASW operations. This study concluded that nuclear depth charges deliverable by all types of units should be in common supply. Canadian planners believed that:

> The lack of nuclear weapons will make Canadian forces less effective and if it planned to introduce nuclear weapons into Canadian ASW forces by 1957, it is necessary to incorporate design changes in aircraft and ships at an early date.[57]

Nuclear weapons were considered necessary for a number of reasons. The effectiveness of conventional ASW weapons against the new Soviet submarines was questionable, particularly because of the difficulties existing Allied ASW forces could have in accurately locating them. Moreover, there was a good chance that conventional weapons would only damage the submarine and not impair its ability to launch missiles.

To combat the threat, the RCAF's Maritime Air Group had now reached a strength of three Argus and one Neptune squadron on the east coast, and one Neptune squadron on

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[56] Minutes of a Special Meeting of the Chiefs of Staff Committee, 26 October 1955, DHist 73/1223, Series 3, file 1308B.

[57] "Nuclear Weapons for ASW," Sea/Air Warfare Committee, 5 January 1956, RG 24 83-84/167, vol. 89, file 1270-78-1 vol. 3, NAC, in Sean Maloney, "Parry and Thrust: Canadian Maritime Forces and the Defence of North America, 1954-1962," p. 13.

the west coast.[58] For its part, the RCN committed the aircraft carrier - with its mix of Trackers and fighters - 18 ASW destroyers and 13 ASW frigates, and approximately 40 of its shore-based long-range maritime patrol aircraft (Trackers) to SACLANT. The Pacific Command had received 7 ASW destroyers, and 5 ASW frigates.[59] The navy also planned to introduce fleet replenishment ships so that the ships on station could provide continuous surveillance. Curiously, there was no mention of helicopters in the joint concept of maritime warfare despite the fact that earlier RCN/RCAF planning papers, including the "Concept of Anti-Submarine Operations in the North Atlantic" specifically mentioned them. In fact, the latter paper concluded that helicopters were particularly important because of their ability, unlike other aircraft, to carry out a continuous sub-surface search and carry weapons.[60]

The second part of the working party's study on control of helicopter operations was held up pending a decision of the Chiefs of Staff Committee on the RCN/RCAF concept of maritime operations.[61] It would take the Sea/Air Warfare Committee an additional ten

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[58] "RCAF Programme of Activities, 1961-1966," DHist 73/430. Thirty-three Argus aircraft entered service with the RCAF between 1957 and 1960. A modification of the basic Bristol Britannia design the new planes carried the latest ASW equipment, including 21 radio and radar installations, MAD, sonobuoys, and a device for air navigation and tactical air control (ANTAC). The Argus, heavily armed with large bombs, missiles and homing torpedoes and with a maximum endurance of 24 hours at reconnaissance speed, was a powerful addition to the anti-submarine forces. The Argus was capable of carrying nuclear depth bombs.

[59] Minutes of the 551st Meeting of the Naval Board, 13 November 1957, DHist 1000-100/2.

[60] "Concept of Anti-Submarine Operations in the North Atlantic," NSS 1270-78, n.d., RG 24 83-84/167, vol. 89, file 1270-78-1 vol. 2, NAC.

[61] "Change of Chairmanship - Turnover Notes," Captain W.M. Landymore, Chairman Sub-Committee Sea/Air Warfare Committee, NSS 1270-78-1 (Staff), 9 July 1957, RG 24 83-

months, from the time the Chiefs of Staff Committee approved the joint concept on maritime warfare, to complete the second phase of its study.

On 10 January 1958, the Sub-Committee of the Sea/Air Warfare Committee submitted its recommendations to the main committee. At that meeting, Group Captain R.A. Gordon, DMTRO, and Chairman of the Sub-Committee, concluded that the helicopter did have a role in maritime warfare, and that role was bifurcated: A/S helicopters operating from naval vessels, and from shore bases in support of the joint maritime concept. The Sub-Committee recommended, therefore, that the RCN be given responsibility for the operation and control of ship-borne ASW helicopters, while the RCAF assumed responsibility for the shore-based helicopters, although the specific role of shore-based helicopters was yet to be determined.[62] Even at this late date some RCAF members of the committee wanted to delay submitting a final report to the Chiefs of Staff Committee. Captain Russell, Director of Undersea Warfare (DUSW), pressured the committee for an interim report noting "there is no requirement at present for shore-based A/S helicopters, and as the role of shipborne A/S helicopters has now been identified, the SAWC should report to the COSC that the study has been completed".[63] Rear-Admiral H.N. Lay, VCNS, and chair of the committee, agreed, noting the RCN's desire to have it on the record should the navy wish to procure ASW helicopters the following year.

84/167, vol. 89, file 1270-78-1 vol. 4, NAC. On 1 July 1957 the RCAF assumed the responsibility for the Chairmanship of the Sub-Committee of the Sea/Air Warfare Committee.

[62] Minutes of the 30th Meeting of the Sea/Air Warfare Committee, NSS 1270-78-1, 10 January 1958, RG 24 83-84/167, vol. 89, file, 1270-78-1 vol. 4, NAC.

[63] Ibid. Air Vice-Marshal C.R. Dunlap, VCAS, considered it untimely to try and identify the role of shore-based helicopters at this time.

Within two weeks of the Sea/Air Warfare Committee's decision, an interim report was drafted and sent to the COSC.

The COSC approved the Sea/Air Warfare Committee's recommendation with remarkably little debate on 28 February 1958. This removed many, but not all, of the remaining obstacles in the RCN's path.

CHAPTER NINE

INTEGRATION OF THE ASW HELICOPTER

INTO THE FLEET, 1957-1961

In the spring of 1956, the navy began the process, on paper at least, to integrate the ASW helicopter into the fleet. It will be remembered that on 25 April 1956 the Director of Naval Aviation called together his staff to discuss the re-appraisal of the 1960 A/S helicopter staff requirement. At that meeting Mr. Orr, of the Defence Research Board, expressed his surprise that the navy did not consider the helicopter to be the main weapon of the escort. Accordingly, Commander Hunter, Deputy Director of Naval Aviation, had Mr. Orr's suggestion incorporated into the staff paper being prepared on the subject.[1] This staff paper influenced Commodore H.P. Sears', ACNS (Air), decision later that same year that "helicopters would operate from St. Laurent class destroyers as a permanent addition to the ship rather than the previous requirement of an escort just catering for refuelling and re-arming a helicopter".[2]

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[1] See chapter eight of this thesis, and; "Minutes of a Meeting Held in DNA's Office on 25 April 1956, to Discuss the Re-Appraisal of the 1960 A/S Helicopter Staff Requirement." NSS 1115-39 (Staff), RG 24 83-84/167, vol. 11, file 1115-39 vol. 2, NAC.

[2] Minutes of a Meeting to Discuss Helicopter/Escort Trials held on 28 December 1956, in ACNS (Air's) Office, NSC 8700-8 (Staff), 11 January 1957, RG 24 83-84/167, Box 3827, file S-8260-11 vol. 1, NAC.

Less than a year later, following the completion of additional tactical trials in the spring of 1957, sufficient data was available to produce a staff paper on the concept of employing A/S helicopters from escort vessels.[3] That paper, prepared by Captain Russell, then DTASW, in consultation with various headquarters directorates and committees, recommended that "the Naval Staff approve the requirement to carry fully instrumented, manned A/S helicopters as part of the anti-submarine system in ships of the St. Laurent/Restigouche class and later".[4] To that end, he called for additional trials using a ship of the St. Laurent/Restigouche class. Russell's recommendation for the manned helicopter reflected a consensus within the navy against an alternative system, the unmanned drone helicopter that the USN was developing.

The drone helicopter was one of a number of ideas that the USN pursued in its search for a stand-off anti-submarine weapon that was compact enough to be carried within the very limited space available in a destroyer. One of the initial efforts, proposed in 1953, was the Rocket Assisted Torpedo (RAT), which featured a lightweight homing torpedo carried by a ballistic rocket to a range of about 5,000 yards. RAT proved inaccurate, and was abandoned in 1957 in favour of the Anti-Submarine Rocket (ASROC), a heavier and much more

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[3] Chapter seven above has a review of those tactical trials. The report submitted to headquarters following the trials in Key West, Florida, noted that "from the limited trials conducted considerable tactical advantage can be obtained from the use of helicopters in that, in suitable weather, they have the capacity to improve the range at which lethal weapons can be launched, or improve the rate at which doubtful sonar or radar contacts can be investigated".

[4] Memorandum, "The Concept of Employing Anti-Submarine Helicopters from Escort Vessels," NSS 1115-39 (Staff) 23 July 1957, Captain P.F.X. Russell, DTASW, to ACNS (W), DHist 79/246, file B-5. See also, RG 24 83-84/167, vol. 11, file 1115-39 vol. 3, NAC.

sophisticated piece of equipment. As Friedman notes, it was believed that even the lighter RAT would be far too massive to be accommodated aboard a standard Gearing class destroyer.[5]

In 1956 the USN's Atlantic Destroyer Force (DESLANT) proposed an alternative means of stand-off delivery, initially referred to as DAT (Drone Assisted Torpedo). The Chief of Naval Operations approved development in August 1957 as Drone Anti-Submarine Helicopter (DASH).[6] This is not to say that the USN abandoned the larger manned A/S helicopters: they were embarked in the aircraft carriers. Similarly, the RN also chose to carry the larger helicopters in its carriers. The RCN, as we have seen, could not do so because of the limited hangar space available in HMCS Bonaventure. The USN had at one time intended to use the big all-weather helicopters on the largest destroyers but the DASH superseded those plans.

The DASH concept was jointly developed by Kaman Helicopter Corporation and DESLANT. Success in vectoring manned helicopters for ASW attacks inspired the drone concept. The first trials were conducted with a small HUL-1 (Bell 47) helicopter operating from USS Mitscher in February 1957. Similar experiments soon followed using the HTK-1

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[5] ASROC carried the Mark 44 or Mark 46 lightweight torpedo, and had a range of between 1.2 and 10 nautical miles. This weapon had a short flight time and could put the torpedo in the water quickly. This gave the surface warship a considerable tactical advantage since a submarine, once localised and tracked long enough for a fire control solution to be worked out, can be attacked immediately. More important, ASROC, unlike helicopters of the day, could operate in all types of weather around the clock. The British equivalent to ASROC was known as Ikara.

[6] Norman Friedman, U.S Destroyers: An Illustrated Design History, (Annapolis: Naval Institute Press, 1982), pp. 280-287; Charles H. Kaman and R.H. Jones, "Evolution of the Helicopter," in Vertical Flight: The Age of the Helicopter, pp. 85-99.

training helicopter. From the outset, drone helicopters were seen simply as weapon carriers which were guided to the datum point by the destroyer. The destroyer coordinated sonar and radar information, and controlled the release of the weapon. DAT helicopters were pilotless aircraft weighing approximately 1,000 pounds, including the weight of the two torpedoes (Mark 43) and the fuel.[7] Because of their small size the USN believed, incorrectly as it turned out, that relatively few ship modifications would have to be undertaken in order to embark these aircraft. Early plans envisioned these helicopters operating om the fantail of a destroyer, on a temporary flight deck and without a hangar. The Canadian navy's vision for a viable long-range weapon system - manned ASW helicopters operating from small warships - was both unique and certainly well ahead of similar programmes in both the British and the American navies.

The USN believed that recovery of the drone helicopters would not present any problems. In fact, the helicopter used onboard Mitscher was outfitted with a canvas fire hose wrapped around the skids to adhere to the non-skid paint on the flight deck. Later, the USN began to investigate another idea where "a line from the DAT is bent into a hauling in line and hauled in by manpower or a winch and operator and the DAT is eased into a cradle".[8] This concept for recovery of the drone helicopter was still in the experimental stages and would not be operational for some time.

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[7] It should be pointed out that the HUL-1 helicopter could carry one pilot, but rarely did.

[8] See, Minutes of the Anti-Submarine Plans and Policies Group Meeting, OP-312/cjl, 5 February 1957 and 5 March 1957, in DHist 79/246, file B-5.

For the USN, drone helicopters provided tactical flexibility not found in either the RAT or ASROC systems, despite the fact that these machines suffered from the same limitations as the larger manned helicopters, namely the inability to operate in poor weather or at night. Having said that, both the manned and unmanned helicopters operated at longer ranges than either RAT or ASROC.[9]

Drone helicopters were attractive for other reasons as well. Because of their size they cost less than manned helicopters ($100,000 vs 600,000 to 800,000 per machine) and the escort could carry as many as thirty. Moreover, because drone helicopters did not carry a crew, aircrew safety was not an issue, and for that reason alone some believed they were expendable weapons. Regardless of these attributes, DASH helicopters were not as capable as manned ASW helicopters.

Classification of the contact was the chief problem. DASH helicopters, like the RAT and ASROC weapons systems, were dependent upon a ship's hull-mounted sonar. Although the new SQS-23 sonar promised longer ranges, it did not solve the problem of detection of submarines operating below the thermal layer. Variable Depth Sonar (VDS), in which the transducer was mounted at the end of a cable that could be lowered below the gradient, looked like the answer. Development, however, was encountering difficulties and delays even though experiments with the system began as early as 1948. In the Canadian context, the initial requirement for VDS had arisen because of extreme temperature gradients off the east

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[9] Both RAT and ASROC were already operating at the limits of the ship-borne radars and sonars (ie SQS-4 had a range of 2,000 to 4,500 yards) of the day. To enhance the ship's ability to track the smaller drone helicopter, and increase its range the USN planned to outfit the helicopters with transponder beacons.

coast, that in the Second World War had enabled U-boats to escape detection by conventional sonars in the shallow water areas of the Gulf of St. Lawrence and off Halifax harbour. By 1953, as Soviet submarines acquired increased underwater performance and were able to launch longer range missiles, the need shifted to longer initial detection ranges, ie. early warning".[10] VDS, with its ability to "channel" its transmission beneath the temperature gradients over great distances looked like the answer. Unfortunately, it would be another ten years before VDS was ready for service in the fleet.[11]

The advantage of the manned helicopter was that it carried both sensors - dunking sonars and passive sonobuoys - and thus extended the search and striking range of a warship far beyond that of RAT, ASROC and DASH. The main drawback of the manned helicopter, compared to weapon systems like ASROC, was its inability to operate in all types of weather, a critical limitation in the severe conditions of the north Atlantic. Captain Russell asked the Directorate of Naval Weather Service to undertake a detailed study of meteorological conditions in light of the helicopter's capabilities. The weather service found that "aircraft when flown from escort type vessels would provide a weather availability factor of 72.4% in

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[10] Lieutenant D. Brassington, "The Canadian Development of VDS," in Maritime Warfare Bulletin, (Commemorative Edition, 1985), pp. 51-54. According to Brassington, "the first time the system went to sea for trials a submarine contact was achieved at a range of 27,500 yards. When you compare this with the typical 5,000 to 7,000 yard performance of the sonar it was replacing the success of this development really comes into sharp focus".

[11] The USN, for example, did not believe that VDS could be carried on a ship of this size. During the early trials with VDS the USN streamed the array from the side of the ship, which meant even less space was available on the deck for other weapon systems.

those areas where RCN forces are most likely to be employed in a future war".[12] This figure was based upon the availability of the HSS-1N aircraft scheduled to enter service in 1959 which, unlike the S-58 helicopter, could operate at night and on instruments.

In September 1957 the Naval Staff considered Captain Russell's paper which bluntly declared that the "concept of embarking manned helicopters in escort vessels was designed to improve the ASW effectiveness of HMC Ships in locating and attacking the fast submarine. Russell also argued that this concept was particularly attractive because of the difficulties of embarking helicopters in Bonaventure in addition to her complement of fixed-wing ASW and fighter aircraft,"[13] and he explained the inadequacies of drone aircraft. The Staff, however, could not fully accept Russell's recommendation that helicopters be carried in St. Laurent class and all follow-on classes. It was premature. Such large decisions should await "completion of the Ottawa trials and consideration of other possible armament modifications to these ships". Instead, the Staff recommended to the Naval Board that "the use of manned helicopters as part of a ships weapon system would considerably improve the ASW effectiveness of the ship".[14]

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[12] Memorandum, "Effect of Weather on Small Ship Helicopter Operations," NSS 8260-11 (Staff), 18 June 1957, W.F. Ganong, Director of Naval Weather Service, to DOR (N) and DTASW, DHist 79/246, file B-5; Memorandum, "The Concept of Employing Anti-Submarine Helicopters from Escort Vessels," NSS 1115-39 (Staff), 23 July 1957, DTASW to ACNS (W), DHist 79/246, file B-5, and; RG 24 83-84/167, vol. 11, file 1115-39 vol. 3, NAC.

[13] Minutes of the 22/57 Meeting of the Naval Staff, 17 September 1957, DHist 1000-100/3.

[14] Ibid.

It had been less than six months since the tactical trials with St. Laurent and Buckingham off the coast of Florida. In that time the platform had been removed from the frigate, enlarged to carry the bigger S-58 helicopter, and fitted to Ottawa. Escalating costs for a temporary hangar, made of canvas, aboard Ottawa forced a change of plans to include the carrier in the trials.[15] Commodore H.P. Sears, ACNS (Air), explained "the helicopter can be transferred to the carrier for shelter if spray conditions were likely to be serious enough to cause damaging corrosion".[16] Admiral DeWolf agreed, "partly to avoid the necessity of constructing a hangar but also in the interest of safety so that flying from the escort could be pressed to the limits of feasibility [the carrier would accompany Ottawa]".[17]

The Directorate of Naval Aviation was charged with the task of finding a helicopter for the trials. Lieutenant-Commander Ken Gibbs, as Liaison officer for the project at headquarters, approached the RCAF, and successfully negotiated the loan of one H-34 (naval designation, S-58) helicopter for the trials. In addition, the RCAF was to supply one pilot and the necessary maintenance crews; the RCN provided two pilots, Lieutenant-Commander W.H. Frayn, Project Officer, and Lieutenant G.W. Clarke, and five aircraft handlers.[18] The

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[15] The costs of fitting the platform had risen from $2,000 to $15,000 dollars. A canvas hangar would add an additional $30,000 to the cost of the trials.

[16] Memorandum, "Helicopter Trials," NSC 8260-11 (Staff), 6 August 1957, Commodore A.H.G. Storrs, ACNS (Warfare), to VCNS, RG 24 83-84/167, Box 3827, file S-8260-11 vol. 2, NAC.

[17] Ibid.

[18] All the spare gear and servicing equipment, along with one pilot (Flight Lieutenant Lloyd Cummings) and a maintenance team consisting of seven personnel were supplied by 108 Communication Flight, RCAF Station, Rockcliffe. The Flag Officer Atlantic Coast had to make available one helicopter from HU-21 to carry out the SAR duties.

RCN pilots underwent a two-week conversion course on the H-34 helicopter at RCAF Station, Rockcliffe. Before the trials could begin some modifications to the helicopter, essential for naval operations, were carried out.[19]

This creation of a joint RCN/RCAF squadron for the trials came about for a number of reasons. The Chiefs of Staff had been putting a great deal of pressure on both services to eliminate duplication and cut costs. Admiral DeWolf decided that the navy would cooperate with the RCAF until the navy knew what type of helicopter it wanted to procure for ship-borne ASW operations. Equally important, the RCN did not own an S-58 helicopter, and one had to be employed in the trials if the navy was to accurately assess the capabilities of the most promising ASW helicopter technology. Adding to the problem was the fact that he Sea/Air Warfare Committee had not, as yet, submitted its recommendations to the COSC regarding control of ASW helicopters in maritime warfare. The formation of the joint squadron should not be seen as the end of inter-service wrangling over the control and operation of ASW helicopters. The RCN viewed the creation of the squadron as a necessary evil in order to complete the next series of trials.

COMOPVAL, in conjunction with the Trials Project Officer, developed the project plan. The primary object was to determine the feasibility of operating HSS type helicopters

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[19] See, Memorandum "H-34 (S-58) Helicopter Trials - HMCS Ottawa, NSC 1680-50 Staff/SE-42, 19 September 1957, Captain P.F.X. Russell, Director Undersea Warfare, to ACNTS (Air), RG 24 83-84/167, vol. 491, file C-1680-50 Staff/SE-42, NAC. The H-34 helicopter was not equipped with dunking sonar and there were no plans to do so. The H-34 helicopter was equipped with VHF radio, while Bonaventure and Ottawa were outfitted with UHF. To ensure compatibility with existing ship-borne communications systems a UHF radio and antenna had to be fitted in the helicopter. In addition, do-nut emergency floatation gear had to be fitted to the aircraft.

from St. Laurent/Restigouche class destroyers in the north Atlantic over an extended period. The trial would also determine: the suitability of the HSS helicopter for helicopter/escort operations; the effect of weather and corrosion on the aircraft; the all-weather limitations of the S-58; the effects of rotor and fuselage icing; personnel requirements for an escort borne helicopter; the capability of destroyer escorts to track the helicopter by ship's radar over long ranges, and; maintenance and serviceability requirements, including the type of hangar required.[20] Five weeks of intensive flying, measurements and evaluation of various systems would be required to complete these trials.

On 18 October 1957, following embarkation of Squadron HS-50's stores and equipment, HMCS Ottawa slipped her moorings and proceeded into Bedford Basin for deck landing trials, which gave the aircraft handlers and maintenance personnel - particularly the RCAF personnel - an opportunity to familiarize themselves with flight deck procedures.[21] On 23 October, Ottawa, in company with the aircraft carrier, departed Halifax and shaped course for Londonderry. During the course of the 38 day evaluation the weather varied from calm seas and clear air to sixty knot winds, high seas and poor visibility - typical weather for the

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[20] "Operational Evaluation Project Assignment Letter - The Feasibility of Operations HSS (S-58) Helicopters from St. Laurent/Restigouche Class Destroyers Escorts," Enclosure A, NSC 1680-50 Staff/SE 42, 30 August 1957, RG 24 83-84/167, vol. 491, file C-1680-50 Staff/SE 42, NAC. For a detailed project plan see, "Project Plan COMOPVAL Project Staff/SE 42 - Operation of Anti-Submarine Helicopters from Escort Type Ship HMCS Ottawa and HS 50 Detachment One." Staff/SE 42, 8 October 1957, Prepared by Commander, Operational Evaluation Organization, RG 24-83-84/167, vol. 491, file C-1680-50 Staff/SE 42, NAC.

[21] This was not the first time a helicopter landed aboard Canada's newest St. Laurent class destroyer. In April 1957, Ottawa joined Task Unit 301.1.2, for ASW exercises off the Florida coast. Helicopters joined the ships and, for the first time, Ottawa had these aircraft land on and take-off from a temporary flight deck, rigged on her quarter-deck.

north Atlantic during this time of year. Twenty-one days were spent on the open sea, four days in the Northern Ireland exercise area, and 13 days in harbour. These trials were a clear success. The helicopter flew, or could have flown 75% of the available daylight hours.[22]

As the previous trials aboard Buckingham had demonstrated the moment immediately after touch-down, and the deck handling that had to take place that instant were the most critical - and dangerous - stages of ship-borne helicopter operations. "It takes the [aircraft] handlers about 10 seconds to secure the primary lashings and until these are on, there is nothing to prevent the helicopter from shifting position". Equally precarious were attempts to move the aircraft around the flight deck. In fact, "deck handling was considered unsafe except in calm or moderate sea states. There was insufficient space on the flight deck to use a steering arm and the weight of the aircraft [precluded] manual handling".[23] These findings corroborated previous test results, especially as they related to landing operations.

The trials showed that while the dimensions of the flight deck (47 x 40 feet) were adequate for the operation of the helicopter, a longer platform would provide increased safety under difficult conditions. Construction of a longer flight deck fitted over the after ASW

[22] "Final Report on COMOPVAL Project Staff/SE 42: The Feasibility of Operating an HSS Helicopter from St. Laurent/Restigouche Class Destroyer Escorts," Staff/SE 42, 4 March 1958, prepared by Lieutenant-Commander C.J. Benoit, Commander, Operational Evaluation Organization, RG 24 83-84/167, vol. 491, file C-1680-50 Staff/SE 42, NAC. The helicopter could operate in sea and swell heights of 12-18 feet, while anything over 18 feet was considered dangerous. Similarly, in wind speeds over 45 knots helicopter operations were deemed unsafe. Flying operations could not be carried out when the ship rolled more than 12-15° degrees (on average). The total time of daylight during the 38 day trial, was 350 hours. The helicopter was unserviceable for 88 hours in this period. Based upon these figures the aircraft was serviceable for 75% of the time.

[23] Ibid.

mortar well was not feasible, and thus the navy had to consider other alternatives. The only suitable position for a platform was atop the after superstructure extending aft over the 3"/50 gun. This meant moving the hangar as far forward as possible - towards the funnel.

The Naval Constructors Branch had been investigating, since the fall of 1956, the best position for a flight deck on a St. Laurent class destroyer, and had decided on two alternatives. The first option was to place the platform aft of the after mortar well. The second choice was to place the platform midships, fitted abaft the funnel and over the torpedo deckhouse. Both platforms were acceptable to DNA, although the midships platform was preferred because it offered a larger landing area (40 x 76 feet), gave unrestricted arcs of fire to the Limbo mortars, provided better protection from the weather, and was closer to the ship's centre of gravity, which reduced the pitching angle. This option, however, entailed major modifications to the ship, and required approval from both the Cabinet Defence Committee and the Treasury Board. By contrast, the stern platform required little in the way of alterations to the ship, was relatively cheap to construct, and did not require higher approval. The main drawback to the stern platform was that it restricted the stern arcs of fire of the after mortar.[24]

To overcome the aircraft handling problems, COMOPVAL recommended the installation of "centring rollers in the forward area of the platform for centring the

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[24] See, "Restriction on the Arcs of Fire of A/S Mortar Mk. 10 St. Laurent/Restigouche Class Escorts," NSS 8260-11 (Staff), 4 June 1957, DNA to DTASW, RG 24 83-84/167, Box 3827, file S-8260-11 vol. 1, NAC, and: "Restriction of the Limbo Arc of Fire by Proposed Helicopter Platform," NSC 8260-11 (NCC), 21 March 1957, DOR to DTASW, RG 24 83-84/167, Box 3827, file S-8260-11 vol. 1, NAC.

helicopter...."[25] The navy was coming to the realization that deck handling and the rapid securing device were complementary pieces of equipment, and that the problems had to be tackled simultaneously.

As seen in chapter seven, the navy had begun to give methods of securing the helicopter close study since early 1955. In monitoring British and American projects, Canadian officers came to realize that the RCN would have to develop its own equipment and technologies if the helicopter project was to succeed.

Genaire Company Limited, which had entered the field with a proposal for a complex system in 1954, presented a fresh idea in 1956 that was the essence of simplicity.[26] Mr. Picken, President and Chief Engineer of the company, proposed using suction cups attached to the helicopter instead of wheels. "A small suction motor inside the aircraft expelled air from the cups immediately the aircraft touches down, and also breaks the suction just prior to take-off". The naval officers who studied the idea thought it had some promise, but it was never pursued.[27]

In January 1957, the Naval Constructors branch submitted its own proposal to headquarters.

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[25] Ibid. During the Buckingham trials Lieutenant-Commander Benoit had reached the same conclusion.

[26] At this time three companies had shown interest in designing a collapsible hangar and rapid securing device for the RCN. Those companies were: Genaire Limited, Pratt and Whitney Aircraft Company of Montreal, and Siegmund Werner, also of Montreal.

[27] "Report of Visit to Genaire Limited on 27 December 1956 by Staff Officer (Helicopters)," NS 1225-ACNS (Air) (Staff), 7 January 1957, Lieutenant-Commander K.L. Gibbs, Staff Officer (Helicopters) to DNA, RG 24 83-84/167, Box 3827, file S-8260-11 vol. 1, NAC.

> It would seem that this whole problem of bringing the aircraft to the ship must be met in a radical manner, by catching the aircraft in hover and bringing it to the ship under final control ie., harpoon method, hanging wire hook etc.[28]

The NCC suggested constructing an arrestor system with two transverse wires across the breadth of the flight deck, some four feet above the deck, which could be dropped quickly. The helicopter outfitted with two spring hooks, one forward and one aft, would land between the transverse wires to engage the two hooks. The hooks and wires together would also act as the lashing arrangement (tie downs) for the aircraft.[29] The navy explored this idea only to reject it at a later date.

To facilitate the landing of the helicopter COMOPVAL suggested reducing the ships' roll. Benoit envisioned the construction of a roll stabilized flight deck. The idea was to mount a platform on a hinge, and control the roll by means of a gyro or pendulum controlled hydraulic actuator system operating in the vertical axis on both sides of the platform. Initially, there was some support in headquarters for this concept but it was shortlived.

Investigation by Commodore Freeborn, NCC, found that a stabilized flight deck would weigh substantially more than a conventional platform. More important to the helicopter pilots and aircraft handlers, "the pivot of a stabilized platform would be located well above the centre of roll of the ship, which would cause considerable lateral movement

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[28] Memorandum, "Small Ship Helicopter Operation," NS 8260-11 (NCC), 18 January 1957, Constructor Commodore F. Freeborn, Naval Constructor-in-Chief, to CNTS, RG 83-84/167, Box 3827, file S-8260-11 vol. 2, NAC.

[29] Ibid. In his memorandum Commodore Freeborn suggested that a fitting of this type together with power-folding rotor blades would permit the navy to operate helicopters from a even smaller platform than that fitted to Buckingham.

of the platform when the ship rolled".[30] Contrary to previous technical estimates the installation of a roll stabilized platform would entail major modifications and the machinery would occupy valuable space onboard a destroyer. In what would turn out to be a particularly prescient observation, Commodore Freeborn suggested that it "would be far easier, less expensive and more practicable to stabilize a ship".[31]

Certainly the insights gained into the central problem of rapid securing and aircraft handling, unclear as the solutions seemed at the time, were the most important results of the Ottawa trials. The tests forced consideration of other fundamental issues as well. Among these was the question of a hangar. There were, as has already been suggested, two imperatives at the heart of the matter, pulling, as is so often the case in warship design, in opposite directions. The structure had to be light and compact, so as to minimize disruption of the ship's equipment, yet it also had to be strong and sufficiently large for essential aircraft support operations. The navy had already rejected a proposal from Genaire for collapsible hangars, because they would disrupt the superstructure sufficiently to require fundamental re-engineering, and yet were too fragile and small.[32]

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[30] Memorandum, "Conversion of Ships to Helicopter Carriers - Stabilization of Helicopter Landing Platforms," NSC 8260-11 (NCC), 17 April 1957, NCC to D/CNTS and A/CNTS (Air), RG 24 83-84/167, Box 3827, file S-8260-11 vol. 3, NAC.

[31] Ibid. What did survive, however, was the idea of providing a heated flight deck, which would facilitate the removal of ice and snow, thereby improving not only landing operations but the aircraft handlers job.

[32] NCC doubted the ability of a collapsible hangar to withstand the gunblast of the 3/50 gun. Adding to the problem was the fact that the rotor blades of the S-58 helicopter could not be folded to fit a temporary hangar. What was required was power-folding rotor blades and a larger permanent hangar.

North Atlantic conditions during the Ottawa trials nudged discussion a step toward the extremely difficult decision to reconstruct the destroyers to provide a substantial, permanent hangar. Commander Benoit's report urged the need for a permanent hangar, suggesting that the helicopter would scarcely ever be operated without it: "maintenance would generally take longer at sea and in the event of cold weather, maintenance time would probably be doubled or tripled. The fact cannot be overstressed that the provision of a hangar...will undoubtedly reduce the amount of corrosion and maintenance necessary".[33]

The resolution of the basic questions of the hangar structure and the rapid securing equipment depended upon the particular specifications of the helicopter selected as the operational type. Once this was settled, the navy could ascertain the precise specifications for a rapid securing device, as well as the size and location of the flight deck and hangar. Finding and procuring a suitable helicopter, however, would prove to be no less difficult a task than it had been in the past.

While helping to focus the big issues, the Ottawa trials produced solutions to particular operating problems. To assist the helicopter pilots during take-off, and especially for landings, a system of lights was installed aboard Ottawa. This innovation came about when it was found that the Landing Signal Officer (LSO) could not be seen by the pilot when the LSO was on the flight deck. Several locations for the proper position of the LSO were tried before the evaluation team settled on a position at the after end of the superstructure on the starboard side, referred to as the Emergency Conning Position (ECP). This location gave the LSO a good view of the helicopter (altitude) and the movement of the ship, but forced the

[33] Ibid. Provision of a hangar would also permit work to be carried out on a 24 hour basis.

pilot to divide his attention between the LSO's directions and the flight deck, which created a dangerous situation. The installation of landing lights allowed the pilot to concentrate on his approach to the flight deck rather than the LSO.[34]

Another important component of the trials were the flights to evaluate the destroyer's ability to control helicopters for anti-submarine warfare. Test DELTA was designed to establish the AN/SPS-10 and AN/SPS-12 radar detection ranges for helicopters flying at various altitudes, while ECHO evaluated the ship's ability to direct the helicopter to a torpedo dropping position over a ship's sonar contact.

The helicopter made six runs at altitudes of twenty to 500 feet for the DELTA tests. With the aircraft maintaining a height of 20 feet, the AN/SPS-10 radar could maintain contact to a maximum of 10-12 nautical miles, and the AN/SPS-12 could hold contact out to 12 nautical miles. At 500 feet the AN/SPS-10 could hold contact out to 23 miles, but the range of the AN/SPS-12 radar increased to 31 nautical miles. These detection ranges varied according to conditions, but clearly showed that both AN/SPS-10 and AN/SPS-12 radars could track the aircraft at long-range. The only limiting factor was the performance of the radio.[35]

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[34] Ibid. The LSO could communicate with the pilot on UHF through the radio remote control system (RCU), and to the Command and Operations Room on the internal communication circuit of the RCU system. Finally, the LSO could communicate with the flight deck crew through the RCU which was wired through the ships loudspeaker system.

[35] Ibid. The AN/ARC-12 was considered a poor homing device by modern standards. Moreover, the radios, both VHF and UHF were inadequate, rarely giving good performance over 15 miles, and on many occasions did not function well over 8 miles.

The ECHO tests were conducted in the Londonderry exercise area with Ottawa and HM submarine Alaric. A total of 21 runs were conducted, with the submarine maintaining a constant course and a speed of 2-6 knots.[36] The helicopter flew at 100 feet at approximately 75 knots, and was radar controlled from the ship's operations room on the basis of information received from the ship's sonar operator. All but one run was considered a success. What these tests showed was "the longer the run available, the more accurate the final dropping point. If the helicopter only has a short run to the dropping point it is invariably in a correcting turn at the time of the ordered drop".[37] The navy had demonstrated that a St. Laurent class destroyer could direct and control a helicopter over long ranges to the dropping point. Despite the controlled nature of these exercises, the helicopter was proving to be a potent weapon in A/S warfare.

Following completion of the Ottawa trials, the joint RCN/RCAF squadron was disbanded and the personnel went back to their units. The RCAF's H-34 helicopter was returned "with such a bad case of salt water corrosion that it required a major overhaul and

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[36] Ibid. and; HMCS Ottawa, "Report of Proceedings for November 1957," DOA 1926-365/4, 4 December 1957, DHist, HMCS Ottawa, 8000. The following week Ottawa was scheduled to conduct additional A/S exercises with two other submarines. Unfortunately, the final exercise had to be cancelled because HM Explorer experienced mechanical problems.

[37] Ibid. Over 2,000 yards the average launching error was 79 yards. At 2,000 yards or less the average error was 184 yards. The Canadian navy was the only navy experimenting with a helicopter equipped with both sonar and weapons. The RN and USN were conducting trials with both manned and unmanned single-purpose helicopters (weapons only) controlled by a parent ship. If the ship lost contact with either the submarine or the helicopter an effective attack could not be carried out.

Lieutenant-Commander Gibbs had to face the ire of the Air Commodore who had approved the loan".[38]

Most observers considered the trials a success. In COMOPVAL's final report, however, he noted that only the basic operating limits of the helicopter were known because "it had been unofficially muted that, under no circumstances was the [aircraft] to be damaged".[39] Flying operations had been restricted and on many occasions tests were scaled back. Lieutenant-Commander Benoit stressed that these facts should be borne in mind when assessing the results:

> It is reasonable to say that the helicopter could have been flown with similar safety to that which is expected in carrier operations, more often and under a greater variety of conditions than was done. Provided operational circumstances warrant such risks, the maximum limits set out in this report are reasonable and practicable. The actual time flown and the number of landings conducted are not representative of that which the HSS helicopter is fully capable.[40]

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[38] Pe:.r Charlton and Michael Whitby (eds.), "Certified Serviceable": Swordf sh to Sea King. The Technical Story of Canadian Naval Aviation by Those Who Made it So, (Ottawa: CNATH, 1995), p. 377. Rumours suggest that the helicopter never flew again. According to Pratt and Whitney which conducted the corrosion survey report the corrosion was due to several factors. The manufacturing specifications for this type of helicopter differed completely from that of the HSS type (S-58 naval version). The most important factor, however, was the fact that the H-34 helicopter was manufactured in 1955, and since that time numerous changes had been made in the manufacturing process to minimize corrosion. See, Appendix D, "Canadian Pratt and Whitney Aircraft Company Corrosion Report," 20 February 1958, Pratt and Whitney to Commander, Operational Evaluation Organization, in the "Final Report on COMOPVAL Project Staff/SE 42, 4 March 1958, RG 24 83-84/167, vol. 491, file C-1680-50 Staff/SE 42, NAC.

[39] Ibid.

[40] Ibid, and; "COMOPVAL Project Staff/SE 42 Operation of Helicopters from Escort Vessels," Staff/SE 42, 3 March 1958, Lieutenant-Commander C.J. Benoit, Commander, Operational Evaluation Organization, to Director Undersea Warfare, RG 24 83-83/167, vol. 491, file C-1680-50 Staff/SE 42, NAC. For example, the full programme for all-weather and icing trials were not carried out.

In view of the favourable results of the trials and the tactical potential of the helicopter, COMOPVAL concluded that:

> a large helicopter could operate from a small ship in heavy weather; a hangar was essential for maintenance and shelter; a quick release and rapid securing device was required, and; mechanical assistance was needed to move and centre the aircraft before being moved into the hangar.

Lieutenant-Commander Benoit recommended to headquarters that "operational platform installations be fitted to all St. Laurent/Restigouche class escorts without further delay".[41]

Rear-Admiral E.P. Tisdall, Vice-Chief of the Naval Staff, rejected the reconstruction of the Restigouche and the four Repeat Restigouche class destroyers. Commodore Freeborn, NCC, had advised that the displacement in Restigouche class destroyers "was already close to the limit that can be accepted for the hull.... and stresses in [the] deck and keel are slightly in excess of those normally accepted for ships of this type, constructed of mild steel. NCC cannot, at this stage, accept this situation in view of the stresses produced".[42]

There was all the more reason for caution because a comprehensive A/S and A/A Weapons Systems Effectiveness Study was in the preliminary stages. With that in mind, Commodore Freeborn called for a comprehensive set of plans which outlined all the requirements for any ship conversion, including destroyers and frigates, in order to carry a

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[41] "COMOPVAL Project Staff/SE 42 Operation of Helicopters from Escort Vessels," Staff/SE 42, 3 March 1958, Commander, Operational Evaluation Organization to Director Undersea Warfare, RG 24 83-84/167, vol. 491, file C-1680-50 Staff/SE 42, NAC, and; "Final Report on COMOPVAL Project Staff/SE 42," Staff/SE 42, 4 March 1958, RG 24 83-84/167, vol. 491, file C-1680-50 Staff/SE 42, NAC.

[42] Memorandum, "St. Laurent and Restigouche Classes Modified to Carry Helicopters and VDS," NS 8260-11 (NCC), 23 June 1958, NCC to VCNS, RG 24 83-84/167, Box 3827, file S-8260-11 vol. 3, NAC, and; Minutes of the 11/58 Meeting of the Naval Staff, 24 June 1958, DHist 1000-100/3.

helicopter.[43] It was absolutely essential that any modernization programme be examined in its entirety because even simple modifications would have repercussions for other systems, and at this time, the RCN did not have precise data as to which systems offered the best response to a given threat. An early draft of the A/S Weapons Systems Effectiveness Study, submitted to the Naval Board in late 1957, for example, suggested that the most effective A/S forces, at least in a barrier type operation, would be a combination of anti-submarine submarines and fixed-wing aircraft. Improving the A/S effectiveness of the fleet to counter increasingly advanced Soviet submarines was driving the entire helicopter/ship conversion programme.[44]

The Naval Staff agreed to recommend the concept of integrating helicopters into the ASW system of the St. Laurent class destroyers, but rejected the proposals of Captain

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[43] At this time the Canadian navy was considering embarking helicopters in the following classes of ships: St. Laurent/Restigouche class destroyers; Tribal class destroyers, and; the Prestonian class frigates. In fact, some planning documents suggested carrying up to four helicopters in the frigates. For a detailed discussion of those plans see, RG 24 83-84/167, Box 3827, file S-8260 vol. 3, NAC.

[44] See, Minutes of the 552 Meeting of the Naval Board, 20 November 1957, DHist 1000-100/2. The study concluded that the growing effectiveness of the submarine in combination with fixed-wing aircraft warranted the replacement of a proportion of surface A/S vessels in the RCN with submarines. Embarking helicopters in the destroyers, including the Tribals, and the frigates promised to offset the corresponding reduction in the number of surface A/S escorts. Following the Whiskey class missile conversions came the Zulu class. First sighted in 1956, the Zulu V's contained two vertical ballistic missile canisters, housed in the fin. The next generation of submarine was the Golf class. The Golf I, a conventional diesel powered boat, was the Soviet navy's first ballistic missile submarine built from the keel up. The Golf class submarines carried a modified R-10 missile (second generation V-2) adapted for air ejection from the launch tube. These missiles had a range of 350 nautical miles. More worrisome to the West, however, was the Soviet navy's commissioning of its first nuclear-powered submarine on 8 April 1958, four years after the USN commissioned the USS Nautilus. Western sources believed that the ballistic missiles had a range of 1,500 miles. See, Jan Breemer, Soviet Submarines: Design, Development and Tactics, pp. 91-102.

Russell, now Director of Undersea Warfare (DUSW)'s, regarding implementation of the conversion programme, observing that "factors effecting ships deployment and personnel issues [manpower ceilings] would have to be investigated".[45] Russell's revised plan for the integration of helicopters into the fleet was ready within two months. The study differed little from his previous paper, but he did drop the earlier recommendation to convert the Restigouche class destroyers, no doubt a reflection of the Naval Staff's decision to restrict the programme to the seven St. Laurent class destroyers.

Russell envisioned fitting the helicopter pl··tforms, hangars, and new sonar equipment (VDS and the hull-mounted SQS 503) during normally scheduled refits. He suggested, therefore, that the first ship, Skeena, begin conversion in November 1959, and that every four months thereafter another destroyer should begin refit. Following this schedule, it would take three years to complete the entire programme with the last ship returning to service by October 1962. The first ship would take 18 months to complete from the date of approval, allowing for preparation of drawings and approval of specifications and construction. Subsequent ships would require ten months to complete the refit.[46]

For planning purposes, Captain Russell recommended procuring twelve ASW helicopters over a two year period, and two additional helicopters per year to cover attrition. If helicopters were required to operate from other types of ships more aircraft would have to be purchased. To man a squadron headquarters, and provide detachments in the seven

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[45] Minutes of the 11/58 Meeting of the Naval Staff, 24 June 1958, DHist 1000-100/3.

[46] Appendix III, "The Integration of Helicopters as Part of a Ship's ASW System," NSS 1115-39 (Staff), 18 August 1958, DUSW to ACNS (A&W) and VCNS, RG 24 83-84/167, vol. 11, file 1115-39 vol. 4, NAC, and; DHist 79/246, file B-5.

destroyers the navy required 36 officers and 119 ratings, wartime complement. A smaller complement would suffice for peacetime, but the larger complement would be necessary for round-the-clock, all-weather operations. The total cost for the programme, including the purchase of 12 helicopters, training for 17 pilots, and ship fitting was approximately $15 million dollars.[47]

Captain Russell, in conjunction with the Directorate of Naval Aviation, had also prepared a staff requirement for A/S aircraft, both fixed-wing and helicopters to establish the RCN's A/S aircraft requirements beyond 1966. The most important criteria for the helicopters was the requirement that the aircraft must be able to carry the latest devices for locating, identifying and tracking a submerged submarine, together with the associated navigation, plotting and display equipment. It had to be able to carry sufficient weapons, sonobuoys, markers and illuminators to make two attacks on any one sortie, day or night. In addition, the aircraft had to operate in all weather conditions, including severe icing. Finally, the maximum all up weight was not to exceed 12,000 pounds.[48]

At this time the RCN was considering a number of aircraft types: Vertol H-21, Kaman HOK-1 and HU2K-1, and Sikorsky S-62. The Vertol was considered too large and unwieldy for escort operations, while the Kaman helicopters could not carry a sufficient payload and

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[47] Appendix VIII, "The Integration of Helicopters as Part of a Ship's ASW System," NSS 1115-39 (Staff), 18 August 1958, DUSW to ACNS (A&W) and VCNS, RG 24 83-84/167, vol. 11, file 1115-39 vol. 4, NAC, and; DHist 79/246, file B-5. The breakdown was as follows: ship fitting (7 x $800,000); ship drawings, ($150,000); helicopters (12 x $761,055), and; pilot training (17 x $21,000).

[48] "The RCN Anti-Submarine Aircraft Replacement Requirements in 1966," NSS 7801-105 (Staff), 15 July 1958, DUSW to ACNS (A&W) and VCNS, DHist 79/246, file B-5.

had limited endurance. The next generation of Sikorsky helicopters, the S-62, could not carry both weapons and the latest types of dunking sonar. More promising was the advent of the turbine-powered helicopter, but it was in the initial stages of development, and would not be available until 1961. If the turbine-powered helicopters were made available sooner, the navy would re-evaluate its requirements. Thus, only the S-58 had a proven record in escort-borne ASW operations, and more important was a dual-purpose aircraft capable of carrying both weapons and sonar.[49]

The Naval Board was in no mood to rush. Because the St. Laurent class destroyers were brand new vessels, the CNS was reluctant to consider any major conversion. Operational availability of Canadian ships was another major stumbling block. NATO commitments had to be maintained, and removing one to two ships every four months for the next three years would be an unacceptable reduction in the number of operational units. As early as 17 July 1958, the Naval Board decided that insofar as future refits and conversions were concerned operational availability of Canadian ships would govern the schedule. "The aim of our refit and maintenance programmes should provide for the maximum operational availability of each ship over the expected life of that ship".[50] Moreover, the Naval Board laid down a firm policy which dictated not only the frequency of refits but the length of time permitted for each one. In the case of the destroyers and destroyer escorts, for example, the period between refits was to be two years, and the refits were not permitted to last longer

[49] Appendix II, "The Integration of Helicopters as Part of a Ship's ASW System," NSS 1115-39 (Staff), 18 August 1957, DUSW to ACNS (A&W) and VCNS, RG 24 83-84/167, vol. 11, file 1115-39 vol. 4, NAC, and; DHist 79-246, file B-5.

[50] Minutes of the 573rd Meeting of the Naval Board, 17 July 1958, DHist 1000-100/2.

than 16 weeks.[51] External events would soon reverse these decisions and accelerate the navy's helicopter programme.

In the interim, during the last months of 1958, the navy continued the struggle within the inter-service bureaucracy for procurement of an ASW helicopter. The Chiefs of Staff Committee, on 28 November, reasserted the need to standardize among all three services on a minimum number of helicopter types in the interest of economy and the government's insistence on standardization. The navy, however, made some headway in winning recognition of the very specialized requirements of ASW. The COSC referred the matter to the Vice-Chiefs of Staff Committee for more detailed study.[52]

At the Vice-Chiefs Committee meeting on 12 December 1958, Rear-Admiral Tisdall, VCNS, declared that only two helicopters were suitable for ASW: the Sikorsky S-63 and the Kaman HU2K, with preference for the former. Tisdall stated that "the S-63 used some of the S-58 components which the RCAF was already using, it had a flying boat hull and Sikorsky was already set up with Canadian Pratt and Whitney. [Finally], the RCN had always used Sikorsky helicopters for ASW duties".[53] When it became apparent that both the army and the air force preferred the Vertol 107, another solution had to be found.

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[51] Ibid.

[52] Minutes of a Special Meeting of the Chiefs of Staff Committee, 28 November 1958, DHist 73/1223, files 1308-1309.

[53] Minutes of the 48th Meeting of the Vice-Chiefs of Staff Committee, 12 December 1958, DHist 73/1223, files 1308-1309. See also, Memorandum, "Helicopter Programme," NSC 7820-102 vol. 2 (Staff), 11 December 1958, Rear-Admiral E.P. Tisdall, VCNS to CNS, DHist 79/246, file B-1 vol. 1.

Major General J.V. Allard, Vice-Chief of the General Staff, and Chairman of the Committee, asked whether there could be any standardization between these two types of aircraft, either in components used or engine types. Air Vice-Marshal D.M. Smith assured the committee that the T58-8 engine could be installed in both types of aircraft, and it was quickly agreed to recommend to the COSC that the RCN be equipped with the S-63, while the army and air force procure the Vertol 107, both outfitted with the same engines.[54] The Chiefs of Staff Committee immediately endorsed the plan, but instructed the services to "review the quantitative requirements in conjunction with the overall review of service programmes".[55]

The Naval Board at this same time showed much greater commitment to early and full integration of the ASW helicopter into the fleet. On 14 January 1959, the Board gave procurement of the helicopters first priority, and agreed that the 5th and 6th Repeat Restigouche destroyers would be fitted during construction with VDS, a flight deck and hangar, and SQS 503 hull-mounted sonar.[56] These particular vessels were in the early stages of construction and could therefore be readily modified to carry the helicopters, unlike the completed Restigouche escorts. The seven St. Laurent class destroyers, as we have seen, could be converted with the hangar and platform more readily than the original Restigouche

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[54] Ibid. and; Memorandum "Helicopter Programme." CSC 10-9 (VCOS), 23 December 1958, Lt-Col. W.A. Todd, Secretary to Secretary, Chiefs of Staff Committee, DHist 73/1223, Series I, File 185.

[55] Minutes of the 628th Meeting of the Chiefs of Staff Committee, 29 January 1959, DHist 73/1223 files 1308-1309.

[56] Minutes of the 584th Meeting of the Naval Board, 14 and 16 January 1959, DHist 1000-100/2.

destroyers, and the Board now agreed that this should be done, together with fitting of the latest sonars.

These important decisions were made so swiftly because the Soviet navy had recently commissioned its first nuclear powered ballistic-missile submarine.[57] In July 1958, the Working Panel of the Surface Systems of the US-UK-Canada Tripartite Technical Cooperation Committee recommended that "A/S helicopters be integrated in the ASW weapon systems (1960-1966) to fulfil the long range attack requirement".[58] In late 1958, the North Atlantic Council (NATO) at their Annual Review, urged Canada to accelerate the introduction of the helicopter for her anti-submarine forces as the primary A/S weapon system.[59] The Canadian navy, having long recognized the potential of the ASW helicopter, seized upon these events to win approval for its helicopter programme.[60]

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[57] The first generation of Soviet nuclear powered ballistic missile submarines (SLBM's), were designated by NATO as the "Hotel" class. Nine of these submarines were built between 1958 and 1961. They could sustain speeds of 25-knots underwater and could dive to 1,000 feet. Each submarine carried three SS-N-4 Sark ballistic missiles. NATO believed that these missiles had a range of 1,500 nautical miles. See, Jan Breemer, Soviet Submarines: Design, Development and Tactics, pp. 98-105. See also, "An Appreciation of the Threat to North America of Submarine-Launched Missiles Carrying Nuclear Weapons," 14 August 1958, prepared by H.H. Watson of the Operational Research Group, RG 24 83-84/167, vol. 2043, file S-5151-49-1 vol. 1, NAC.

[58] See, Memorandum, "Integration of the ASW Helicopter into the Fleet," NSS 1115-39 (Staff), 4 February 1959, Captain R.W. Timbrell, DUSW, to ACNS (A&W), DHist 79/246, file B-1 vol. 1. Captain Timbrell replaced Captain Russell as the Director of Undersea Warfare in 1958.

[59] See, Memorandum, "Helicopters for Anti-Submarine Warfare," NSS 1115-39 (Staff), 10 April 1959, Vice-Admiral H.G. DeWolf, CNS, to Chairman of the Chiefs of Staff Committee, DHist 79/246, file B-1 vol. 1.

[60] The RCN wanted to purchase six helicopters in 1960-1961, and then approximately six per year thereafter up to a total of forty aircraft. See, Memorandum, "Integration of A/S

The domestic political environment looked somewhat more favourable for this kind of effort. George R. Pearkes, who had become Minister of National Defence, when the Conservatives formed a minority government in 1957, and retained the portfolio when his party won a landslide victory in the general elections of 1958, was a long time supporter of both the navy and its plans to acquire both a second carrier and helicopters for anti-submarine warfare. As defence critic in the mid-1950's, he was especially concerned about modern Soviet submarines, which could "come within reasonable distance [of our shores] and from those submarines launch missiles...." He argued that, "to improve the means of locating the submarines, the fullest possible use of reconnaissance planes and helicopters working with the fleet air arm" should be considered.[61] By early 1959, western intelligence analysts were warning that by 1961 the Soviet Union would have 750 Inter-Continental Ballistic Missiles (ICBM's) and Submarine Launched Ballistic Missiles (SLBM's) targeted on air defence control centres, SAC bases, and other key sites.[62] As Minister of Defence, he was in a position to act upon those ideas. Support for the navy's helicopter programme must be viewed as part of Pearkes's larger plan to equip the Canadian armed forces with the latest

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Helicopters into the Fleet," NSS 1115-39 (Staff), 27 February 1959, CNS to Chairman, Chiefs of Staff Committee, DHist 79/246, file B-5.

[61] Reginald H. Roy, For Most Conspicuous Bravery: A Biography of Major-General George R. Pearkes, V.C., through Two World Wars, (Vancouver: UBC Press), p. 279. See also, Memorandum, "Helicopters for Anti-Submarine Warfare," NSS 1115-39 (Staff), 10 April 1959, Minister of National Defence to Cabinet Defence Committee, DHist 79/246, file B-1 vol. 1, and; DHist 73/1223 Series 3, file 1332.

[62] Ibid., p. 321.

weapons to counter the Soviet threat and the federal government's decision in 1958 to equip those forces with nuclear weapons.[63]

The RCN, for its part, swept aside earlier reservations about the ship conversion programme and now planned to provide one helicopter for each of the following classes of ships: St. Laurent (7), Restigouche destroyers (7), and the Repeat Restigouche (6). In addition, the navy intended to re-equip the experimental helicopter squadron with six aircraft to operate from the carrier, and provide three helicopters for an operational training unit. Eleven helicopters were to be purchased to cover attrition, for a total of 40 aircraft. Refitting the twenty ships of the St. Laurent, Restigouche, and Repeat Restigouche class destroyers would vastly improve the A/S effectiveness of the fleet for about the same cost as building one new Repeat Restigouche class destroyer.[64]

By late April 1959, the navy received word that the Treasury Board had approved the changes for the two Repeat Restigouche class destroyers (DDE's 265 and 266), which included the fitting of a hangar and flight deck. These ships would become the Annapolis class destroyers, the first purpose-built helicopter carriers in the RCN. The Board granted approval on the understanding that these modifications would not delay the commissioning

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[63] For a detailed discussion of Pearkes' plans and the government's defence policy, as it relates to nuclear weapons, during this period see, Reginald H. Roy, For Conspicuous Bravery, chs. 15-16. See also, J.L. Granatstein, Canada, 1957-1967: The Years of Uncertainty and Innovation, (Toronto: McClelland and Stewart, 1986), chs 2 and 5; Richard A. Preston, Canada in World Affairs, 1959-1961, vol XI, (Toronto: Oxford University Press, 1965), chs. 1-3, and; Robert Bothwell et al, Canada since 1945: Power, Politics, and Provincialism, (Toronto: University of Toronto Press, 1981), ch. 24.

[64] See, Minutes of the 584th and 588th Meetings of the Naval Board, 14 January and 25 February 1959 respectively, DHist 1000-100/2.

of the ships. Since construction had not yet begun the navy did not expect that it would encounter any problems. The Board, however, deferred a decision on converting the St. Laurent and Restigouche class destroyers until the navy decided what type of helicopters it wanted to procure.

Despite the Vice-Chiefs of Staff Committee's recommendation that the navy procure the Sikorsky S-63 helicopter, the Kaman HU2K-1 helicopter had become the frontrunner. It had always been an even race within the navy, but Captain C.G.H. Daniel, ACNTS (Air), now strongly urged the acquisition of the latter, based upon discussions with U.S. Navy's BuAer Department (Rotary Wing Section), Sikorsky, Pratt and Whitney, and Kaman Helicopters. He argued that the HU2K-1 helicopter was smaller, faster and lighter than the S-63. Moreover, the rotor blades of the HU2K-1 were self-supporting during the blade folding process. This was a major consideration since the S-63 rotor blades had to be manually supported and rotated 90° degrees along their axis. This meant that the sail of the blade was at right angles to the wind which made a difficult task even more demanding, especially in windy conditions. Another selling point was the fact that the Kaman helicopter was designed to meet the SAR requirements of the USN. "The HU2K-1 is being designed and built for operational service in the USN. Thus technical and logistic support would be available to the RCN".[65] While Commodore Jeffry Brock, ACNS (A&W), supported Daniel's recommendation the VCNS, Rear-Admiral Tisdall, was reluctant to reverse the decision of

[65] Memorandum, "Selection of an ASW Helicopter to Operate from RCN Escort Ships," NSC 7801-102 (TS Air), 5 January 1959, Captain C.G.H. Daniel, ACNTS (Air) to DUSW, ACNS (A&W), and VCNS, DHist 79/246, file B-1 vol. 1.

the Vice-Chiefs of Staff Committee. He had convinced the army and air force of the merits of the S-63 helicopter, and was loath to go before the Vice-Chiefs of Staff again.

When the Chiefs of Staff Committee met three months later to resolve the issue Vice-Admiral DeWolf informed the committee that either the Sikorsky S-63 or the Kaman HU2K-1 would be suitable. The CNS pointed out that the Sikorsky helicopter had greater lifting power and growth potential than the Kaman helicopter. These were important considerations and would come to play a crucial role in the decision-making process. The committee learned, however, that the S-63 would cost more to purchase and be more expensive to maintain.[66] It is important to note that both helicopters had not yet flown and neither could be considered a true ASW helicopter. Both would have to be modified. The COSC referred the matter back to the Vice-Chiefs of Staff Committee. The committee also instructed F.R. Miller, Deputy Minister of National Defence, to contact Mr. Golden, Deputy Minister of DDP, to examine the possibility of manufacturing the helicopters in Canada.

The RCN was meanwhile finalizing specifications for the escort-borne ASW helicopter. It had long since been decided that the machine must be manned, dual-purpose (ie. able to carry both sonar and weapons), and all-weather. The helicopter was to be turbine powered, have two or more engines, adequate space to carry two pilots and two sonarmen, and weigh no more than 16,000 pounds. The aircraft had to be of rugged construction to withstand the stresses imposed in continuous operations from escort vessels, and suitable for fitting in a quick securing device. A cruising speed of 100 knots, with a maximum speed of

[66] Minutes of the 632nd Meeting of the Chiefs of Staff Committee, 21 April 1959, DHist 73/1223, files 1308-1309, and; Memorandum, "ASW Helicopters," 18 September 1959, VCNS to CNS, DHist 79/246, file B-1 vol. 1.

135 knots was crucial. So too. was the minimum two-and-a-half hour endurance requirement. with a 10% reserve of fuel. Other requirements included full dual instrumentation, automatic stabilization equipment, an integrated doppler navigation system, radar, dunking sonar, Magnetic Anomaly Detection gear (MAD), and anti-icing equipment. The navy further insisted, as a safety measure that, the aircraft had to be able to float should it have to ditch into the ocean. Finally, the helicopter had to be able to carry two Mk 44 torpedoes (500 pounds each), two 5-inch anti-submarine rockets, and one 1,200 pound nuclear depth bomb.[67] The Kaman HU2K-1 and the Sikorsky S-63 each met many, but not all of these specifications. The PPCC approved the staff specifications on 9 September 1959, but since the committee was not responsible for choosing a specific type of helicopter referred the matter to back to the Naval Board.[68]

On 18 September 1959, the Vice-Chiefs of Staff Committee sat down for what it hoped would be the final time to resolve the helicopter issue. At that meeting, Admiral Tisdall, informed his counterparts that there were some in the Department that believed that one type of helicopter would suffice for all three services. He would quickly dissuade them of that notion. "The RCN required the smallest possible helicopter than can fulfil its function

[67] "Staff Characteristics for an Escort Borne ASW Helicopter," NSS 8885-14, 9 September 1959, DHist 79/246, file B-1 vol. 1. Recent developments in dunking sonar had led to the production of two new sets: the AN/AQS-10 and the AN/AQS-12. The former weighed 776 pounds and could be lowered to a depth of 250 feet, whereas the latter weighed 258 pounds and could be lowered to a depth of 450 feet. The AN/AQS-12 was an "off the shelf item" but was not considered by the USN as a complete system like the AQS-10/HSS-2 combination. MAD was a relatively recent development which showed promising results. Consequently, the navy was considering installing this equipment into its helicopters as well.

[68] Extract from the Minutes of the 176th Meeting of the Policy and Projects Co-ordinating Committee, 9 September 1959, DHist 79/246, file B-1 vol. 1.

as part of the ASW system, and the navy has no requirement for a cargo helicopter".[69] After much discussion, the committee established that one type of aircraft would not meet the needs of the three services. The only helicopter that came close was the Sikorsky S-63-2 (a variant of the S-63) but "it had so many disadvantages that it could only be operated...with a considerable loss of operational efficiency".[70] The committee finally decided to send a submission to the Chiefs of Staff pointing out that "no one aircraft would meet the requirements of all three services and that the RCN be equipped with the Kaman HU2K-1 helicopter".[71]

The Chiefs of Staff and the Minister quickly endorsed the recommendations of the vice-chiefs. At a special meeting of the COSC and the Minister, the Deputy Minister was instructed to negotiate with the Department of Defence Production for the procurement of 40 Kaman helicopters at a rate of six per year.[72] At a subsequent meeting, the Chiefs of Staff decided to purchase six helicopters per year for the first two years, "with no firm requirement

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[69] Minutes of the 49th Meeting of the Vice-Chiefs of Staff Committee, 18 September 1959, DHist 73/1223, file 1308-1309.

[70] Ibid. The disadvantages were its price, operating costs and weight.

[71] Ibid, and; Memorandum, "Medium/Heavy Helicopters - Service Requirements," CSC 10-9 (VCOS), 18 September 1959, Secretary, Vice-Chiefs of Staff Committee, to Secretary, Chiefs of Staff Committee, DHist 79/246, file B-1 vol. 1.

[72] Memorandum, "Procurement of Helicopters," 22 September 1959, General Charles Foulkes, Chairman, Chiefs of Staff Committee, to the Deputy Minister, DHist 79/246, file B-1 vol. 1, and; Memorandum, "Procurement of ASW Helicopters," NSS 7801-102 (Staff), 22 September 1959, VCNS to CNTS, DHist 79/246, file B-1 vol. 1. For economic reasons the helicopters would be manufactured in the United States, although some components would be manufactured in Canada. Delivery would commence 15-18 months after an order was placed.

as to type after that".[73] This change of plan was designed to coincide with the ship conversion schedule and the ship replacement programme.

Because of the RCN's ASW requirements, the helicopter had to undergo re-engineering before the navy could accept the aircraft. The Kaman helicopter had been originally designed as a medium utility machine which the USN planned to use in the SAR role. To outfit the aircraft for the Canadian navy would increase the gross weight of the aircraft above its original specifications. This meant that the aircraft had to undergo a qualification programme to evaluate the effects of different loading under operational conditions, adding another $4 million dollars to the procurement costs. By the end of November, the cost to purchase the initial twelve helicopters had risen to $16 million dollars, which threatened the entire helicopter programme. No one was more aware of this than Rear-Admiral Tisdall, VCNS, the leading supporter of the Sikorsky helicopter.

In a strongly worded memo to Commodore Brock, ACNS (A&W), Tisdall expressed concern over a report that concluded that even with the turbine powered engine the Kaman helicopter would not meet the staff requirements.

> If there is any doubt that after spending $16 million dollars to get 12 of these helicopters that they do not meet the staff requirements, the RCN is in an extremely embarrassing position. What the CNS requires is a clear statement on whether or not the Kaman production model with the present engine will do the job we require. I am sure that you realize that the helicopter question must be settled correctly and now.

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[73] See, Minutes of the 648th Meeting of the Chiefs of Staff Committee, 5 November 1959, DHist 73/1223, file 1308-1309; "Chronological Review of Helicopter Operations in the Royal Canadian Navy," DHist 86/377, and; Memorandum, "Procurement of Helicopters," CSC 10-9, 13 November 1959, Chairman, COSC, to the Minister of National Defence, DHist 79/246, file B-1 vol. 1. The cost for the twelve helicopters, plus spares, ASW equipment (ie. sonar, associated electronic equipment), and de-icing and all-weather instrumentation was approximately $12 million dollars.

> as the future of the programme, ie. new construction and conversion programme, depends entirely on the helicopters.[74]

Brock responded the following day, pointing out that none of the helicopters met the stringent characteristics demanded by the RCN without some re-engineering and re-qualification. The Kaman helicopter was considered the best option but even it had certain limitations. "The Kaman has no growth potential and could not carry the special weapon."[75] For that reason he had recommended to the CNS the purchase of a limited number of helicopters to meet the navy's immediate requirements, while monitoring trials and developments of the Sikorsky S-65 helicopter which looked promising.

While the navy struggled to resolve these problems with the manufacturer, the Treasury Board transferred $12 million dollars to the supplementary estimates, pending approval by the cabinet. The Vice-Chiefs of Staff Committee supported the RCN's procurement plan despite the higher costs and submitted a memorandum to that effect to the Cabinet Defence Committee for the Minister's signature.[76] Escalating costs and rumours of engineering problems, however, delayed approval to purchase the helicopters.

By the spring of 1960, with no other choices available, the navy was forced to accept the Kaman HU2K-1. The machine's all-up weight of 9,328 pounds meant that the helicopter

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[74] Memorandum, "ASW Helicopters," NS 7801-102 (Staff), 17 December 1960, VCNS to ACNS (A&W), DHist 79/246, file B-1 vol. 1.

[75] Memorandum, "ASW Helicopters," NSC 7801-102 (Staff), 18 December 1959, ACNS (A&W) to VCNS, DHist 79/246, file B-1 vol. 1.

[76] Memorandum, "Tri-Service Helicopter Requirements," CSC 10-9, 17 December 1959, Secretary, Vice-Chiefs of Staff Committee, to the Cabinet Defence Committee, DHist 79/246, file B-1 vol. 1.

could only carry two Mk. 44 torpedoes, and not the nuclear depth bomb, one sonar operator instead of two, and enough fuel for two hours instead of two-and-a-half hours. Because Kaman could not increase the weight capacity of their aircraft to meet the RCN's requirements, the cost of the twelve aircraft dropped from $16 million dollars to $14 million dollars.[77] The navy was not happy with the reduced operational capability but it had no other choice; it desperately needed to replace the aging S-55 helicopters and get on with the ship conversion programme.

Within two weeks, a proposal which outlined the planned programme, including costs, for improving the anti-submarine efficiency of the fleet by fitting VDS, long-range hull mounted sonars, and helicopters went forward to the Deputy Minister and then to Treasury Board. The navy sought approval to convert seven St. Laurent class destroyers, and HMCS *Crusader*, one of the advanced fleet destroyers acquired from the RN at the end of the Second World War. Costs for the ship conversion programme were estimated at $25 million dollars, and the programme was scheduled to begin in 1962, with completion by 1967. Over and above the conversion programme, the RCN requested permission to procure twelve Kaman helicopters at a cost of $14 million dollars. Timing was crucial. To guarantee delivery prior to the completion of the ship conversion programme, it was necessary to place the order for the helicopters immediately.[78]

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[77] Memorandum, "ASW Helicopters," NSS 7801-102 (Staff), 12 May 1960, VCNS to CNS, DHist 79/246, file B-1 vol. 1.

[78] Minister of National Defence to the Treasury Board, no date, DHist 79/246, file B-1 vol. 1; "Extract from Submission to Treasury Board," 24 May 1960, DHist 79/246, file B-1 vol. 1, and; "Chronological Review of Helicopter Operations in the Royal Canadian Navy," DHist 86/377.

The following month, June 1960, the Treasury Board "agreed in principle with the overall concept of the programme but felt that the procurement of the helicopters at that time was premature". The Treasury Board was unwilling to spend vast amounts of money on a helicopter that required extensive modifications. Moreover,

> in view of the current rapid changes in the state of the art, the Board considered that it would be preferable to defer this portion of the programme in the hope that an aircraft would be available in the near future for which there might be less risk of obsolescence than for something available at this time. [It] is desirable to avoid having a further major purchase come up too soon on the grounds that rapid developments had made these Kaman helicopters obsolete.[79]

The Board did approve, in principle, the commencement of the programme to convert seven St. Laurent class destroyers over the period 1960-1967, as well as HMCS Crusader.

The Treasury Board's decision not to go ahead with procurement of the helicopters placed the navy in a precarious position. Without them, the converted St. Laurent class destroyers would have no long-range ASW capability, and would, therefore, be virtually defenceless against Soviet submarines. The new Chief of the Naval Staff, Vice-Admiral H.S Rayner, appealed to the Deputy Minister to approach the Treasury Board to review the matter. The CNS pointed out that while the S-65 was an attractive proposition it was a "paper helicopter" designed solely to meet the needs of the RCN.

> The government is well aware of the expense, time and difficulties involved in the development of a new aircraft design. In view of the immediate necessity to replace the helicopters of HS-50, and the ever present military need to have at sea improved ASW weapon systems, it cannot be stressed too strongly that the procurement of the HU2K-1 is an urgent operational requirement. It is recommended, therefore, that the

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[79] Assistant Secretary, Treasury Board, to Deputy Minister of National Defence, 23 June 1960, DHist 79/246, file B-1 vol. 1; Extract from the Minutes of the Treasury Board, Minute 566257, 16 June 1960, DHist 79/246, file B-1 vol. 1, and; "Chronological Review of Helicopter Operations in the Royal Canadian Navy," DHist 86/377.

Treasury Board review the matter and give favourable consideration to the procurement of the Kaman helicopter.[80]

The Board reviewed the matter again on 22 September 1960. but could not agree to support the programme. "In the Board's view both the size and duration of the proposed procurement programme reinforce the importance of delaying the choice of helicopter as long as possible to get the maximum design advantage".[81] To that end, the Board suggested that the navy re-evaluate the Sikorsky S-65 helicopter proposal.

Rayner asked the Minister to approach the Treasury Board for yet another review. Before the Minister responded to the CNS's concerns, he instructed the COSC to investigate the matter to see if it was feasible to comply with the Board's decision to defer the procurement. That investigation concluded that there was an immediate operational need for the helicopters and that no other suitable aircraft was as yet available. Pearkes, in one of his last acts as Minister of National Defence, asked the Treasury Board to review the matter once again, stating that "the Chiefs of Staff Committee confirmed that the operational need was such that suitable ASW aircraft should indeed be obtained as soon as possible."[82]

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[80] CNS to Deputy Minister of National Defence, NSS 7820-102 (Staff), n.d. (circa August 1960), DHist 79/246, file B-1 vol. 1.

[81] Assistant Secretary, Treasury Board, to Mr. E.B. Armstrong, Deputy Minister of National Defence, 5 October 1960, DHist 79/246, file B-1 vol. 1.

[82] Minister of National Defence to the Treasury Board, NOF 23451, n.d. (circa September 1960), DHist 79/246, file B-1 vol. 1. Pearkes wanted to make sure that the navy got its helicopters before he departed Ottawa to become the next Lieutenant-Governor of British Columbia.

The Treasury Board met on 24 November 1960, and finally granted approval for procurement of twelve Kaman helicopters.[83] The Board reversed its earlier decision, in part, because of the possible monetary risks involved in launching a design competition to select an alternative helicopter. The gamble would have been out of proportion to the advantages which might have been gained. Selecting an "off the shelf" helicopter was, in the final analysis, seen as the safest course of action.

By the end of 1960, after four years of trials and sometimes bitter bureaucratic wrangling, the RCN had finally received approval for both the ship conversions and helicopter procurement plan. All that remained, or so it appeared, was to resolve some of the outstanding design and technical issues, such as the rapid securing device and the hangar.

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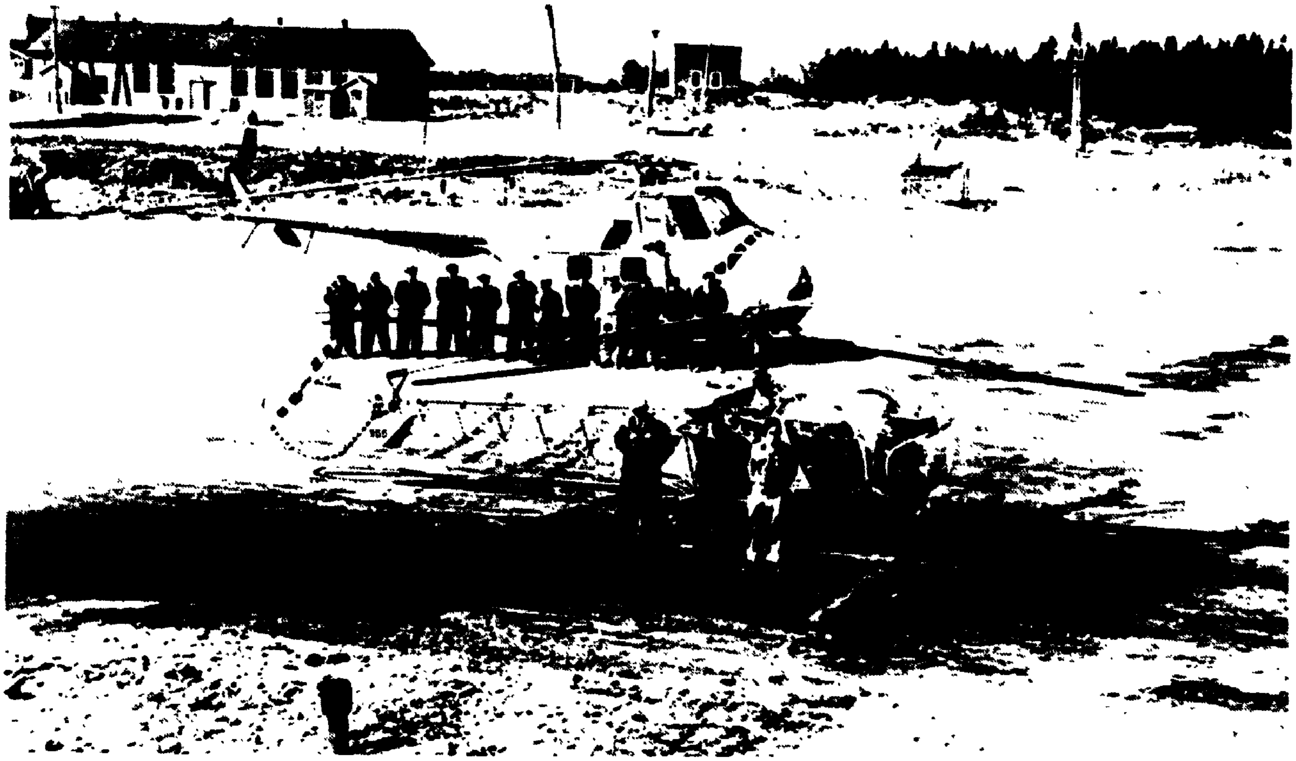
[83] Assistant Secretary, Treasury Board, to Mr. E.B Armstrong, Deputy Minister of National Defence, NS 7820-102, 5 December 1960, DHist 79/246 file B-1 vol. 1, and; "Chronological Review of Helicopter Operations in the Royal Canadian Navy," DHist 86/377. The Minister of National Defence with support from the Chiefs of Staff Committee and the navy was able to allay the fears of Treasury Board that the first six helicopters were earmarked for HS-50, and that the second batch of helicopters would be embarked in the destroyers. It was pointed out that six months of training was required on the new helicopters and this could only be done in Squadron HS-50. Once the training was complete detachments would be formed for assignment to the escorts.

The Bell 47 helicopter on display at HMCS <u>Shearwater</u>. The Bell aircraft was the mainstay of the RCN's utility squadron -HU-21. (PA 193929)



Squadron HU-21, at HMCS Shearwater, with a Bell 47 in the foreground, and Sikorsky S-55 helicopter in the background. (PA 189948)

CHAPTER TEN

"FLYING THE WIRE": THE SEA KING HELICOPTER AND HMCS ASSINIBOINE, 1961-1964

"...fates do so contrary run that
our devices still are overthrown"

Hamlet

Less than two months after the Treasury Board had approved the RCN's procurement of the helicopters the programme was in jeopardy. The first blow came in January 1961, when the Department of Defence Production informed Kaman Aircraft Corporation it would have to provide a firm price for the helicopters before the government could proceed with the contract. When the proposal was received from the contractor "the figures bore no resemblance to those which had been proposed....The new grand total was $23.3 million dollars, and the terms of the contract would permit further increases".[1] The cost of each aircraft had risen to approximately $1.8 million dollars, meaning a shortfall in the funds allocated of $8.7 million.

The Naval Staff immediately launched an investigation to determine what the options were. The study group began by comparing and contrasting the operational performance of

[1] See, Mr. J.L Bush, Department of Defence Production, Aircraft Branch, to Mr. H.H. Poyntz, Assistant Deputy Minister (Requirements), HX 30-21202, 24 January 1961, RG 24 83-84/167, vol 3428, file C-7820-102-5 vol. 1, NAC; "Chronological Review of Helicopter Operations in the Royal Canadian Navy," DHist 86/377, and; Minutes of the 1/61 Meeting of the Naval Staff, 18 January 1961, DHist 1000-100/3. This new price represented a 63% increase over the original proposal.

various A/S weapons systems, including ASROC, DASH helicopters, manned helicopters that could carry weapons only, and manned dual purpose helicopters, that is equipped with both sonar and weapons. The study concluded that "the advantages of the manned dual purpose helicopter far outweighed other systems"[2] and that the integration of helicopters into the A/S weapon system of the St. Laurent and Restigouche class destroyers would greatly improve the effectiveness of those ships.

The next stage of the investigation was a detailed re-examination of all the ASW helicopters.[3] That inquiry concluded, among other things, that the "increased costs of the Kaman helicopters did not appear to provide sufficient value for expenditure. The HSS-2 (Sea King) has such advantages for the RCN ASW role that it is worthy of a detailed examination, including cost analysis".[4] As recounted earlier, the HSS-2 had not been chosen earlier because of its size, complexity, development problems, and cost. It now appeared that size was the main limiting factor. A study by the Naval Constructors Branch, however, concluded that "it was possible to alter the arrangements for both the DDE 205 and DDE 265

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[2] "ASW Helicopter Procurement," NS 7820-102 (Staff), 18 January 1961, RG 24 83-84/167, vol. 3428, file C-7820-102-5 vol. 1, NAC.

[3] In all, the RCN considered ten different types of helicopters, including: Vertol 107, Kaman HU2K-1, Westland Wessex, Bristol 193. In addition the following Sikorsky helicopters were considered; HSS-2 (Sea King), S-63-2 (smaller version of the HSS-2), S-62, S-63, HSS-1 (S-58), and S-65.

[4] "ASW Helicopter Procurement," NS 7820-102 (Staff), 18 January 1961, RG 24 83-84/167, vol. 3428, file C-7820-102-5 vol. 1, NAC. The HSS-2 was a variant of the Sikorsky S-61 aircraft.

class in order to accommodate the HSS-2 helicopter".[5] The study group, therefore, sought approval to form a team of staff and technical personnel to investigate the merits of the HSS-2 helicopter, including a cost analysis study. Nevertheless, the staff still favoured the Kaman HU2K-1, noting that "it might prove easier to procure, even at the higher cost, rather than to suggest procurement of another make".[6] The Naval Staff could not agree on the proper course of action, and referred the matter to the Naval Board. Admiral Tisdall, a long time supporter of the Sikorsky helicopter, sent a brief memo to the CNS, which attempted to counter the Staff's recommendation. "I do not entirely agree with the Naval Staff, but there

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[5] Appendix C, "Description of Changes Involved in Converting DDE 265 Class, DDE 205 Class, Modernized Class, and Crusader to Accommodate the HSS-2 Helicopter," in "ASW Helicopter Procurement," NS 7820-102 (Staff), 18 January 1961, RG 24 83-84/167, vol. 3428, file C-7820-102-5 vol. 1, NAC. In order to accommodate the larger helicopter, plus the additional requirements of personnel, fuel, and equipment the Naval Constructors Branch, (Commodore Freeborn, NCC), decided to shorten the hangar by approximately one-and-a-half feet. More important, in order "to ensure a blast tight hangar which would afford as much protection to the stowed helicopter as had been provided for interior fighting equipment, it was necessary to fit a rigid fixed hangar. [Accordingly, NCC] proposed to split the single funnel uptake into two, and to push the hangar as far forward as possible between the two uptakes. This arrangement would provide the required 78 foot flight deck," necessary to operate the larger helicopter. Credit for this unique idea must fall to Commodore Freeborn, Naval Constructor-in-Chief, and not to Commodore Jeffry Brock, ACNS (A&W), as he would have us believe. To compare and contrast the various accounts see, Appendix C, in "ASW Helicopter Procurement," NS 7820-102 (Staff), 18 January 1961, RG 24 83-84/167, vol. 3428, file C-7820-102-5 vol. 1, NAC, and; Jeffry V. Brock, Memoirs of a Sailor: The Thunder and the Sunshine, vol. II, (Toronto: McClelland and Stewart, 1983), pp. 81-82.

[6] Minutes of the 1/61 Meeting of the Naval Staff, 19 January 1961, DHist 1000-100/3, and; RG 24 83-84/167, vol. 3428, file C-7820-102-5 vol. 1, NAC.

is some merit in the proposal regarding the helicopter and the fitting of larger flight decks to DDE's [destroyer escorts]".[7]

The Naval Board decided to proceed with the plan to purchase twelve Kaman helicopters, in spite of the increased costs. The Board felt that the HSS-2 helicopter was too costly to purchase and maintain, and too heavy a machine. Embarking a Sea King with the necessary supporting equipment would add 30 tons of topweight to the destroyer, reducing its stability. NCC informed the Board that the additional modifications required to embark the Sea King helicopters would cost approximately $85,000 to $100,000 per ship. The ideal aircraft, the Board observed, "was one which could carry sonar and weapons, and yet at the same time be as light and small as possible. These features, consistent with adequate performance, were desirable from the aspect of seamanship, stability of ships, operating expense and ease of maintenance".[8]

In deciding to proceed with the Kaman, however, the Board also concluded that no more than twelve aircraft of this type should be procured. In a particularly revealing comment, the Board stated: "Operational trials in the fleet would determine its [HU2K-1] suitability or provide sufficient operating experience for selection of the optimum ASW helicopter as a replacement for the balance of the 40 helicopters required.[9] To allow for the

[7] "Naval Staff Project - ASW Helicopter Procurement," NSC 7820-102, 19 January 1961, VCNS to CNS, RG 24 83-84/167, vol. 3428, file C-7820-102-5 vol. 1, NAC.

[8] Minutes of the 643rd Meeting of the Naval Board, 27 January 1961, DHist 1000-100/2, and; RG 24 83-84/167, vol. 3428, file C-7820-102-5 vol. 1, NAC. Early estimates for the HSS-2 helicopters ran 40% higher than the Kaman helicopters. A recent price reduction, however, meant that the two helicopters would cost about the same.

[9] Ibid.

possibility a bigger machine might prove essential in the long run, the Board also instructed the Chief of Naval Technical Services to make plans to extend the flight decks of both the St. Laurent and Restigouche class destroyers.

In early March 1961, the Treasury Board agreed to increase the funds authorized for procurement of twelve Kaman helicopters from $14.5 million to $23.8 million dollars. "The [Treasury] Board," one of its officials warned the Department of National Defence, "accepted the large increase of approximately 63% only after the most careful scrutiny....It is the Board's understanding that the RCN, having made what appears to be a logical choice [under] the circumstances, intends to use the Kaman [helicopter] for the whole of its economically useful life and not as an interim helicopter...."[10] The Board was so worried that it requested confirmation in writing from the RCN on this point, before a contractual proposal would be submitted. E.B. Armstrong, Deputy Minister of National Defence, replied that, "the RCN intends to use the Kaman in an ASW operational role in support of their destroyer escorts throughout the economically useful life of these helicopters...and these twelve helicopters will serve the RCN for a long time to come".[11] Those helicopters would never fly in the Royal Canadian Navy.

Even as Treasury Board approved the Kaman purchase, word of problems came from the Naval Member Canadian Joint Staff in Washington. The Canadian ASW configuration

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[10] Assistant Secretary, Treasury Board, to Mr. E.B. Armstrong, Deputy Minister of National Defence, T.B. Minute 577472, 15 March 1961, RG 24 83-84/167, vol. 3428, file S-7820-102-5 vol. 2, NAC.

[11] Mr. E.B. Armstrong, Deputy Minister of National Defence, to Mr. MacDonald, Assistant Secretary, Treasury Board, NS 7820-102 (Staff), 30 March 1961, RG 24 83-84/167, vol. 3428, file S-7820-102-5 vol. 2, NAC.

of the aircraft, which was supposed to be starting flying trials at that very time, needed further engineering work.[12] It would get worse. When the USN conducted a preliminary evaluation at the manufacturers plant in April, critical design flaws were discovered. This raised doubts as to whether the aircraft would ever meet the Canadian navy's requirements. The most serious problems were with the engines, generators, malfunctioning navigation equipment and landing gear. There were also numerous complaints about the aircraft's stability and flight handling qualities.[13] Individually these were significant engineering design flaws but when combined they spelled disaster not only for the company but also for anyone attempting to fly the aircraft. The USN, unwilling to abandon the project, offered the company approximately $5 million dollars to correct the problems, and sent in its own team to supervise the work. There would be a new evaluation in September 1961. Not entirely satisfied with this option and worried about rising costs, the RCN launched a thorough investigation into the merits of the HSS-2 helicopter.[14]

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[12] CANAVUS, "Report of Proceedings for February 1961," NMWS 1926-193/139, Commodore O.C.S. Robertson, Naval Member, Canadian Joint Staff, Washington, D.C., to the Naval Secretary, DHist - Shore Establishments 8000 - HMCS Niagara.

[13] Appendix E, "Summary of the Development Problems of the Kaman HU2K," in "ASW Helicopter Procurement - DDE Programme," NSS 7820-102 (Staff), 14 August 1961, Commodore R. P. Welland, ACNS (A&W), to Naval Policy Coordinating Committee, (NPCC), DHist 79/246, file B-2, vol. 2; Extract from Minutes of the 217th Meeting of the Base Planning Committee, 9 August 1961, DHist 79/246, file B-2, vol. 2, and; Memorandum, "Acceleration of Helicopter Procurement," NSS 7801-102 (Staff), 8 August 1961, Commodore R.P. Welland, ACNS (A&W), to VCNS, DHist 79/246, file B-2, vol. 2.

[14] See, Minutes of the 657th Meeting of the Naval Board, 23 August 1961, DHist 1000-100/2, and DHist 79/246, file B-2, vol. 2.

Within two weeks, the HSS-2 Evaluation Team had been assembled and despatched to the United States to visit the Sikorsky Aircraft Company, the USN Bureau of Weapons in Washington, and Squadron VX-1 in Key West, Florida, to fly a Sikorsky helicopter. During the team's two week trip, they managed to interview thirty-six individuals, ranging from maintenance personnel and pilots all the way up to the general manager of the Sikorsky Aircraft Company, and the HSS-2 project manager in the Bureau of Weapons.[15]

Three members of the Evaluation Team logged a total of seventeen hours in the helicopter and were so impressed with the aircraft's handling and flight characteristics that they strongly urged the navy to procure the machine. The team did not foresee any problems with either maintenance or moving the aircraft around the deck. In fact, "the helicopter handles easily on the ground and in the air, and it is considered that it can be manoeuvred to a spot landing as easily as the S-58 employed in the Ottawa trials".[16] Equally important was the team's observations that the helicopter was equipped with power-folding rotor blades and a manual-folding tail pylon. Both of these features were crucial if the RCN hoped to operate this aircraft from a St. Laurent class destroyer. Other notable attributes of the helicopter was

[15] The Evaluation Team consisted of the following officers: Commander H.W. Isaac, Director Avionics Design and Production (DAV); Commander J.F. Frank, Director General Aircraft (DGA); Commander F.R. Fink, DNAR; Lieutenant-Commander L.R. Wagener, DGA; Lieutenant-Commander H.R. Welsh, Director Naval Aircraft Requirements (DNAR); Lieutenant-Commander W.H. Frayn, DGA, and; Lieutenant D.J. Cruickshank, DGA. It should be pointed out that the team was tasked to evaluate the HSS-2 solely as a carrier-borne helicopter. The navy was still concerned that the sheer size of the aircraft would prevent it from operating on a destroyer.

[16] "Report of RCN Evaluation of the Sikorsky HSS-2 as a Carrier Borne ASW Helicopter." NSS 7820-102 (Staff), 19 October 1961, Commander F.R. Fink, Acting Director of Naval Aircraft Requirements, et al. to VCNS, DHist 79/246, file B-2 vol. 2.

its ability to carry both torpedoes and the special weapon, and its hull-shaped fuselage. "Although the aircraft is still undergoing operational evaluation in the USN, it is apparent that this concept will provide the RCN with an ASW helicopter capability far superior to any currently in existence".[17] The HSS-2 was truly an all-weather dual-purpose aircraft.

The evaluation team's report was well-received and the navy accepted that the HSS-2 helicopter could operate from the aircraft carrier.[18] More interesting, however, was the fact that discussion turned to those sections of the report that dealt with the power-folding rotor blades and the manual- folding tail pylon. The RCN was well aware of the fact that these features might allow it to operate the larger Sea King helicopter from escort vessels. VCNS instructed the Evaluation Team to investigate this possibility.

The new study, completed in October 1961, noted many difficulties, but anticipated practicable solutions. Although manual tail folding was unsatisfactory for escort borne operations, the team reported that "the modification necessary to incorporate semi-automatic

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[17] Ibid. The fact that the helicopter had flown more than 2,000 hours, had passed the Navy Preliminary Evaluation, and the Board of Inspection and Survey Trials, and the USN had recently placed an order for 162 of these helicopters only strengthened the RCN's argument.

[18] In fact, on 9 November 1961, the navy approached the Chiefs of Staff Committee for approval to re-equip Squadron HS-50 with ten HSS-2 helicopters for operation from the carrier. The Chairman pointed out that there was no formal authorization for a carrier-borne operational A/S helicopter squadron, only for a small test and development squadron. "In presenting the programme for approval the RCN should explain the evolution of the squadron from test to operational status". The Chairman also felt that there should be one make of helicopter for both carrier-borne and destroyer escort operations. This was a prescient observation, as the navy would soon discover. In the end the COSC agreed to support the continued role of the Squadron, and granted approval for the re-equipping of the Squadron with HSS-2 helicopters. See, Minutes of the 704 Meeting of the Chiefs of Staff Committee, 9 November 1961, DHist 73/1223, file 1310, and; RG 24 83-84/167, vol. 3427, file 7820-102 vol. 3, NAC.

or mechanically assisted folding of the tail pylon was discussed with the manufacturer, and it is apparent that this is feasible".[19] On a related matter, the team noted that provision of a somewhat longer flight deck (78 feet), and larger hangar (53 feet long x 19 feet, 6 inches wide x 19 feet high) would permit the embarkation of the helicopter.[20] The main rotors would still overhang the flight deck by ten feet on either side, and the tail rotor would overhang the after edge of the flight deck by eight feet, but this was unlikely to have any adverse effect on helicopter operations during take-off or landing. Stabilization of the ship was required, but now it looked like this could be accomplished with the existing salt water ballast tanks fitted in the ships.

The other crucial element was the haul-down system, upon which a year's work had been expended on the basis of specifications for the smaller Kaman helicopter. The greater weight of the HSS-2 aircraft would place additional stresses on the rapid-securing and deck handling device. However, the team had put the problem to the Sikorsky company and been encouraged by their optimism that the equipment could be readily adapted.[21]

The navy did not act upon these recommendations because it was still awaiting the USN's final report on the Kaman helicopter. If the HU2K-1 helicopter failed to pass the

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[19] "The Suitability of the HSS-2 as an Alternate Choice for ASW Operations from Destroyer Escorts," NS 7801-102, 27 October 1961, Commander F.R. Fink, DNAR, to VCNS, DHist 79/246, file B-2 vol. 2. The other two members of the Evaluation Team tasked to conduct this study were: Commander H.W. Isaac, DAV, and Commander J.F. Frank, DAV.

[20] The flight deck designed to accommodate the smaller Sikorsky S-58 helicopter was 56 feet in length, and the hangar was 40 feet long.

[21] Ibid.

evaluation, the Canadian navy was left with the choice of accepting another aircraft or abandoning the whole concept of operating helicopters from destroyer escorts.[22] Rear-Admiral Brock, VCNS, was loath to consider the latter alternative, and sought the advice of the key technical and staff officers involved in the project.[23] There was strong support for the HSS-2 helicopter, and VCNS instructed DGA to investigate the "hold-down" and "tail folding pylon" problems.

At the end of November, naval headquarters received word from the Naval Air Test Center, at Patuxent River, Maryland, that "[the] HU2K-1 was not ready for Board of Inspection and Survey".[24] This message confirmed what many had suspected, that the aircraft was not suitable for escort-borne operations. That left the Sea King helicopter.

Time was now crucial if the first converted St. Laurent class destroyer was to be ready for trials by 1963. On 20 December 1961, the Naval Board approved the plan to acquire the Sea King for the destroyer escorts, enlarge the helicopter facilities in the DDE 205, DDE 265, and DDE 266 classes of destroyer escorts, provide ship stabilization, and re-arm Squadron HS-50 with ten HSS-2 helicopters - replacing the aging S-55 helicopters - for operations with the carrier.[25]

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[22] Minutes of a Meeting Held in Naval Board Room, 3 November 1961, NSC 7801-1021 (Staff), DHist 79/246, file B-2, vol. 2.

[23] The following directorates were represented at the meeting: CNTS, DNAR, DG Ships, DNOR, DGA. In addition, the following pilots were in attendance: Commanders Fink, Isaac, and Frank, and Lieutenant-Commanders Welsh and Muncaster.

[24] CANAVUS to CANAVHED, 22 November 1961, DHist 79/246, file B-2, vol. 2.

[25] See memorandum, "The Suitability of the HSS-2 as an Alternate Choice for ASW Operations from Destroyer Escorts," NSC 7801-102 (Staff), 8 December 1961, Rear-Admiral

> The Treasury Board, on 10 January 1962, rejected the helicopter procurement.
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> In view of the difficulties experienced with the choice of Kaman helicopter in the anti-submarine role, the Board considered that it would be premature to grant approval for the procurement of the HSS-2 for the carrier until it could be demonstrated that this choice was also a feasible one for destroyer escorts.[26]

The Board did not close the door to future submissions. Rather, it suggested that the RCN conduct additional tests to determine once and for all the feasibility of operating large ASW helicopters from destroyers.

The Chief of the Naval Staff was not happy that the procurement plan was contingent upon a demonstration, but the navy had to comply. Headquarters immediately began negotiations with the USN for the loan of a HSS-2 helicopter for the trials, and work was accelerated on the haul-down system.

The engineers tasked with the development of the haul-down device had investigated a number of systems, including a harpoon grid system and suction pads attached to the helicopter's skids, but Lieutenant-Commander J.H. Johnson, Deputy Director of Air Engineering, suggested as early as January 1955 that helicopters could be landed by using a cable and winch system. In January 1957, following the Buckingham trials, Commodore Freeborn, NCC, decided that a haul-down winch system was the best chance to make the helicopter/escort concept work.

J.B Caldwell, CNTS, and Rear-Admiral Jeffry Brock, VCNS, to CNS, DHist 79/246, file B-2, vol. 2, and: Minutes of the 664th Meeting of the Naval Board, 20 December 1961, DHist 1000-100/2.

[26] C.G. Steele, Secretary, Treasury Board, to Mr. E.B. Armstrong, Deputy Minister of National Defence, T.B. Minute 590367, 10 January 1962, DHist 79/246, file B-2, vol. 2.

In December 1959, the navy had sent invitations to industry for tenders for a haul-down and rapid-securing device. None of the responses showed sufficient promise so the service continued development of its own concept. The engineers had already determined - following the Buckingham and Ottawa trials - that a constant-tension winch system would be used to haul the aircraft down to the deck while a shuttle running in a channel under the flight deck would manoeuvre the aircraft into the hangar. Provision would be made for incorporating a slot into the deck, similar to the steam catapult shuttle runs in Bonaventure. The device would consist of a trolley mounted in the track beneath the deck, supporting a hold-down mechanism above deck level. The slot would run from the proposed landing and take-off area into the centre of the hangar.[27]

That decision was a defining moment in the helicopter/escort concept, and for the RCN. The Ottawa trials confirmed what the engineers had long suspected was the best method for bringing a helicopter to the deck of a pitching and rolling destroyer and securing it firmly to that deck. The USN was exploring similar haul-down systems - but not a rapid-securing device - for its DASH programme. Nevertheless, the RCN continued to monitor those developments in the United States. In 1960 Lieutenant-Commander Bill Frayn went to Newport, Rhode Island, where he flew the Kaman HUK-1 helicopter, aboard a USN frigate which was carrying out DASH trials. As the costs of the DASH helicopters continued

[27] See, Memorandum, "Information Relating to British Developments in Helicopter Attach/Detach Devices," NS 1115-39 (TS Air), 9 October 1959, Captain (E) J. Doherty, ACNTS (Air), to ACNS (A&W), RG 24 83-84/167, vol. 12, file S-1115-39 vol. 5, NAC; Memorandum, "DDE 265 and 266 - Arrangement of Weather Deck, Helicopter Platform and Hangar," NS 1115-39 (TS Air), 2 November 1959, Captain J. Doherty, ACNTS (Air), to NCC, RG 24 83-84/167, vol. 12, file S-1115-39 vol. 5, NAC, and; Minutes of the 113th Meeting of the Research Control Committee, April 1959, DHist 79/246, file B-3 vol. 3.

to escalate, the USN came to the realization that these aircraft were not expendable and some means of recovery had to be found. "The ship was fitted with a balloon-winch carrying a kevlar rope connecting it the helicopter, and the aircraft was pulled down"[28] to the flight deck. Following these trials, Lieutenant-Commander Frayn carried out additional tests in an S-55 helicopter at Shearwater. "Initially, the aircraft was pulled down by a group of eight sailors manning a rope connected to it through a block on the ground. When this [proved] successful, the motive power was supplied by a truck".[29] These trials - in both Canada and the United States - merely confirmed that the RCN was on the right course.

The RCN was the only navy in the world to tackle the much more difficult and complex problem of pulling and securing a heavy manned helicopter to a flight deck. Five directorates, HMC Dockyard, Halifax, VX-10 Squadron, Fairey Aviation and Dowty would play a role in bringing this concept to fruition. There would also be important assistance from Canadian Pratt and Whitney, the Sikorsky Aircraft Company, and the USN.[30]

By late 1961, work had progressed to the point where the navy could begin serious negotiations with the two prime manufacturers - Fairey Aviation and Dowty - for the

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[28] Peter Charlton and Michael Whitby (eds), "Certified Serviceable": Swordfish to Sea King. The Technical Story of Canadian Naval Aviation by Those Who Made it So. (Ottawa: CNATH, 1995), p. 379, and; Peter Charlton, Nobody Told US it Couldn't Be Done: The VX10 Story. (Ottawa: Published Privately, 1993), p. 145.

[29] Ibid, p. 380 and p. 145 respectively.

[30] The five directorates were: ACNTS (Air), NCC, Director General (Ships), Director General (Air), and the Director of Naval Aircraft Requirements. ACNTS (Air) which became DGA in 1961, was responsible for design and development of both the rapid securing device, and the mechanism for moving the aircraft into the hangar. DG (Ships) was responsible for shipboard provisions, while DNAR was tasked with operational requirements.

construction of a prototype of the rapid-securing device. Before the contract was signed. however, the service had to approach the USN and the Sikorsky Aircraft Company for assistance with its upcoming demonstration, which was scheduled for the spring of 1962. Just prior to the haul-down tests, the RCN accepted the detailed design proposal by Fairey Aviation, together with a working model of the deck handling device, which was sent to Sikorsky Aircraft Company for evaluation.

The USN agreed to the loan of an HSS-2 helicopter, while Sikorsky promised to provide the technical expertise and the access to its facilities. The haul-down demonstration took place at the Sikorsky Aircraft Plant, Stratford, Connecticut, on 16 April 1962. Representatives of the Treasury Board, the Department of National Defence, the Sikorsky Aircraft Company, the USN, and the U.S. Coast Guard witnessed the demonstration.[31]

All went well, and not surprisingly because "some 150 haul-downs had been performed prior to the demonstration".[32] The display included haul-downs:

> with the helicopter displaced laterally and astern of the haul-down point to give angles of pull up to 45° degrees from the vertical. Under haul-down tension, the helicopter

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[31] The trials were witnessed by the following individuals: Mr. J. MacDonald, Assistant Secretary, Treasury Board; Mr. G. Hunter, Assistant Deputy Minister, DDP; Mr. D.L. Thompson, Director, Aircraft Production, DDP; Mr. L.M. Chesley, Assistant Deputy Minister (Requirements), DND; and Mr. H.H. Poyntz, Assistant Deputy Minister (Requirements), Staff, DND. In addition, the following RCN officers were present: Rear-Admiral J.B. Caldwell, CNTS; Commodore Welland, ACNS (A&W); Commodore O'Brien, Naval Member Canadian Joint Staff, Washington; Captain Doherty, DGA, and; Captain Wilgress, DNAR.

[32] Memorandum, "Haul-Down Demonstration - Sikorsky," NSC 7820-102 (CNTS), 17 April 1962, Rear-Admiral J.B. Caldwell, CNTS, to CNS, DHist 79/246, file B-2, vol. 2. It remains unclear whether the previous 150 haul-down trials were conducted by the RCN, the USN, or both. The USN was conducting haul-down tests for its DASH programme. What is known is that Lieutenant-Commander Bill Frayn and Bob Decker, Sikorsky's chief test pilot, flew the HSS-2 helicopter during this demonstration.

> quite clearly sought to centre itself over the haul-down point.... Gusts of some 20-45 knots arose during the course of the demonstration without adverse effect.... It was altogether a most convincing demonstration, so trouble free and lacking in incident as to be somewhat anti-climatic.[33]

The observers were impressed. Treasury Board's doubts about the feasibility of the helicopter/escort concept disappeared.

Nevertheless, there was another five months' delay before the Treasury Board gave its approval for procurement of the HSS-2 helicopter. One central issue was expansion of the RCN's plans, which now included upwards of 72 helicopters. Forty-four helicopters were required to outfit the carrier-borne Squadron HS-50, to arm the St. Laurent class destroyers on completion of their conversion, and the last two Mackenzie ("Repeat Restigouche") class destroyers. If the service proceeded with its plans to convert eleven more DDE's (7 Restigouche and the remaining four Mackenzies), the navy would require another 28 aircraft.[34] The seventy-two helicopters were to be purchased over a ten year period, and included spares to cover attrition. The McDonnell F2H-3 fighter (Banshee) was quickly reaching the end of its operational life and no decision had been reached on its replacement. Both the RCAF and the RCN were actively searching for suitable fighters, but rumours suggested that the air force would procure a fighter that could not operate off the carrier. When the Banshee was struck off strength in the summer of 1962 this relegated Bonaventure to an ASW role. This, in turn, swept aside the navy's previous reservations about embarking the larger helicopters onboard the carrier.

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[33] Ibid.

[34] See, Mr. George Nowlan, Minister of Finance, to the Honourable D.S. Harkness, Minister of National Defence, 27 August 1962, DHist 79/246, file B-3, vol. 3.

This ambitious programme, however, ran headlong into two questions of higher government policy: the level of defence expenditure, and the desirability of using military procurement to stimulate Canadian industry. Canada entered into a recession in 1957. Inflation was on the rise and so was unemployment. The federal government increased expenditures, de-valued the Canadian dollar to stimulate exports, converted war bonds, and obtained short-term loans, but these measures failed to turn around the economy. The deficit continued to grow at an alarming rate. "The 1961-1962 budget had predicted a $650 million deficit, but although revenues were slightly higher than [the Minister of Finance] had forecast, expenditures were up even more, with the result that the deficit was $791 million dollars".[35] To make matters worse the federal reserves of U.S. dollars and gold were quickly being depleted. In 1962, the government was forced to introduce new taxes and cut government expenditures by approximately $200 million dollars. Because of the government's austerity programme, and the continuing imbalance in the foreign exchange rate with the United States, the Treasury Board did not approve the acquisition of the seventy-two helicopters.[36] Even the navy's plan to purchase 44 helicopters was rejected by the Board. In 1956, the RCN's budget had been $340.8 million dollars, by 1961 it had dropped to $245.5 million dollars. As

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[35] J.L. Granatstein, Canada, 1957-1967: The Years of Uncertainty and Innovation, ch. 4. See also, Robert Bothwell et al, Canada since 1945: Power, Politics, and Provincialism, ch. 23.

[36] See, Mr. George Nowlan, Minister of Finance, to the Honourable D.S. Harkness, Minister of National Defence, 27 August 1962, DHist 79/246, file B-3, vol. 3; Dan W. Middlemiss, "Economic Considerations in the Development of the Canadian Navy since 1945," in The RCN in Transition, 1910-1985, W.A.B. Douglas, ed., (Vancouver: UBC Press, 1988), pp.262-265, and; Minister of Finance to the Minister of National Defence, 14 September 1962, DHist 79/246, file B-3, vol. 3.

Professor Roy has shown, during Pearkes's tenure as Minister of National Defence he was under constant pressure from Donald Fleming, Minister of Finance, to reduce the department's expenditures.[37]

The cost to produce the 44 helicopters in Canada was $107 million dollars, which represented almost half of the navy's budget. The RCN and the Department of Defence Production therefore proposed purchasing eight helicopters, spares, a simulator and associated equipment in order to meet the navy's immediate needs. The cost for the programme was approximately $23.9 million dollars, and was to be spread over a five year period (1962-1966). To address the Canadian government's concerns regarding domestic production the RCN and DDP suggested that the first three helicopters be purchased directly from the manufacturer, and the remaining five, plus any future helicopters, be assembled in Canada by Pratt and Whitney.[38] On 26 September 1962, the Board finally approved the acquisition of eight HSS-2 helicopters. The first three helicopters built by Sikorsky were scheduled for delivery by the end of June 1963, while the aircraft assembled in Canada were

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[37] See, Reginald H. Roy, For Most Conspicuous Bravery, chs. 15-16, and; Dan W. Middlemiss, "Economic Considerations in the Development of the Canadian Navy since 1945," in The RCN in Transition, 1910-1985, W.A.B. Douglas, ed., (Vancouver: UBC Press, 1988), pp. 262-265.

[38] Mr. D.L. Thompson, Director, Aircraft Branch, DDP, to Mr. E.B. Armstrong, Deputy Minister of National Defence, 7 September 1962, DHist 79/246, file B-3, vol. 3, and; D.S. Harkness, Minister of National Defence, to the Honourable George Nowlan, Minister of Finance, 14 September 1962, DHist 79/246, file B-3, vol. 3.

due between May and September 1964.[39] In September 1962 as well the contract for the haul-down and rapid-securing device was awarded to Fairey Aviation.

The reduction in the number of helicopters to be purchased produced shortfalls in all aspects of the programme. Approved plans included the conversion of nine destroyer escorts to carry ASW helicopters. That, plus the six intended for Bonaventure gave a bare minimum requirement of fifteen aircraft. Adding to these problems were the shortages in the number of pilots, other aircrew, and maintenance personnel.[40] To prepare for the delivery of the first three Sea King helicopters in 1963 to 1964 the RCN had to train an additional 49 personnel, which included six pilots, 31 maintenance personnel, and twelve sonarmen. Thereafter, as each Sea King was added to the fleet, manpower requirements would continue to increase substantially. A single destroyer escort detachment included fourteen maintenance personnel, three pilots and three naval sonarmen. There was also a corresponding increase in the number of staff at the squadron headquarters, and at Shearwater.[41]

Ultimately, the Naval Board decided that HS-50 would be equipped with six Sea King helicopters, reformed ashore at Shearwater while training new personnel to be ready for operations from Bonaventure at the beginning of 1965. The squadron would operate from

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[39] Extract from the Minutes of Treasury Board, 26 September 1962, T.B. Minute 590367, DHist 79/246, file B-3, vol. 3. It will be remembered that in March 1961 the Treasury Board approved the procurement of 12 Kaman helicopters for $23.8 million dollars. It was only a matter of amending the original Treasury Board Minute to reflect these changes to the original procurement programme.

[40] See, Minutes of the 698th Meeting of the Naval Board, 10 April 1963, DHist 1000-100/2.

[41] Memorandum, "CHSS-2 Manpower Requirement," NSC 4100-913 (Staff), 26 April 1963, Captain V.J. Wilgress, DNAR, to DNOM, DHist 79/246, file B-3, vol. 3.

the carrier for a period of three months to complete conversion to the new type and give experience to new personnel, and then would re-deploy to the destroyer escorts in the spring of 1965. Squadron operations from the carrier would be curtailed until the spring of 1966, when the navy expected to have sufficient aircraft and trained personnel in order to operate the helicopters from both the carrier and the destroyer escorts. Even this concentration of resources on training and conversion was not enough. Sikorsky Aircraft Company undertook to provide maintenance courses and to train five pilots, and the USN agreed to make up the difference.

The requirements for the trials programme only exacerbated an already difficult situation. One helicopter was required for the haul-down trials and another for radar calibration and high-frequency radio trials. The navy, however, also needed the first three helicopters for pilot and aircrew training. To overcome the conflicting priorities the RCN was forced to purchase an additional helicopter from Sikorsky Aircraft Company, for a total of four from the U.S. manufacturer.

One of the helicopters had to be fitted with a probe and probe housing on the underside of the fuselage for the haul-down trials on HMCS *Assiniboine*. Fairey Aviation was in the process of designing and manufacturing the probe and housing and would ship the mechanism to the Sikorsky Aircraft Plant by mid-April for installation. Fairey Aviation was also responsible for the rapid-securing device and trolley system, and hoped to have a prototype ready by the end of March 1963. Dowty of Canada, the other major contractor, was designing and building the winch system.[42] Following acceptance trials on this equipment it was to be shipped to the V'est Coast, for installation in Assiniboine by mid-June. The RCN expected to complete the entire installation process sometime in September, and have the ship ready for trials by November 1963.[43]

HMCS Assiniboine was only six years old when she was paid off on 15 June 1962, nd turned over to HMC Dockyard, Esquimalt for a forty-week conversion. This was a major undertaking which included the addition of a hangar, flight deck, the rapid-securing device, winch and trolley, ships' stabilizers (to compensate for the additional weight of the Sea King helicopter), aviation fuel facilities, VDS, and the latest hull-mounted sonar. Other modifications included splitting the funnel, moving the main mast, removal of the after mortar, installation of new electronic equipment and additional machinery spaces, and extensive re-wiring of the entire ship.

Because Assiniboine was the first ship of the St. Laurent class to undergo this conversion, there were delays, and the completion date slipped from April 1963 to August 1963. A modern warship is an extremely complex system, or rather many complex systems

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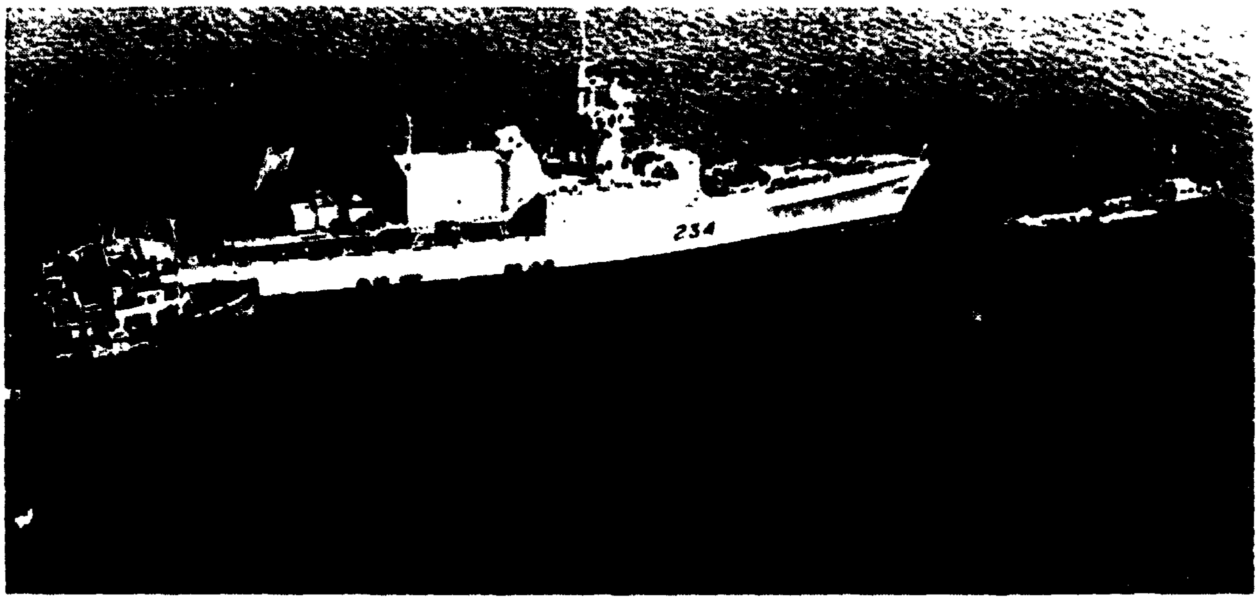
[42] The entire system is composed of four main components: the probe and probe housing affixed to the helicopter, the haul-down winch system, the rapid-securing device located in the centre of the flight deck, and the trolley system (traverse) which moves the aircraft in and out of the hangar. Later, the entire system came to be known as Beartrap.

[43] Memorandum, "Introduction into the RCN of CHSS-2 (Sea King) Helicopter, 14 March 1963, Flag Officer Atlantic Coast to VCNS, DHist 79/246, file B-3, vol. 3. Shop trials of the beartrap system began in March June 1963, just prior to the haul-down demonstration at the Sikorsky Aircraft Plant, which was held in April 1963. Shop trials of the haul-down control system in June were not successful but the rest of the winch system was fitted in Assiniboine during her conversion. See, Research Control Committee Minute, 133-4, 14 April 1964, DHist 79/246, file B-6, vol. 4.



HMCS Assiniboine being towed from Victoria Machinery Depot in Victoria's inner harbour to the naval dockyard at Esquimalt, B.C., in the spring of 1963. Note that the funnel has already been split and the hangar installed in order to fit the flight deck. (Department of Nationa' Defence, DNS 71937) within confined spaces, and large scale modifications are often more complicated than building from scratch.[44] During one week in January 1963, for example, thirty-one electrical drawings were revised. "To handle this work load and obtain an appreciation of the work involved necessitated removing draughtsmen for other important work [on] the conversion. Implementing some of the revisions meant ripping out cable which had been run only two weeks ago and re-routing it".[45] Lessons learned from the prototype Assiniboine conversion, however, produced greater efficiency in the re-configuration of St. Laurent, the next ship in the programme.[46]

Squadron VX-10 had been tasked, in January 1963, with the development and evaluation of the CHSS-2 winch-down and handling system.[47] A team of squadron officers

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[44] See, Report of Progress for period ending 31 January 1963, "DDE 234 Conversion," ROVA 8765-DDE/ISL, 12 February 1963, RG 24 83-84/167, vol. 3423, file 8260-DDE-234, vols. 1-3, NAC.

[45] Memorandum, "HMCS Assiniboine - Conversion," NS 8260-DDE-234 (CNTS), 19 August 1963, Rear-Admiral J.B. Caldwell, CNTS, to CNS, RG 24 83-84/167, vol. 3423, file 8260-DDE-234, vol. 3, NAC. The average daily work force for the entire conversion process was 257 men.

[46] The hangar door for the St. Laurent conversion is an example. When Assiniboine's hangar door was closed there was a gap of several inches between the top of the door and the bottom edge of the hangar. Even with the weather strip at the top of the door the hangar was not completely closed to the elements. The manufacturer of the hangar door was able to correct the problems with the operator track and arm at the plant. See Memorandum, "DDE 234 Conversion - Hangar Door," ROVA 8260-DDE/ISL, 26 July 1963, Commander J.B. Hall, Resident Naval Overseer Victoria Area, to Commodore S. Mathwin Davis, Director General Ships, RG 24 83-84/167, vol. 3423, file 8260-DDE-234, vol. 3, NAC.

[47] This project was designated PD 102, "The Development and Evaluation of the CHSS-2 Winch Down and Handling System". Later the title was changed to Haul Down and Handling System. See, "VX-10 - Report of Proceedings for the Month of January 1963," VX-10 1920-29/10, 5 February 1963, DHist 1700-219/10 (VX-10 Report of Proceedings, 1961-1965); Peter Charlton, Nobody Told Us it Couldn't Be Done: The VX-10 Story, (Ottawa: Published

and representatives from Fairey Aviation was sent to the west coast in August to observe and supervise the installation of the haul-down (winch system), rapid-securing system (Beartrap), and trolley (traverse) system.[48] As recounted earlier problems with the haul-down winch control system precluded it from being fitted in Assiniboine during the refit.

During the shop trials, the constant tension control of the winch system failed completely. It was discovered that the winch system, designed and built by Dowty, was much more powerful than originally anticipated. As Peter Charlton has recounted:

> it was agreed that a rope accumulator was needed; but how much rope, and tension stroke curve had to be defined. Lieutenant-Commander Craig Balson was called in, helped define a rope accumulator with three nitrogen accumulators, and continued to work analysing the constant-tension control problem. The rope accumulator was designed but could not be fitted before Assiniboine sailed for the Halifax, nor could its mounting structure be designed.[49]

Consequently, the navy had to requisition a second prototype winch in order to de-bug the tension control system. Dowty, and its sub-contractor Cowley Consultants, were able to re-design the system by modifying and adding new components such as a hydraulic function generator to the electronics. The second prototype, with a rope accumulator, was tested at Dowty's plant in Ajax, Ontario, and then shipped to Halifax to await Assiniboine's arrival.

Privately, 1993), p. 146, and; Peter Charlton and Michael Whitby (eds.), "Certified Serviceable": Swordfish to Sea King, The Technical Story of Canadian Naval Aviation by Those Who Made it So, (Ottawa: CNATH, 1995), ch. 18.

[48] Members of the team consisted of: Lieutenant-Commander S.M. Rowell, Commanding Officer of VX-10; Lieutenant-Commander Peter Charlton, VX-10, CHSS/DDE Project Officer; C2AT4 T. Boyd, VX-10, Trials Officer; Lieutenant-Commander R.M. Houston, DGA; Lieutenant-Commander W.J. Bryan, DGA, and Mr. Gerry Martin, Fairey Aviation engineer.

[49] Peter Charlton and Michael Whitby (eds.), "Certified Serviceable": Swordfish to Sea King, The Technical Story of Canadian Naval Aviation by Those Who Made it So, p. 382.

Meanwhile, Assiniboine's post-conversion tests had begun on the west coast. The winch, without the haul-down controls, was shipped to Esquimalt for installation in the destroyer, but in the first series of tests the system did not work. Mechanically, the system was sound but an investigation revealed problems with the electrical wiring. Victoria Machinery Depot (VMD) re-wired the system, and ship-board dummy helicopter traverse trials (the shuttle/trolley system that moved the aircraft in and out of the hangar) began on 18 September.

The dummy helicopter, a steel and concrete contraption that had been built by Fairey Aviation, featured oleos and wheels from a Sea King mounted on the steel frame in the same position as they would be on an operational aircraft. The device was designed to approximate, as closely as possible, the weight and centre of gravity, vertically and longitudinally, of the Sea King helicopter. The dummy was fitted with a probe to engage the Beartrap system, so that straightening and traverse trials could be conducted under varying degrees of ship motion. While Assiniboine was still on the west coast, Tom Boyd of VX-10 and Mr. Gerry Martin an engineer from Fairey Aviation, were able to design a new mounting structure for the rope accumulator. This information was rushed to Halifax so that the mechanism could be built in time for Assiniboine's sea trials. Following six days of tests off Victoria, Assiniboine sailed on 25 September 1963 for Halifax. During the passage, more straightening and traverse trials were carried out in weather that more closely approximated operational conditions. "Despite the absence of any really heavy weather [the navy] was able to demonstrate, in rolls of up to 12° degrees, that it was possible to traverse and straighten the [aircraft] as envisioned".[50]

Assiniboine arrived in Halifax on 26 October, and work began immediately on the installation of the rope accumulator and the winch down control system. While work was being carried out on the destroyer, it was decided that the concept of hauling the probe up to the helicopter was too dangerous. In the original design of the Beartrap and the probe the pilot had to be able to release the helicopter, even during the haul-down operation. Accordingly, Fairey Aviation designed a system that released the probe and attached haul-down cable together. "The weight and size of the probe were not really appreciated until one was built. Only then did it become obvious that to release a twenty-pound projectile, over two feet long and three inches in diameter, under 4,000 to 5,000 pounds cable tension"[51] posed a danger not only for the aircraft handlers but to the ship and the Beartrap system as well. This situation caused the entire design of the probe housing to be reviewed, and quickly because the flying trials were scheduled to begin next month. As Peter Charlton has recounted:

> Lieutenant-Commander Charlton, senior technical officer in VX-10, designed a new probe housing that incorporated a hollow probe mounted permanently in the aircraft. This allowed the messenger winch cable to raise the haul-down cable through the

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[50] Peter Charlton and Michael Whitby (eds.), "Certified Serviceable": Swordfish to Sea King, p. 382, and; Peter Charlton, Nobody Told Us it Couldn't Be Done: The VX-10 Story, p. 149.

[51] Peter Charlton, Nobody Told Us it Couldn't Be Done: The VX-10 Story, p. 150; Peter Charlton and Michael Whitby (eds.), "Certified Serviceable": Swordfish to Sea King. The Technical Story of Canadian Naval Aviation by Those Who Made it So, p.381, and; Progress Report, "Haul Down, Hold Down and Deck Handling Equipment," n.d. (circa 1964), DHist 87/77.

> probe and it was then secured with the probe housing. Appropriate inter-locks were provided to sequence the operation, means provided to allow the pilots to release the cable or to cut it with an explosive cutter, and the control circuits designed.[52]

Fairey Aviation then built the new probe and had it ready prior to the flying trials. Installation of the winch-down control system and the rope accumulator was completed at the roughly same time. On 22 November 1963, everything was in place for the RCN to test the entire haul-down/rapid-securing and traversing system, and demonstrate that heavy helicopters had truly been married to the escort destroyer as an effective weapons system.

The prototype Beartrap system included a number of separate components, including the spring loaded retractable probe on the underside of the helicopter's fuselage near the aircraft's centre of gravity, which was trapped by the jaws of the rapid-securing device secured to the ship in the centre of the flight deck.

> The Beartrap is traversed aft out of the hangar and stopped in the landing position with the rails cocked open. The helicopter, with pilot and Landing Signals Officer (LSO) in radio communication, approaches the ship from aft and establishes a hover between 30 and 40 feet over the deck. The pilot lowers the messenger cable which is grounded to the ship and then connected to the haul-down cable flaked down on the deck. The messenger and haul-down cable are raised into the aircraft by means of the messenger winch, and the haul-down cable is automatically secured into the aircraft. A hydraulic control system below the flight deck maintains the haul- down cable at constant tension with reel-in speeds up to 20 feet per second.[53]

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[52] Peter Charlton and Michael Whitby (eds.), "Certified Serviceable": Swordfish to Sea King, The Technical Story of Canadian Naval Aviation by Those Who Made it So, p. 381. The RN experimented with the haul-down system on a simulator, but decided that there was a chance that the helicopter would lose control in such conditions and the idea was not pursued.

[53] Progress Report, "Haul Down, Hold Down and Deck Handling Equipment," n.d. (circa 1964), DHist 87/77; Commander R.A. Douglas, "Helicopter/Ship Interface: Canadian Experience of Helicopter HaulDown and Rapid Securing Device," A Paper Presented at the Commonwealth Engineer Officers' Conference held at Bath, 15-16 September 1977, pp. 213-220, DHist 93/110, Item 082; Captain C. Dalley, "The Marriage of the Small Ship and the

With the haul-down cable connected to the aircraft and the main probe extended, the flight deck was cleared of all personnel except the LSO and the landing began.

The LSO brought the haul-down winch into operation at minimum tension and the excess haul-down cable was taken up on the drum located below the deck. When the cable was taut, the LSO applied 2,000 pounds tension and the pilot applied "upward collective" to give positive lift equal to the tension applied. From this point the pilot applied control only to prevent rolling and pitching, but not to change altitude. As a lull in the ship's motion approached, cable tension was increased to anywhere from 3,000 to 5,000 pounds and the aircraft was hauled to the deck as the lull occurred. When the LSO saw the probe enter the Beartrap, he instructed the pilot to drop his collective (ie. reduce lift), and fired the jaws which closed around the main probe and secured the helicopter to the deck.

The next stage in the operation was to straighten and traverse the helicopter into the hangar. This was also accomplished by means of the Beartrap system. The traverse winch was used to move the Beartrap aft. The turning movement exerted on the probe as the rails bore on the deck chevrons both centred and straightened the aircraft on the deck. The helicopter was then moved forward into the hangar and stowed.

Large Helicopter," in Maritime Warfare Bulletin, (Commemorative Edition, 1985), p. 74, and; Lieutenant A.M. Percy, "Aircraft Facilities in DDE Conversions," p. 17, DHist 93/110, Item 061. The rapid securing device must fit under the Sea King helicopter and between its main wheels. This requirement limits the size of the Beartrap to 36" x 42" inches in diameter. For the aircraft to be trapped successfully the pilot must place the probe in a 10.5 square foot area which is out of sight under the aircraft for the critical final seconds of the landing operation. To assist the pilot during this phase of the operation he relies upon the deck markings, landing lights and other visual aids to tell him where he is in relation to the Beartrap and to give an indication of deck motion. In addition, the LSO who is located on the flight deck in a position to see the Beartrap and the main probe talks the pilot down into the Beartrap and closes the jaws on the probe.

Even with the Beartrap system, landing a helicopter onboard a small flight deck in the middle of the ocean was an extremely difficult operation. Vectoring the aircraft to the destroyer was not the problem. Synchronizing the movement of the helicopter to that of the destroyer prior to hook-up, however, presented all sorts of difficulties.

The aircraft had to maintain a position over the centre of the flight deck - approximately 20-40 feet - while maintaining forward motion (a minimum of 30 knots), while being buffeted by the wind. The destroyer had to hold a steady course, steaming into the wind. Similarly, the destroyer was being battered by the sea, and its pitching and rolling made the entire hook-up process that much more complicated. The pilot had to maintain his position over the deck, paying particular attention to the distance between the aircraft's main rotor and the hangar superstructure, which was located just forward of the flight deck. Once the helicopter was hooked-up to the haul-down cable, the LSO brought the aircraft to the platform and locked it into the Beartrap. That split second between landing on the flight deck and locking the aircraft into the rapid-securing device was a tense time. If the hook-up was not almost instantaneous, the pitch and roll of the destroyer would send the 19,000 pound aircraft lurching out of control on the tiny flight deck, endangering the helicopter, its crew, and the warship.

Proper evaluation of the system required sensitive equipment to measure motion. The installation, which included an oscillograph and associated sensors, control and balance circuits in both the ship and aircraft, was done by the Rotary Wing Instrumentation Division of the United States Naval Air Test Centre, Patuxent, Maryland (USNATC).[54]

On 23 November 1963, Sea King helicopter No. 4003 was hoisted aboard Assiniboine in preparation for the flying trials. The first big test was to see whether or not the hangar was large enough to accommodate such a massive helicopter. The aircraft did fit, but just barely. "'Geez! That's tight' was one of the milder remarks."[55] The rest of the day was spent conducting deck handling and manoeuvring drills.

Prior to these on-board trials the aircraft handlers had conducted on-shore familiarization drills with the helicopter. These exercises were designed to give the flight deck crew some practice in working in the rotorwash (downdraft) of the helicopter, catching the messenger cable from the aircraft and connecting it to the ship's haul-down cable. According to Peter Charlton, the first attempt to grab the messenger cable resulted in:

> a massive static electricity discharge through the man who grabbed the [messenger] cable, Leading Seaman Lawton. This bowled him right off his feet and although he

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[54] Progress Report, "Haul Down, Hold Down and Deck Handling Equipment," n.d. (circa 1964), DHist 87/77; Peter Charlton, Nobody Told Us it Couldn't Be Done: The VX-10 Story, p. 150, and; Peter Charlton and Michael Whitby (eds.), "Certified Serviceable": Swordfish to Sea King. The Technical Story of Canadian Naval Aviation by Those Who Made it So, p. 383.

[55] VX-10, "Report of Proceedings for the Month of November 1963," 1920-29/10, 4 December 1963, DHist 1700-219/10 (VX-10 Report of Proceedings, 1961-1965); Peter Charlton and Michael Whitby (eds.), "Certified Serviceable": Swordfish to Sea King. The Technical Story of Canadian Naval Aviation by Those Who Made it So, p. 383, and; Peter Charlton, Nobody Told Us it Couldn't Be Done: The VX-10 Story, p. 152. The pilots were able to walk around, sit in the cockpit and get their bearings as to just how close the hangar, and deck edges really were. The flight deck crews were similarly able to see just how much free deck they had to work with.

> was not hurt he might very well have gone overboard over the top of the flight deck [safety] nets had we been aboard the ship.[56]

Lawton picked himself up off the ground and was about to make a second attempt to grab the messenger cable when he was stopped. A set of grounding tongs with a long grounding wire, to discharge the aircraft's static charge, had to be made before the flying trials could begin.

On 27 November 1963, a Sea King helicopter, flown by Lieutenant-Commander Joe Sosnkowski, took off from Shearwater and headed for Assiniboine, which was anchored in Bedford Basin. The weather was perfect.[57] After a few practice approaches, Lieutenant-Commander Sosnkowski made a free deck landing, that is without using the winch-down and

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[56] Peter Charlton, Nobody Told Us it Couldn't Be Done: The VX-10 Story, p. 151, and; Peter Charlton and Michael Whitby (eds.), "Certified Serviceable": Swordfish to Sea King. The Technical Story of Canadian Naval Aviation by Those Who Made it So, p. 383.

[57] Lieutenant-Commander Joe Sosnkowski was an experienced aviator on both fixed-wing and rotary-wing aircraft. He joined the RCNR in 1950, and underwent University training at Royal Roads Military College. After one year, he transferred to the regular navy and began pilot training. In 1955, he was sent to Pensacola, Florida, for helicopter pilot training. The following year he joined Squadron VF 871, as Squadron pilot and Divisional Officer, where he flew a variety of fixed-wing aircraft. In 1959, Sosnkowski joined VX-10 as the Project Pilot where he underwent conversion courses on the HTL-6 and S-58 helicopters. In addition, he was also in charge of the RCN acceptance team for the Tracker aircraft. The following year he was sent on course to the United States Naval Test Pilot School, Naval Air Test Centre, Patuxent River, Maryland in the Vertical Take-Off and Landing Short Take-Off and Landing Branch. While there he qualified on the following aircraft: HSS-1, HSS-2, HU2K-1, S62-A, to name but a few. Following completion of the courses he served as the Assistant Project Officer and evaluated the following aircraft types: HU2K-1, HSS-2, and the S-62 helicopters. He returned to Canada and VX-10, in 1963, as the Squadron's Senior Test Pilot. He was well regarded by his senior officers and while on course in the U.S. managed to endear himself to the USN. In fact, Commander P.L. Sullivan, USN, noted that "the interchange of ideas and test procedures and the close cooperation achieved between the RCN and USN on helicopter problems can be largely attributed to Lieutenant Sosnkowski". High praise indeed.

rapid-securing system that would be essential in operations at sea. A week later, in similar weather conditions, he "flew the wire" to the deck of Assiniboine. Under the ideal conditions in Bedford Basin the Beartrap system functioned well enough, but it remained to be seen what would happen out in the north Atlantic.

Over the next six months, VX-10 put the Sea King and Assiniboine through a rigorous series of tests that revealed additional design flaws in some of the operating systems. Neither the flying trials, nor engineering work to correct deficiencies were complete when Assiniboine entered refit, in late 1964, to enlarge the hangar and install additional firefighting equipment.[58] In 1965, therefore, HMCS Annapolis, one of the first purpose-built helicopter destroyers, became the trial's ship.

The number of haul-down cables that snapped during the flying trials was the most troubling. "The limited performance of the haul-down winch control system was the cause of the cable breaking. This control system was fitted in November 1963 despite its limited performance in order to start the flying trials".[59] Alterations to the reeving mechanism, a complicated piece of machinery which was housed in the machinery spaces below the deck, were also necessary. According to Peter Charlton:

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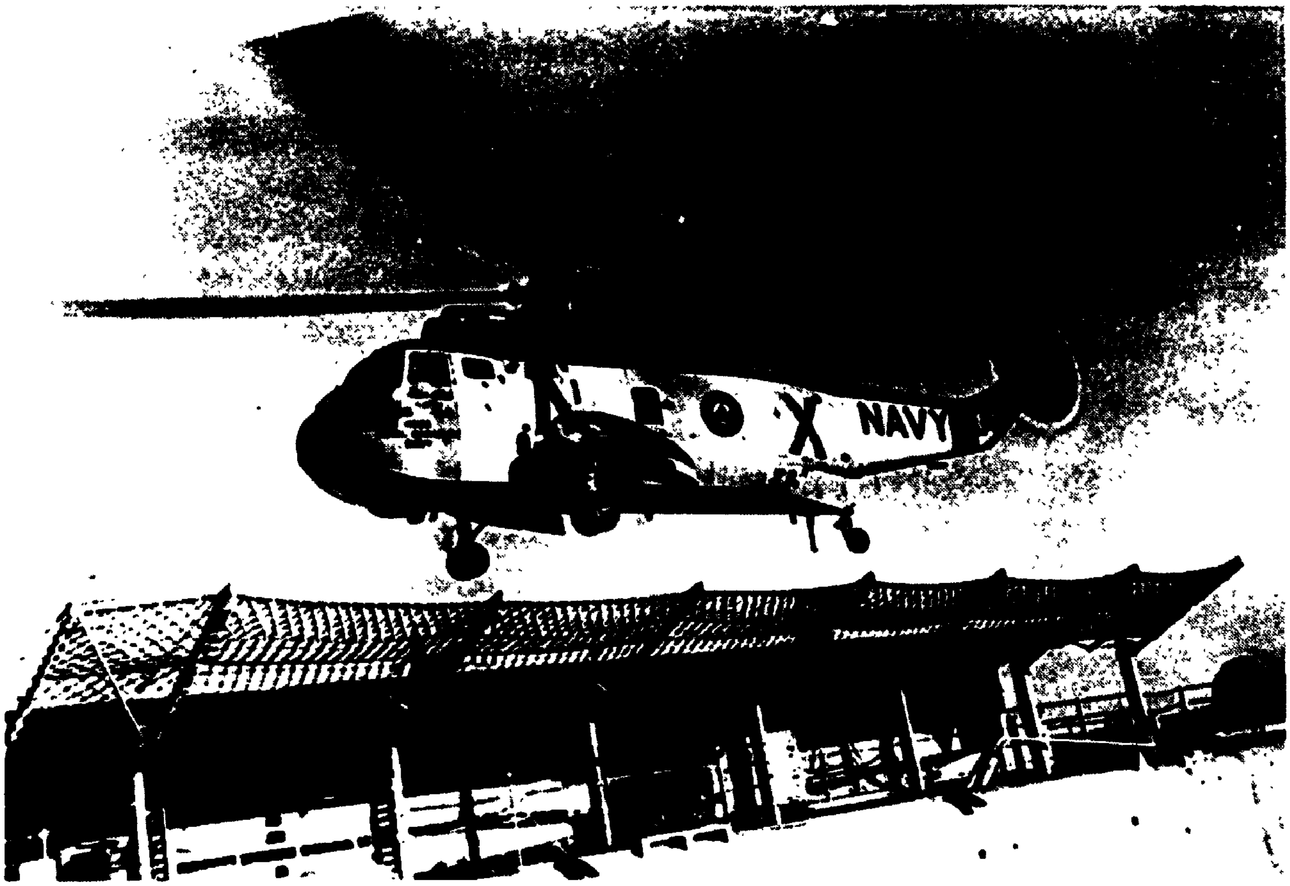
[58] For a detailed discussion of the post-conversion modifications to Assiniboine see the following files: RG 24 83-84/167, vol. 3824, file 8260-DDH 234 vol. 4, NAC; RG 24 83-84/167, vol. 3817, file 8260-DDE/ISL vol. 12, NAC, and; RG 24 83-84/167, vol. 3817, file 8260-DDE/ISL vol. 13, NAC.

[59] Research Control Minutes, 130-5, and 133-4, 24 October 1963, and 14 April 1964 respectively, DHist 79/246, file B-6, vol. 4. During the trials the navy was also attempting to increase the rate at which the aircraft could be hauled down to the deck. The first prototype could pull the helicopter down at a rate of 10 feet per second, but the navy wanted to increase the rate to 20 feet per second. The sooner the helicopter was locked into the Beartrap the safer the landing operation.



Sea King helicopter from VX-10 Squadron making a free deck landing aboard HMCS Assininboine, in 1963. (Department of National Defence, HS 73888)

Sea King helicopter "flying the wire" to HMCS Assininboine's flight deck, in 1964. (Department of National Defence, EKS 1621)

> Originally, the cable from the aircraft entered the Beartrap, passed 90° degrees over the load cell sheave, ran forward under the deck plates, turned 180° degrees around a shuttle, the "bicycle", in the deck track, then aft under the Beartrap to the winch compartment. [The] bicycle moved at half the Beartrap speed and kept the bights of the electric cable to the Beartrap and the haul-down cable tensioned during traversing. When a cable broke, tension on the bicycle was released and transferred to the electric cable and broke the connections. The solution was to pin the bicycle during the haul-down operation, but when the pins were forgotten and traverse started, the electric cable connections were broken anyway. The next solution was to add a pin stowage on the LSO's console with an interlock preventing traverse operation unless the pins were remove and stowed. The redesign simply lowered the first sheave, mounting it below the track instead of on the Beartrap. The haul-down cable then ran up through a hole in the track, then through the centre of the Beartrap and up to the helicopter. Once the aircraft was secured in the Beartrap, the haul-down cable could be released from the aircraft and pulled down clear of the Beartrap to allow traversing.[60]

Re-design of the reeving system reduced stresses on the haul-down cable which in turn prevented the cable from breaking.

Other modifications to the Beartrap system resulting from the Assiniboine and Annapolis trials included a major project, also undertaken by VX-10, to upgrade the electronic equipment,[61] and the development of the tail-guiding winch system. Beartrap was originally designed to centre the aircraft before moving it into the hangar, but it did not work properly, especially if the flight deck was slippery or there was too much wind over the platform. In both instances the tail of the aircraft would slip sideways relative to the centre

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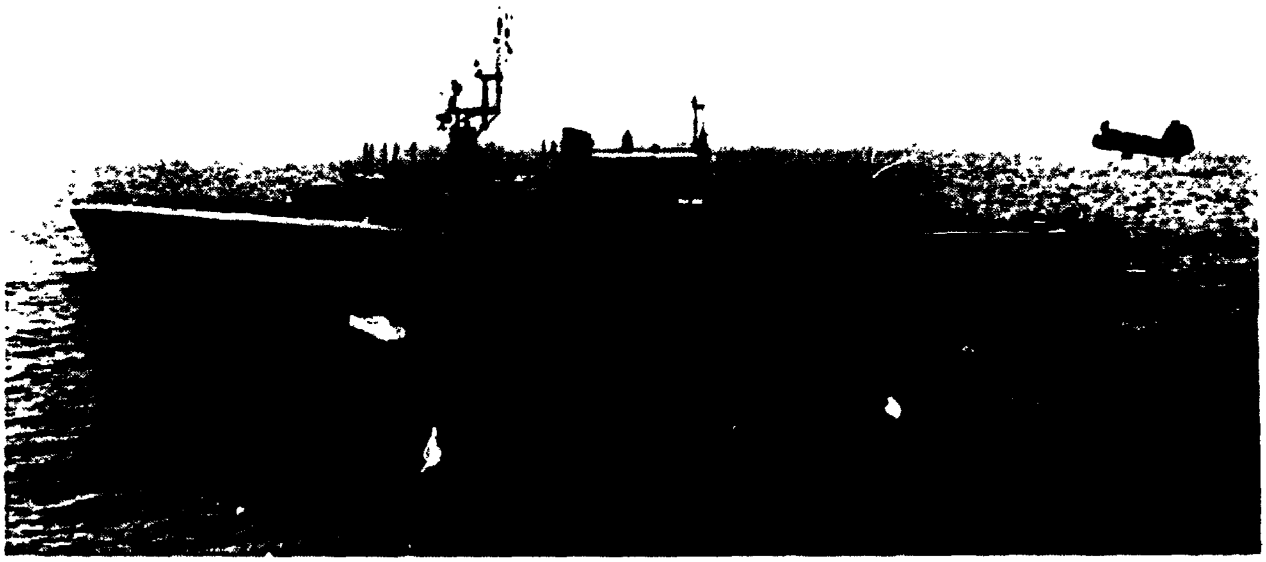
[60] Peter Charlton and Michael Whitby (eds.), "Certified Serviceable": Swordfish to Sea King. The Technical Story of Canadian Naval Aviation by Those Who Made it So, pp. 384-385; Peter Charlton, Nobody Told Us it Couldn't Be Done: The VX-10 Story, pp. 154-155, and; Progress Report, "Haul Down, Hold Down and Deck Handling Equipment," n.d. (circa 1964), DHist 87/77.

[61] For a detailed discussion of the electrical problems see, Appendix A, "Report of Meeting Held at VX-10 on 28 February 1964, in Memorandum, "Report of Visit to HMCS Shearwater by DAPD 26 February - 2 March 1964," NS 1225-DGA, 12 March 1964, Commander R.J.S. Dickinson, Director of Aircraft Design and Production, to DGA, RG 24 83-84/167, vol. 3403, file S-7807-102 vol. 6, NAC.



Piasecki HUP helicopter about to land aboard HMCS <u>Assiniboine</u>, probably 1964. (Department of National Defence, E-73280)

Sea King helicopter conducting dipping sonar exercise in 1965. (Department of National Defence, CN-6572R) line of the ship, creating handling problems for the flight deck crew. To overcome this problem, the RCN installed a second retractable probe just forward of the helicopter's tail wheel. The tail probe, which had a locking tip, was lowered from the aircraft immediately after touching down and was spring-loaded to force the tip into the grid plate (deck slot) on the flight deck. "A special tail probe guide ramp was also designed to guide the tail probe and lock it as it entered the central deck slot".[62] This system prevented lateral movement on a moving and pitching deck. In addition, it ensured centering of the aircraft and the proper alignment during traversing into and out of the hangar.

It would take two more years before the Canadian navy could incorporate all of the design changes that came about as a result of the Assiniboine and Annapolis trials.[63] All seven St. Laurent class were converted to helicopter/destroyers (DDH's) by 1966, while the two Annapolis class destroyers (Annapolis and Nipigon), the first purpose built DDH's, had been completed by late 1964. In 1967, HMCS Nipigon was the first ship to be fitted with the

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[62] Peter Charlton and Michael Whitby (eds.), "Certified Serviceable": Swordfish to Sea King. The Technical Story of Canadian Naval Aviation by Those Who Made it So, pp. 383-384. Equally dangerous, the main rotor blades acted as wings which caught the wind and lifted the aircraft off the flight deck. To secure the helicopter to the deck the "Beartrap arresting beams had to be strengthened and, to take the load off the deck plates in the landing area, tow short hold-down bars which engaged the Beartrap and were bolted to the ship's structure were fitted". To prevent the helicopter's fuselage from being ripped apart under the increased tension the undercarriage had to be reinforced.

[63] The final evaluation was the CHSS-2/DDH Compatibility trials which were carried out by Squadron HS-50 and VX-10 aboard Annapolis in 1966, under VX-10 Project Directive 132. This test was conducted in two stages to assess the degree to which a DDH could support Sea King operations (ie. maintenance and logistic requirements). Once VX-10 completed these trials operational trials were carried out in 1967 aboard Annapolis and Nipigon. Upon completion, the Sea King helicopter was given clearance for both day and night operations (all-weather, and instrument flying).

production model of the Beartrap system, and that same year became fully operational.

What is important to remember here, however, is the fact that by the summer of 1964 the Assiniboine trials had fully proved the haul-down and rapid-securing system for heavy helicopters. A demonstration held aboard Assiniboine in early August 1964, and attended by representatives of various departments of the Canadian government, foreign armed forces, aviation firms, and the press, had gone without a hitch.[64] Even before the RCN had a chance to fix the outstanding technical problems it was approached by the United States Coast Guard, and other navies, including the Argentine, Italian, U.S., and British, who were interested in obtaining the Beartrap system.[65] The Commandant of the U.S. Coast Guard declared that "the Coast Guard had the capability to operate helicopters from some cutters, but it was looking to improve the efficiency and safety of such operations," and believed Beartrap "had potential for Coast Guard use".[66] It will be remembered that the USCG led the way during the latter stages of the Second World War in the operation of helicopters from small warships. Twenty years later the Coast Guard had turned to the RCN, a small navy

[64] The demonstration was carried out at Halifax, from 3-6 August 1964, inclusive. "The demonstrations went according to plan, and were completely successful for the first three days, showing the full operation including approach, hook-up of the helicopter, haul-down, securing, straightening, [traversing] into the hangar, and reverse sequence [for] take-off". See Memorandum, "DDE/CHSS-2 Trials Demonstration, 3-6 August 1964," NSS 7807-102-6 (DGA), 17 August 1964, F.R. Miller, Air Chief Marshal, Chief of the Defence Staff, to Commander R.J.S Dickinson, DGA, RG 24 83-84/167, vol. 3403, file S-7807-102 vol. 6, NAC.

[65] See, Commandant, U.S. Coast Guard, to Naval Member, Canadian Joint Staff, Washington, D.C., 21 June 1965, RG 24 83-84/167, vol. 3403, file S-7807-102 vol. 6, NAC.

[66] Ibid.

with limited resources, for the technical expertise in this field. Certainly, by the late 1960's the RCN was recognized as the leader in the field of ship-borne helicopter operations. While the idea of operating helicopters from the stern of small warships was an evolutionary process - culminating in the design of the Beartrap system - the end result was revolutionary. Indeed, the Canadian beartrap system transformed operations by frigate and destroyer sized vessels in the late twentieth century. Because these types are the work horses of ocean-going fleets, it would be fair to say that the Canadian innovation has significantly changed naval warfare.

CONCLUSION

Conflict leads to innovation. The forces acting upon the navy in the development of the helicopter carrying destroyer (DDH) were both internal and external. In so far as the former is concerned, the conflict was between the supporters of fixed-wing and rotary-wing aircraft. In addition, there were certain fundamental differences in outlook between the surface elements of the navy and the naval aviators. The external variables were many. There was the ongoing debate between the RCN and government over the navy's share of the defence budget and, of course, the RCN's long-standing dispute with the RCAF over control of maritime air. The final conflict was the greatest of all: NATO versus the Warsaw Pact forces. Canada, as part of the NATO alliance, squared off against the Soviet navy and the fast submarine. The interplay between the navy and other branches of the service, including foreign armed forces, and the federal government, led to the creation of the DDH in the Royal Canadian navy. The Davis explanation, with its overemphasis on rationality cannot adequately explain the process of innovation. More persuasive is the approach used by W.A.B. Douglas "Conflict and Innovation in the Royal Canadian Navy, 1939-1945",[1] which argues that conflict facilitates and, indeed, accelerates the process of innovation.

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[1] See W.A.B Douglas, "Conflict and Innovation in the Royal Canadian Navy, 1939-1945," in Naval Warfare in the Twentieth Century, Gerald Jordan, ed., (London: Croom Helm, 1977), pp. 210-233. Douglas's article is based on the seminal work of Carl-Axel Gemzell. For a detailed discussion of conflict and innovation theory see Carl-Axel Gemzell, Organization, Conflict, and Innovation: A Study of German Naval Strategic Planning 1888-1940, (Sweden: Esselte Studium, 1973).

The notion of operating helicopters from the stern of small warships is firmly rooted in the RCN's battle for the convoys in the north Atlantic during the Second World War. The limitations of existing technology, however, prevented the service from employing rotary-wing aircraft in that conflict. In the early post-war years, the RCN continued to monitor developments in other navies, particularly the USN's operation of helicopters from icebreakers. The need to secure Canadian sovereignty in the far north against increasingly intrusive American activities there forced the navy to follow the USN's lead in icebreaker development, including the embarkation of helicopters. This was the first step towards large-scale integration of increasingly more sophisticated helicopters into the Canadian fleet.

Fulfilling the RCN's commitments to its Allies also played a role in the development of ship-borne helicopter operations. The onset of the Cold War, and the creation of NATO in 1949, played a decisive role in transforming the RCN into a highly specialized fleet. Canada, as a middle power with limited resources, and even more circumscribed interests, was hard-pressed to carry out its national and alliance commitments and was forced to specialize in anti-submarine warfare. The Canadian navy's failure, during the latter stages of the war, to sir'. German U-boats that were operating in the approaches off Halifax also explains the navy's desire to acquire a technology which promised to overcome this problem. Anti-submarine operations off the east coast were especially difficult. To many observers, the development of dunking sonar and the helicopter appeared to be the best coun'er to the submarine.

The RCN was fortunate to have a number of officers who actively supported naval aviation. Initially, they favoured the acquisition of fixed-wing aircraft and carriers, but came to recognize the potential of rotary-wing aircraft for A/S operations. Convincing the government and the other services of the merits of helicopters, however, proved to be exceedingly difficult. The problem was further exacerbated by limited budgets and the navy's fight with the Royal Canadian Air Force for control of maritime aviation. The RCN, moreover, received on average only 18% of the entire defence budget. As the costs of weapon systems soared in the post-war period, the RCN was forced to re-evaluate fleet composition in light of its primary mission. To make matters worse, as the government moved into the "Management Era", during the mid-1950's, it exerted even more control over the services and their programmes.[2]

Destroyers, a fixture in the Canadian fleet, had proved, since the First World War, to be the most versatile and effective warships against the submarine because of their speed and manoeuvrability. These same characteristics, in turn, compelled the RCN to explore the possibility of utilizing ASW helicopters to improve upon the destroyer's already potent capabilities.

The RCN realized two benefits with the Beartrap system. First, it allowed the navy to embark large, manned, dual-purpose helicopters in its destroyers, improving the long-range capability of the ship. In fact, the helicopter soon became the Canadian navy's primary ASW weapon. Second, helicopter/destroyer operations were more cost effective than carrier operations. Eventually, the RCN was forced to pay off the aircraft carrier because of

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[2] See, Douglas Bland, The Administration of Defence Policy in Canada, 1947 to 1985, (Kingston, Ontario: Ronald P. Frye and Company, 1987), pp. 1-24. Bland argues that this process began in 1961. I would argue, however, that the move away from the "Command Era" began in the mid-1950's, as the government attempted to regain control over the Department's budget.

escalating operating costs and limited budgets. Acquisition of the Sea King helicopters allowed the navy not only to meet its alliance commitments, but also lead the way in small-ship A/S operations with the development of the Beartrap system.

The Canadian navy was reluctant to rely upon its allies for assistance, as it had done during the last war. As Zimmerman has shown, the RCN's failure to develop its own radar stemmed, in part, from inadequate liaison, lack of expertise in the field, and finite industrial resources.[3] In the case of the helicopter/destroyer, the navy was determined to avoid those same pitfalls.

During the time period covered by this thesis, the navy should be remembered for its ingenuity and innovations in the programmes which it undertook in the ASW field. A number of projects come to mind, including VDS, the hydrofoil and the helicopter/destroyer (DDH). The RCN succeeded, not because of augmented budgets, but because of the quality of its personnel: their education, training and experience.

Equally important, those officers and men were willing to explore new ideas even when larger navies with substantial budgets had abandoned the concept of embarking the large, manned dual-purpose ASW helicopter. Their perseverance paid off. Those same officers were aided in the process because of the navy's relatively small size - liaison between headquarters and the commands was especially good. Equally important, liaison between the RCN, the Royal Navy and the USN facilitated the entire development process. The navy borrowed and then improved upon the existing technology to design the worlds' first truly

[3] See, David Zimmerman, The Great Naval Battle of Ottawa, (Toronto: University of Toronto Press, 1989).

workable haul-down and rapid-securing device. This was a major engineering accomplishment, made possible, in part, by the navy's excellent communication network.

British officers on loan from the RN served in important posts during this period and provided additional expertise to the RCN in its endeavour to develop the DDH. Commodore R. Baker, Naval Constructor-in-Chief, a dynamic individual and brilliant draughtsman, was responsible for designing the St. Laurent class destroyers. His innovative design was particularly well-suited for the navy's future requirements, because his original plans included the provision of ample extra space by the flush upper deck, well rounded deck edges and turtle back forecastle for good seakeeping.[4] His knowledge proved crucial when the time came to convert the St. Laurent class into helicopter/destroyers.

Royal Navy officers also held key posts in the RCN's air arm and played a important role in the navy's bid to acquire helicopters. Traditional scholarship argues that RN officers such as Captain G.A. Rotherham favoured the procurement of British aircraft over American equipment to the detriment of the RCN.[5] This thesis has shown that, in the case of the helicopters, this was not the case. Rotherham, for example, went so far as to suggest that the RCN procure a Canadian-built helicopter because it best met the needs of the navy.

While the idea of operating helicopters from the stern of a destroyer was an evolutionary process - culminating in the design of the Beartrap system - the end result was

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[4] See S. Mathwin Davis, "The 'St. Laurent' Decision: Genesis of a Canadian Fleet," in The RCN in Transition, 1910-1985, (Vancouver: UBC Press, 1988), ch. 10.

[5] See Stuart E. Soward, Hands to Flying Stations: A Recollective History of Canadian Naval Aviation, 1945-1954, vol. I, (Victoria: Neptune Developments, 1993).

revolutionary. The Canadian Beartrap system transformed naval warfare, especially ASW destroyer operations in the late twentieth century.

EPILOGUE

On 2 December 1995, the bulk carrier Mount Olympus was foundering in heavy seas 1,600 kilometres south of Halifax. The ship, caught in a north Atlantic storm was being battered by 75 kilometre winds and heavy seas and, was in danger of sinking. HMCS Calgary, returning from duties in the Persian Gulf and the Adriatic, heading to her home port in Esquimalt, B.C., raced 900 kilometres in less than eighteen hours to rescue the crew of Mount Olympus. "It appeared that [the frigate] made it just in time, launching the Sea King helicopter from 80 kilometres away".[1] The 30 crewmen were about to abandon ship. Captain Dan Burden, pilot of the aging helicopter, battled darkness, gale-force winds and a waning fuel supply to make four harrowing trips to the sinking bulk carrier. Master Corporal Rob Fisher, sonar operator, made more than thirty descents to the ship's deck, attaching himself to the survivors, taking them one by one and transporting them to a nearby cargo vessel which was riding out the storm. The sea was far too rough for the crew to lower lifeboats or for the other ship to assist in the rescue operation.[2] Even an American C-130 Hercules aircraft, which was already on the scene, could not provide much in the way of assistance. The unique combination of the Beartrap system and the Sea King helicopter made this dramatic rescue possible.

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[1] Globe and Mail, 2 December 1995.

[2] Ottawa Citizen, 3 December 1995.

Although the St. Laurent class destroyers were paid off some years ago, the Canadian navy continues to operate DDH's -the Canadian Patrol Frigate (CPF) being just the latest re-incarnation.[3] In the thirty-two years since the Royal Canadian Navy designed and built the Beartrap system, it has undergone a number of minor modifications, but has remained essentially unchanged. This serves as testimony to the foresight of those engineers and pilots who conceived the original design.

By the mid-1960's, the RCN had completed the conversion of the seven St. Laurent class destroyers, while the two Annapolis class destroyers - Annapolis and Nipigon - the first purpose-built DDH's had been completed by 1964. By late 1968, all nine of these ships were fully operational. The next class of ship, the DDH 280, was the logical evolution of the DDH concept, albeit on a larger scale. Unlike the previous escorts, the DDH 280 class carried a twin Beartrap system, and operated two Sea King helicopters. The four ships of this class, like those of the Annapolis class, were purpose-built DDH's, and entered service in 1972-1973. The CPF's are the latest class of warship to carry a helicopter. Although originally designed to embark the larger and heavier EH 101 helicopter, cancellation of that programme forced the RCN to carry on with the aging Sea King helicopters.

That the RCN has been able to keep these "birds" aloft is due, in part, to the unique characteristics and rugged construction of the aircraft. Igor Sikorsky and the engineers who designed and built this aircraft were far ahead of their time. Indeed, the design has remained basically unchanged and became the archetype for all subsequent models. Thirty-seven years after it first flew it is still operating - albeit in diverse and up-dated configurations - in a

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[3] HMCS Calgary is one of the new Canadian Patrol Frigates.

number of navies around the world, including the USN, RN, and U.S. Coast Guard. The Sea King helicopter, like the McDonnell-Douglas DC-3 and Lockheed Hercules, is one of those rare aircraft in aviation history. All of these aircraft have provided exceptional service and continue to do so today.

Similarly, the Beartrap system has undergone a number of minor modifications over the years, but the basic components of that system are essentially identical. More important is the impact of that technology upon ASW operations in the late twentieth century. As the cost of weapons systems soared in the 1960's and through the 1970's, the helicopter/destroyer combination, made possible by the Beartrap system, came to be viewed as the best counter to the fast submarine. In fact, in many navies, including the RCN, the DDH eventually replaced the aircraft carrier as the weapon of choice in anti-submarine warfare, not least because of its much lower operating costs.

Since the introduction of the Canadian Beartrap system, a number of navies have incorporated that system into their own ships. A device very similar to that fitted in the DDH 280 class destroyers has been sold to the Japanese navy for their Tachikaze class frigate. A less expensive version was developed, by Indal Technologies of Toronto, without a rapid-securing device and sold to the Indian navy for installation in its Leander class frigates which carry the Westland Sea King helicopters.[4] The American navy has installed the Recovery,

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[4] Commander R.A. Douglas, "Helicopter/Ship Interface." Paper Presented at the Commonwealth Engineer Officers' Conference at Bath, 15-16 September 1977. DHist 93/110, Item 082. Indal Technologies Incorporated, of Mississauga Ontario have, since the closure of Fairey Aviation, been responsible for the support and development of the Beartrap system (now referred to as RAST). The Royal Navy's two principal ASW helicopters during this time period were the Westland Wasp and the Westland Lynx. Both were light-strike aircraft and were not equipped with dunking sonar (MATCH - Medium-range Anti-Submarine

Assist, Secure and Traverse system (RAST) in over 100 ships, including the Perry class frigates (FFG 7) and the Spruance class destroyers (DD 963).[5] Like the RN, the USN used light-strike helicopters in the ASW role (LAMPS - Light Airborne Multi-Purpose System). That abbreviation is somewhat of an anachronism today, because the USN employs the Sikorsky SH-60B, an aircraft of similar dimensions to that of the Sea King helicopter.[6]

All of these systems, with the exception of the British harpoon-grid device, incorporate key components of the Canadian system, and attest to the success of that design. Nevertheless, the RCN is the only navy to operate the heavy, all-weather, manned dual-purpose (weapon and sonar) ASW helicopter, which requires both a haul-down and rapid-securing device in order to operate from a destroyer in all types of weather.

Torpedo Carrying Helicopter). Both these aircraft were vectored to the target by the ship's radar or sonar to drop the weapons. The Wasp and Lynx helicopters operated from the Leander and Type 22 frigates, but used the harpoon-grid system to secure the aircraft to the deck. The RN did employ the larger Sea King helicopter for ASW operations, but they continued to operate from the carriers.

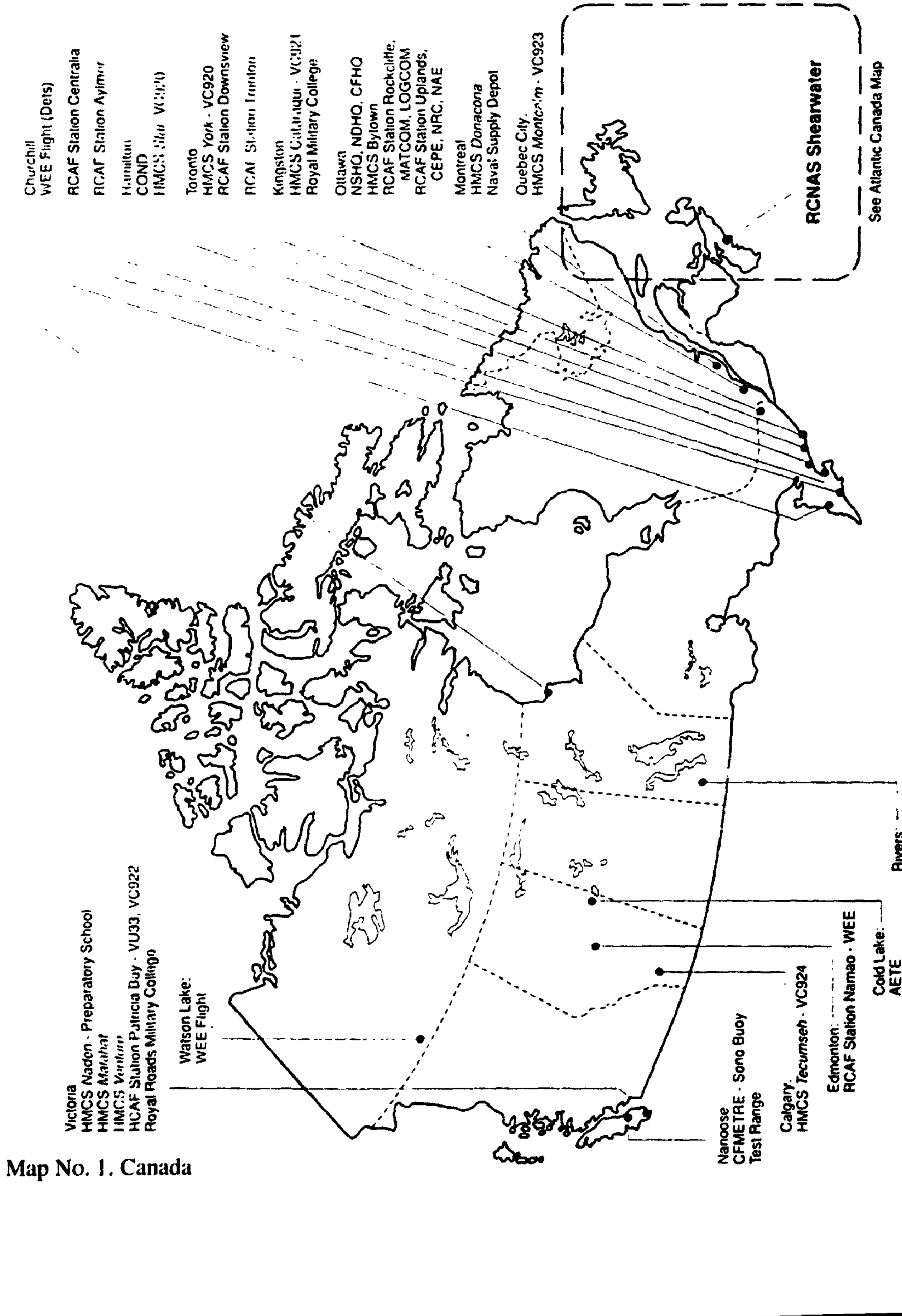
[5] See, Jane's Fighting Ships, 1978-1979, (London: Macdonald and Jane's Publishers Limited, 1978), pp. 677-688; "Presenting the U.S. Navy's DD-963," Warship International, no. 4, 31 December 1970, pp. 351-355; Michael R. Bonsignore, "A Look at our Lamps," Proceedings, vol. 97, no. 12/826, December 1971, pp. 27-29; Robert W. Love Jr., History of the U.S. Navy, 1942-1991, vol. II, (Harrisburg, PA: Stackpole Books, 1992), pp. 642-646, and Commander R.A. Douglas, "Helicopter Ship Interface," Paper Presented at the Commonwealth Engineer Officers' Conference Held at Bath, 15-16 September 1977, p. 220, DHist 93/110, Item 082.

[6] The Spruance class destroyers, like the Canadian DDH 280 class, operate two LAMP's helicopters. The Spruance class destroyers have the following specifications: length - 559 feet; beam - 54 foot beam; displacement - 7,000 tons, and; speed - in excess of 30 knots. Similarly, the Perry class frigates operate two Sikorsky SH-2 LAMP's helicopters. The frigates have the following specifications: length - 445 feet; beam - 45 feet; displacement - 3,605 tons, and; speed - 30 knots. For a comparison, the DDH 280 class has the following specifications: length - 398 feet; beam - 50 feet; displacement - 3,551 tons, and; speed - 30 knots. The DDH 280 operates two Sea King helicopters.

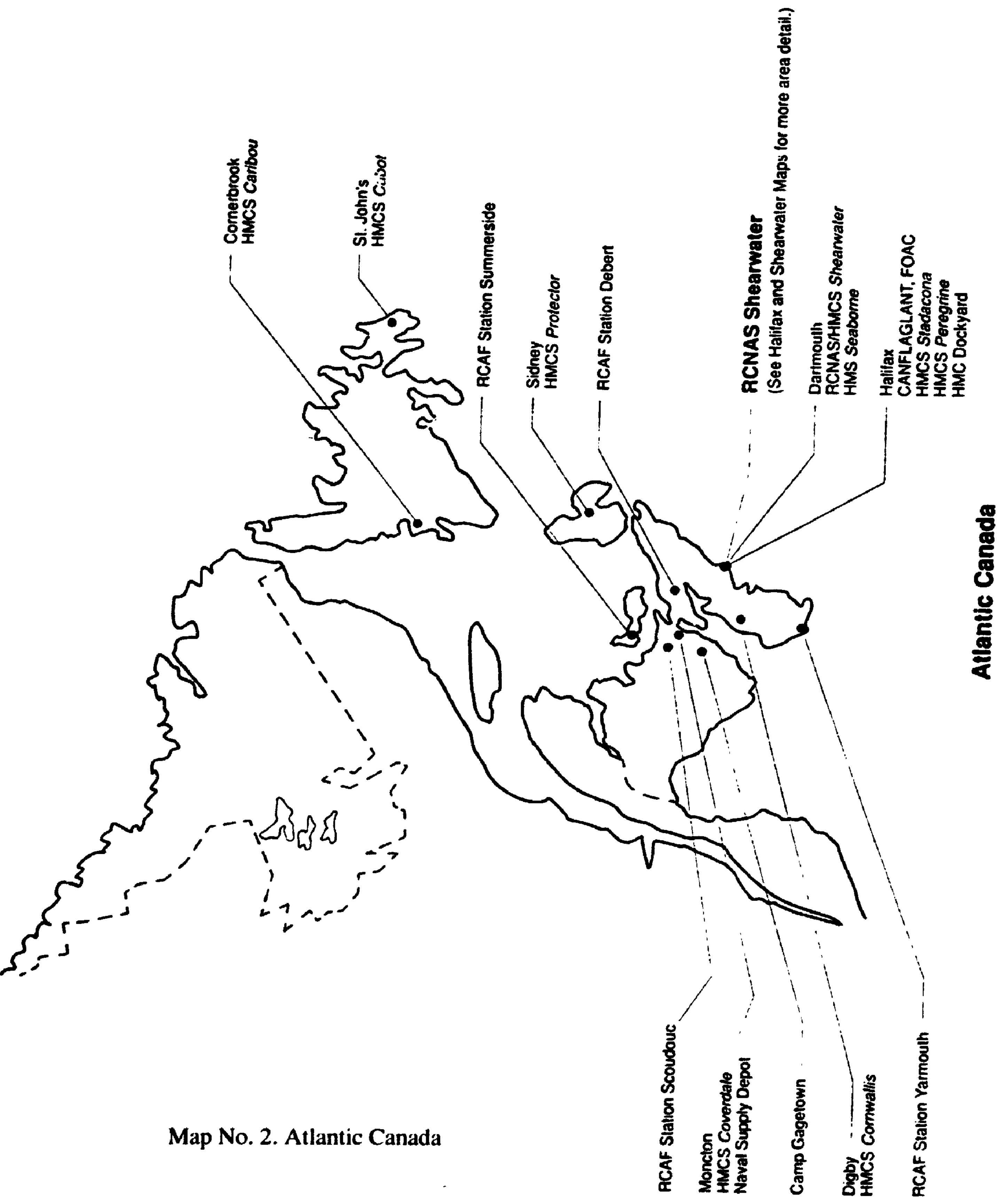
5 OF/DE 5

PM-1 3½"x4" PHOTOGRAPHIC MICROCOPY TARGET
NBS 1010a ANSI/ISO #2 EQUIVALENT

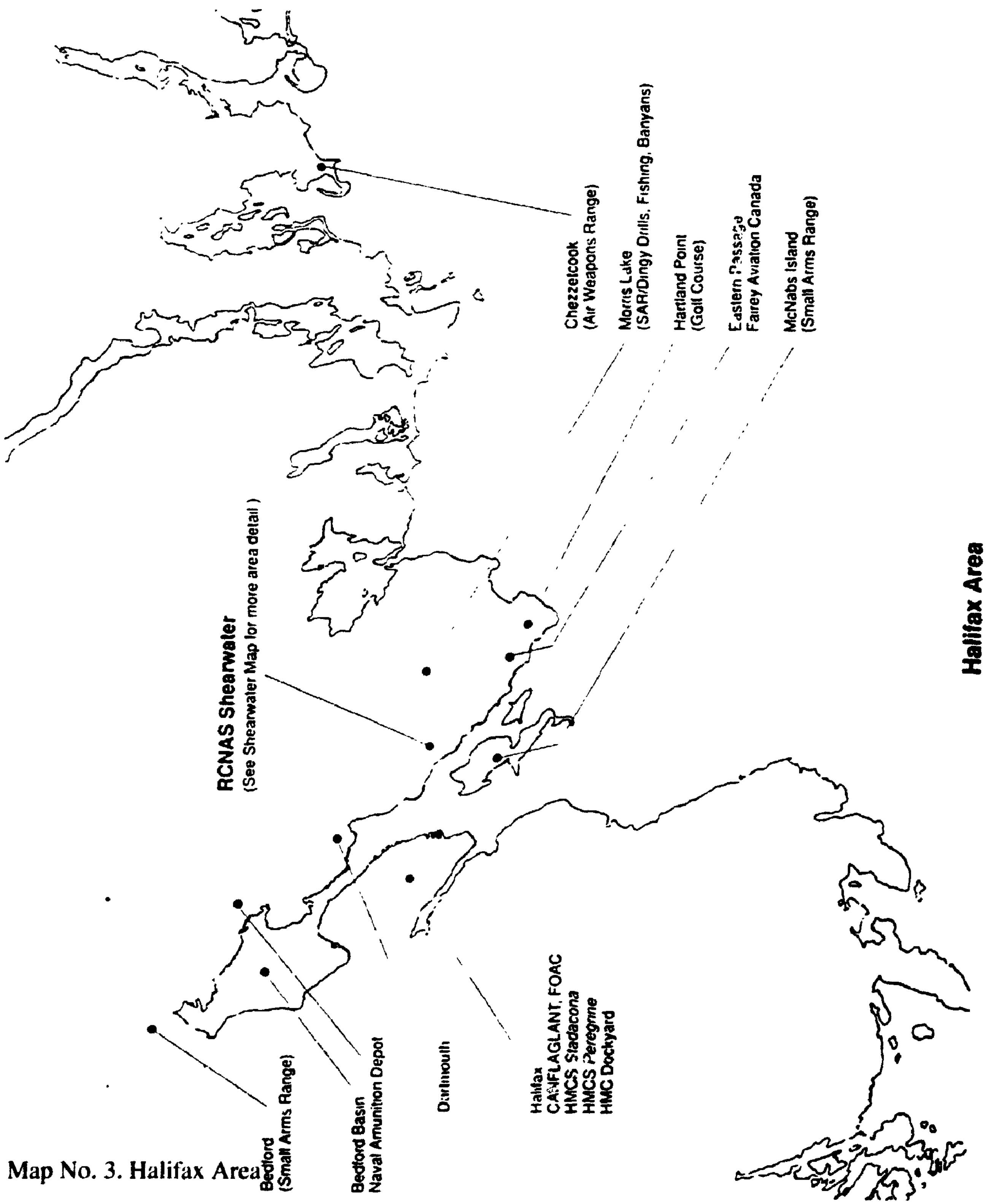
1.0 1.1 1.25 1.4 1.6 1.8 2.0 2.2 2.5 2.8 3.2 3.6 4.0 4.5 5.0 5.6 6.3



Map No. 1. Canada



Map No. 2. Atlantic Canada



Map No. 3. Halifax Area

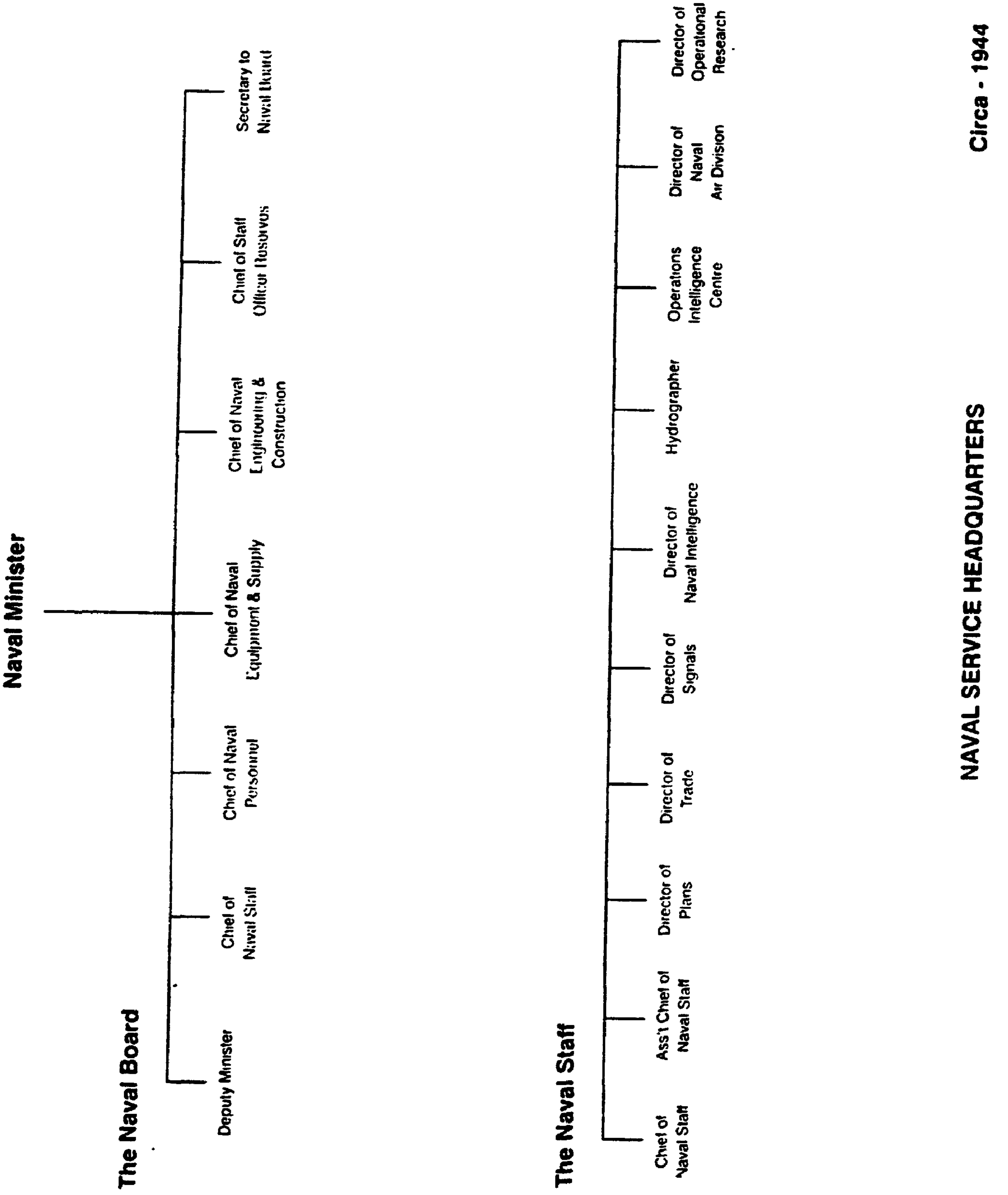


Figure 1. Naval Service Headquarters, circa 1944.

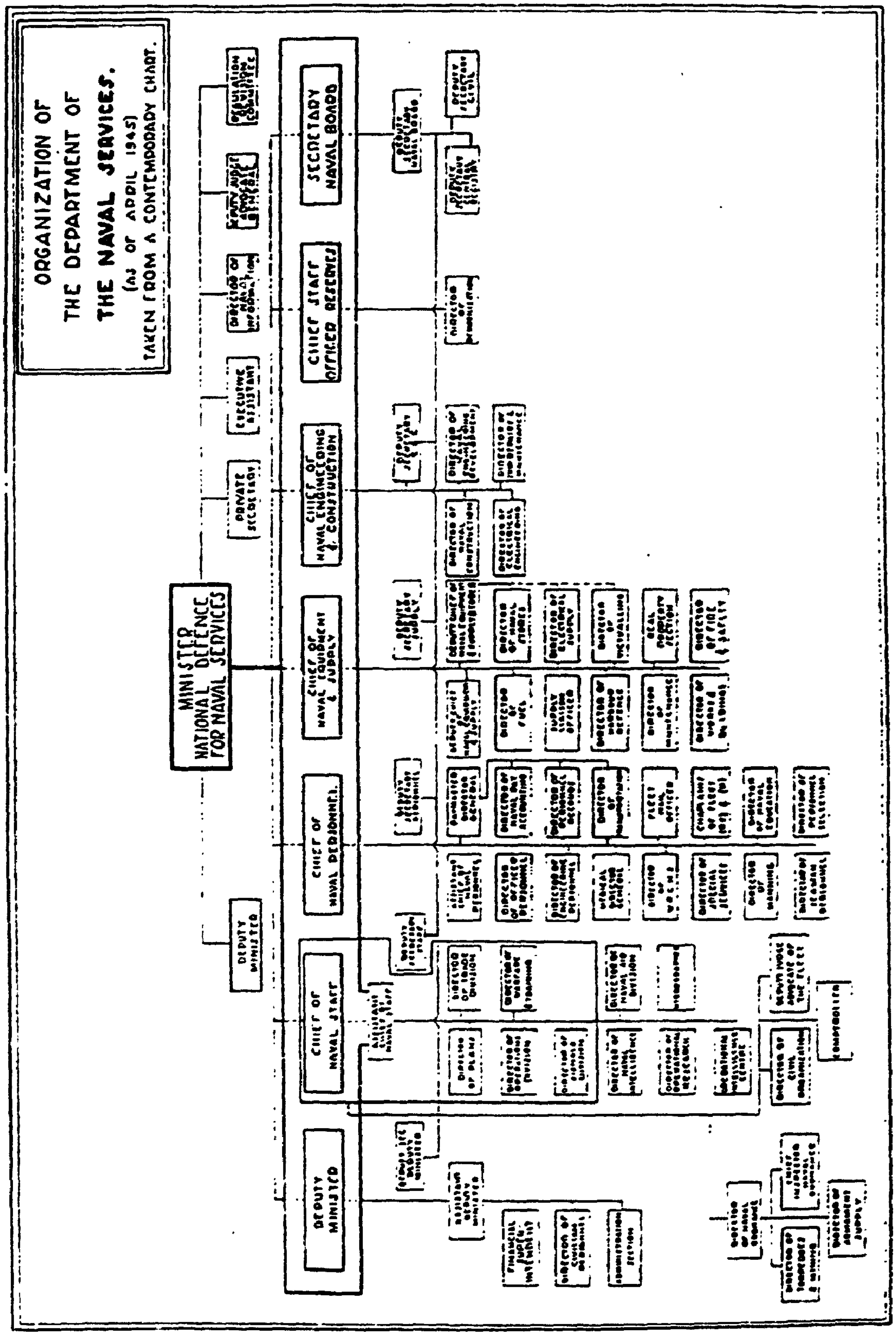


Figure 2. Organization of the Department of the Naval Services, April 1945.

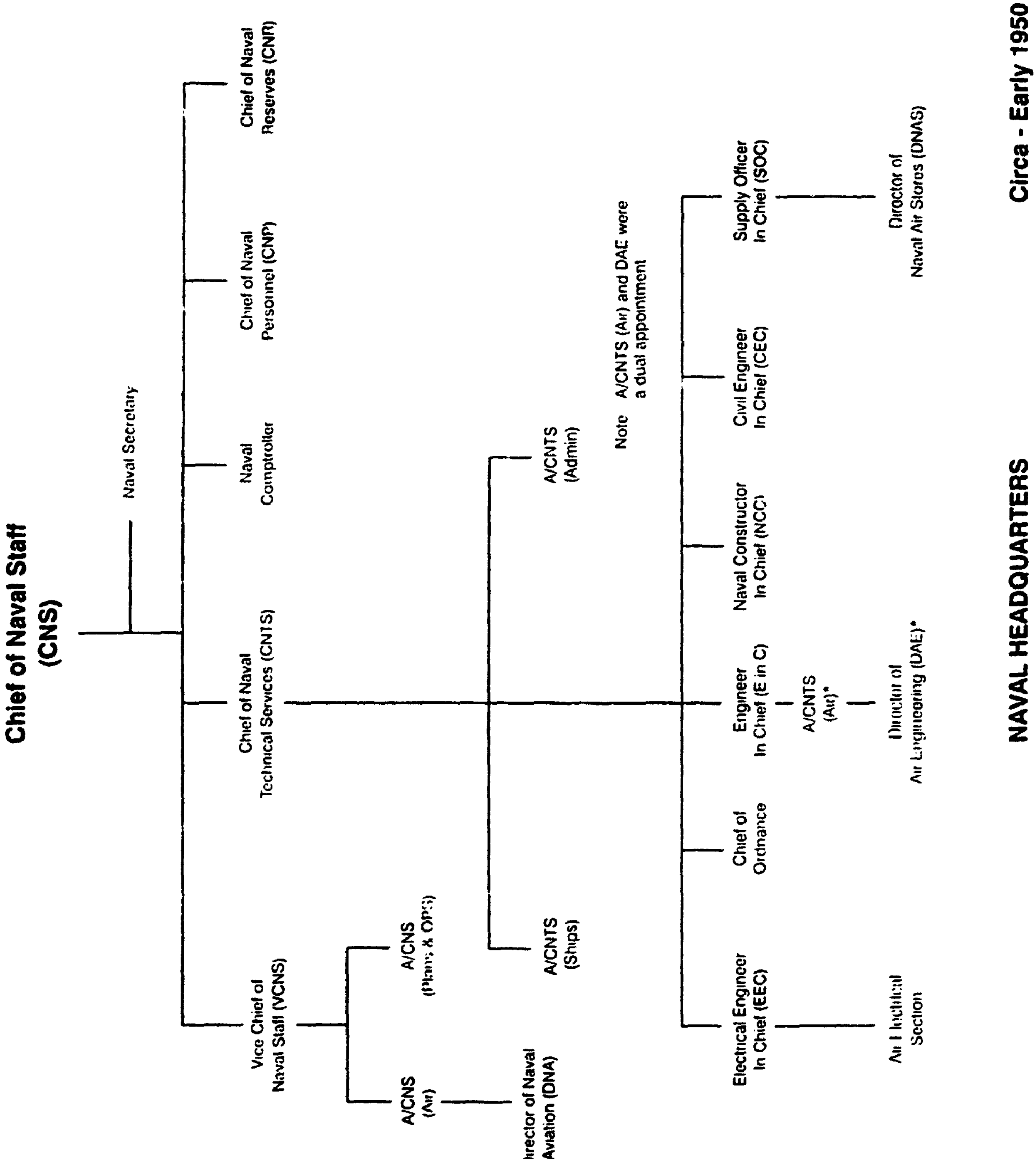


Figure 3. Naval Headquarters, circa early 1950.

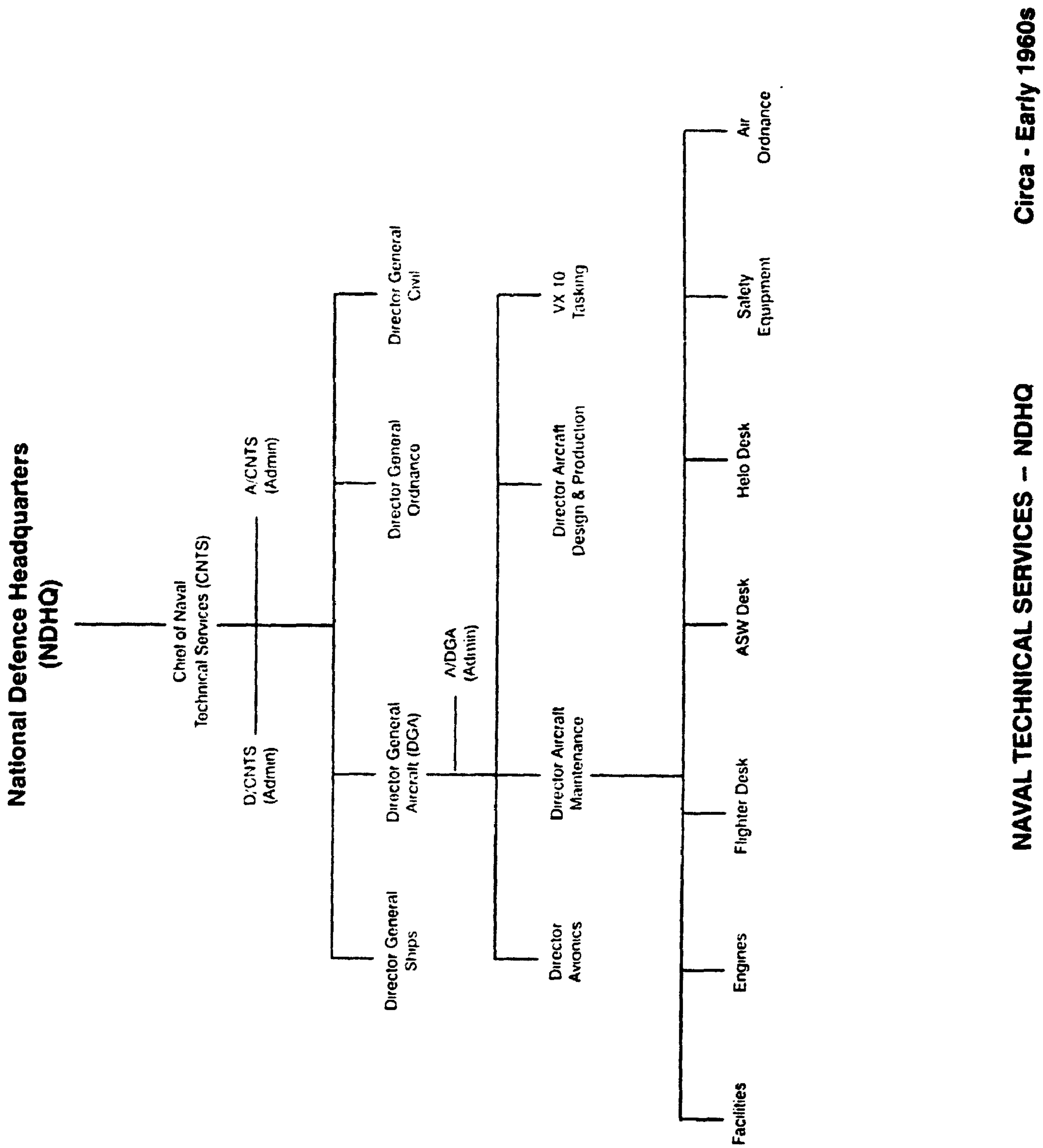


Figure 4. Naval Technical Services, circa early 1960's.

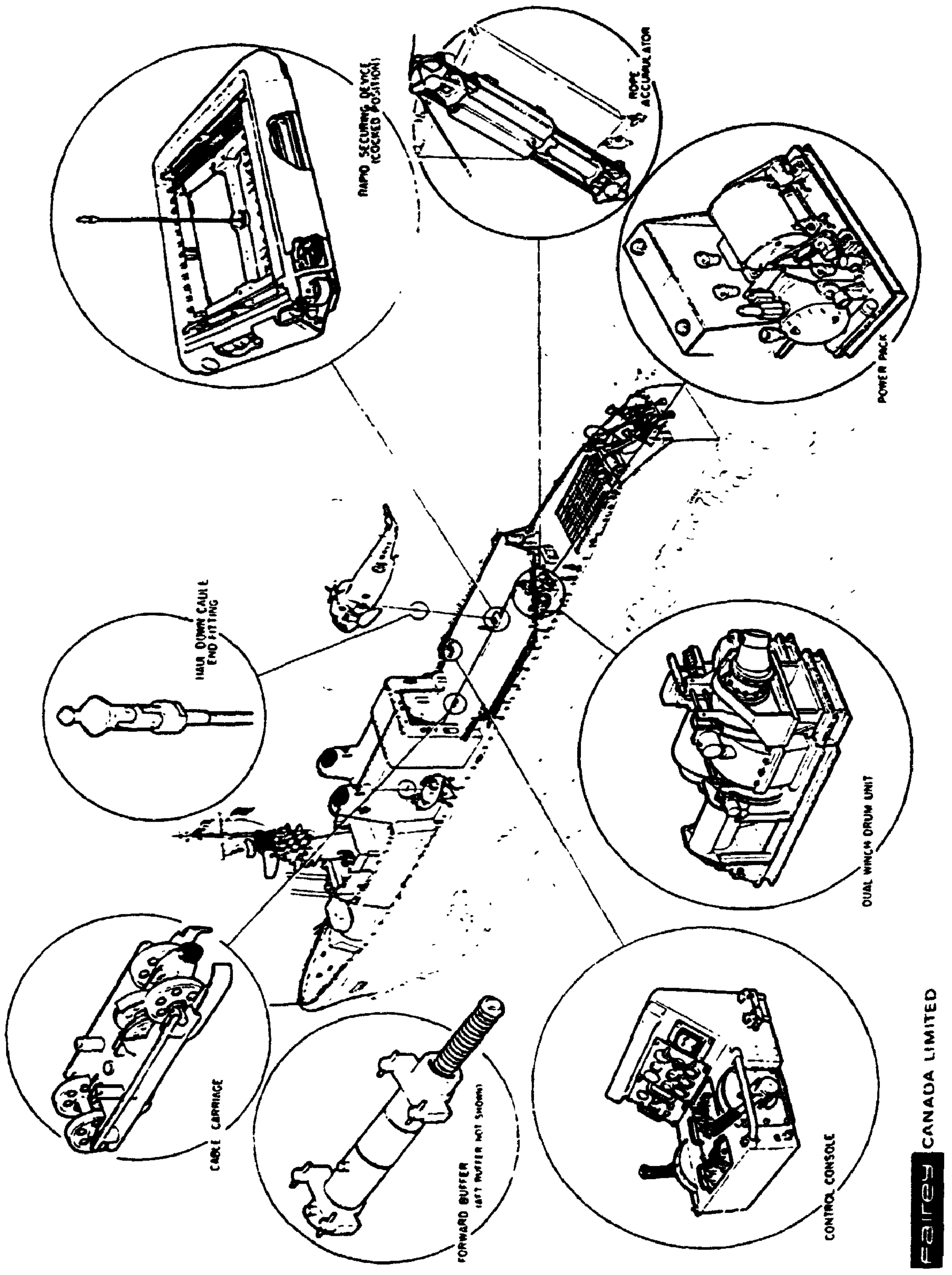


Figure 5. Helicopter Haul-down System, circa 1964.

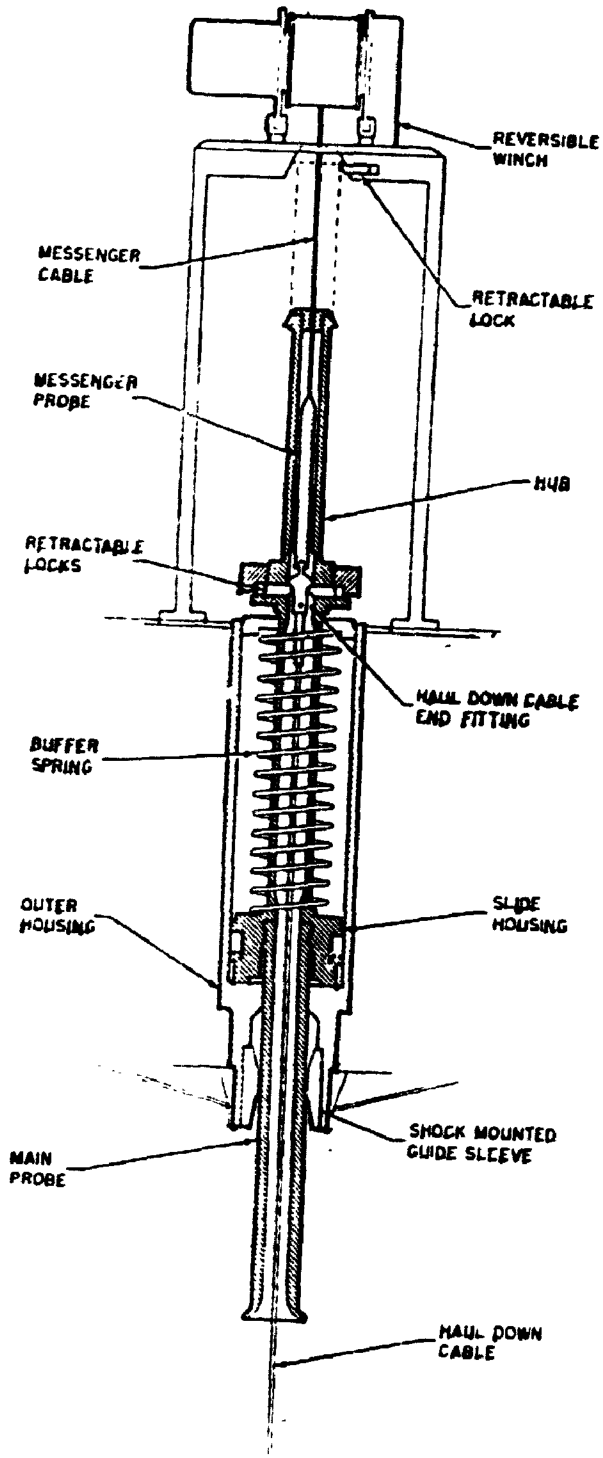


Figure 6. Probe Housing and Winch

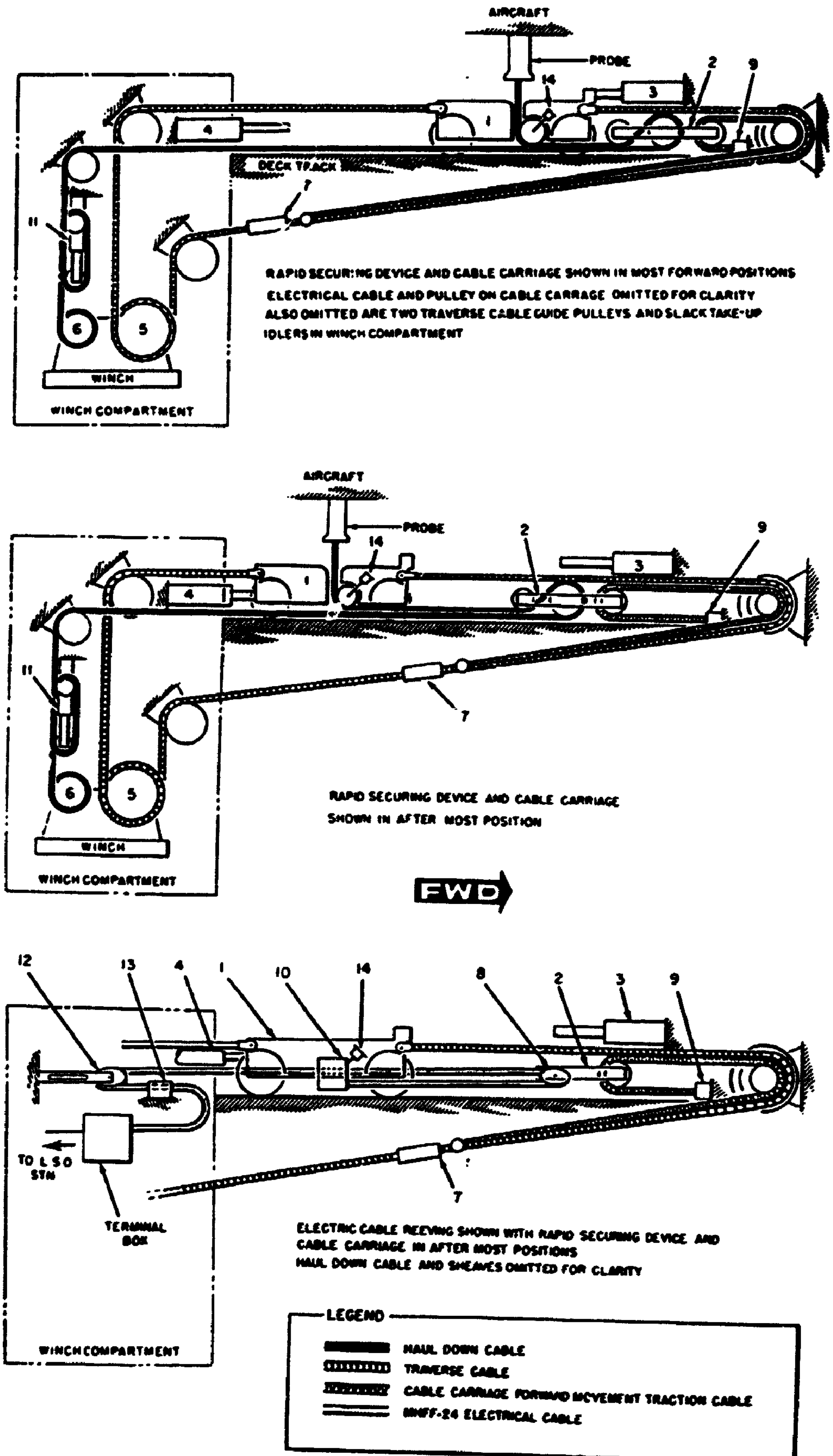


Figure 7. Reeving System

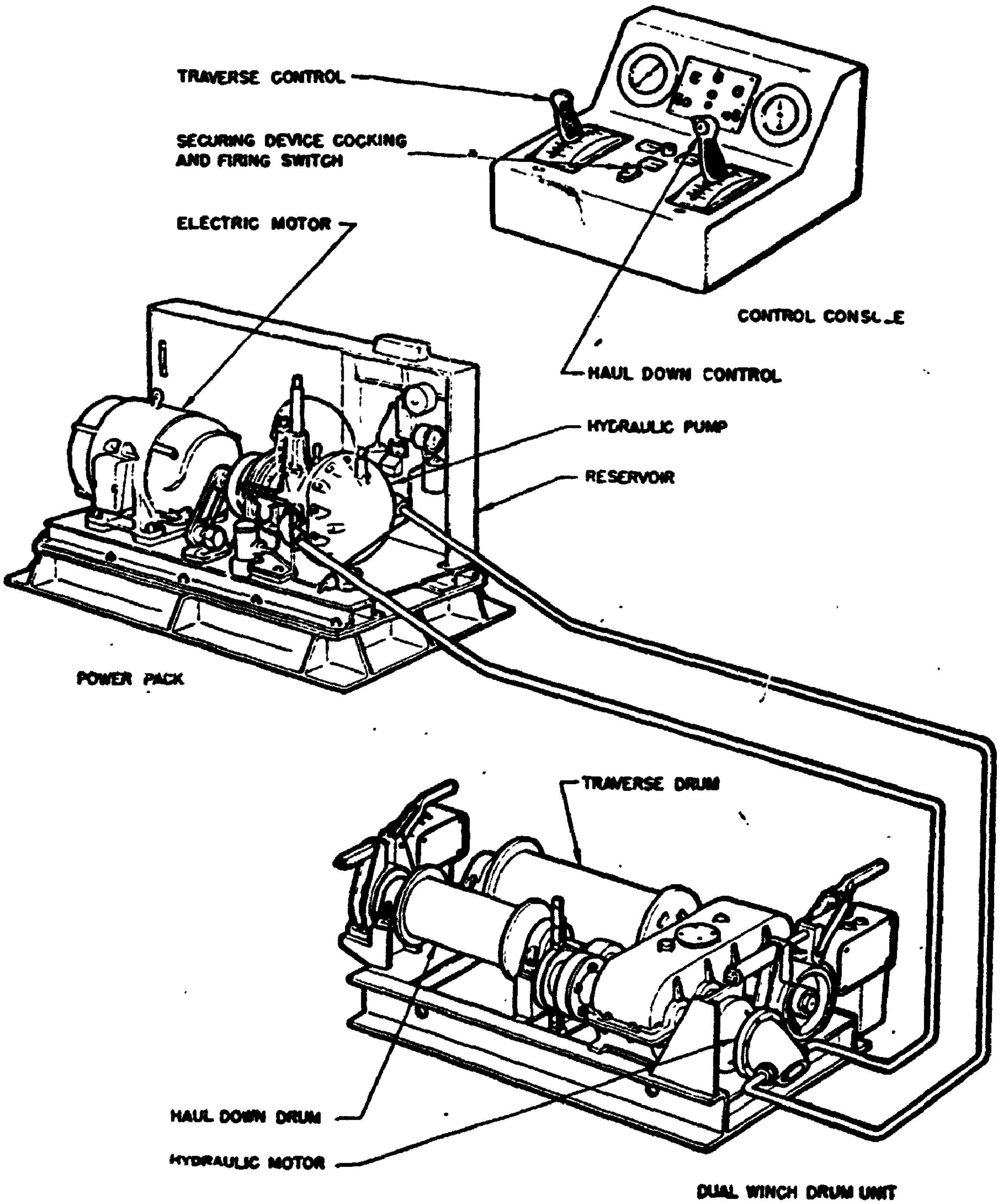


Figure 8. Winch System and Control Console

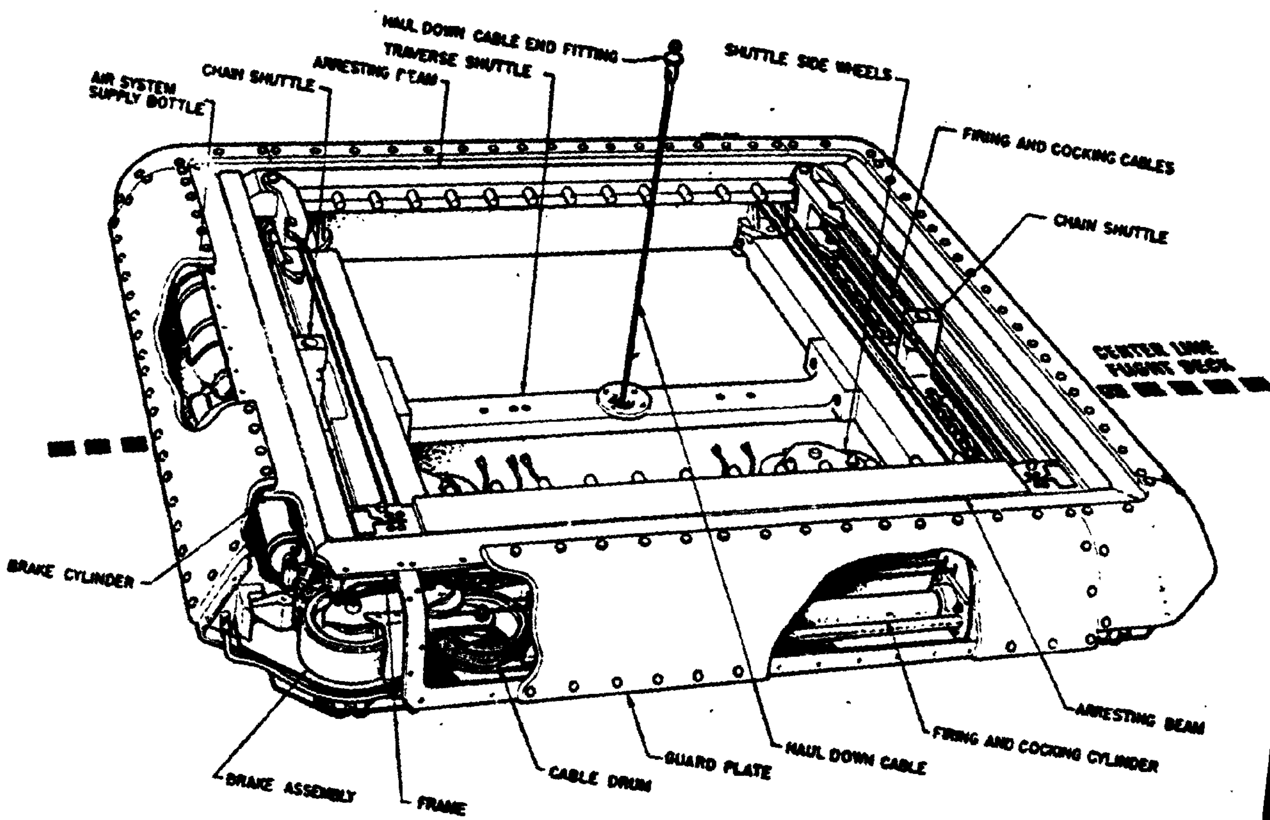


Figure 9. Beartrap Securing Device. Later, the entire system was known as Beartrap.

APPENDIX I

MINISTERS AND SERVICE HEADS, 1943-1964

Ministers of National Defence for Naval Services

A.L. Macdonald	1940-1945
D.C. Abbott	1945-1946

Ministers of National Defence

D.C. Abbott	1946
Brooke Claxton	1946-1954
R.O. Campney	1954-1957
Major-General G.R. Pearkes	1957-1960
Lieutenant-Colonel D.S. Harkness	1960-1963
Lieutenant-Colonel G.M. Churchill	1963
P.T. Hellyer	1963-1967

Chiefs of the Naval Staff (RCN)

Vice-Admiral P.W. Nelles	1934-1944
Vice-Admiral G.C. Jones	1944-1946
Vice-Admiral H.E. Reid	1946-1947
Vice-Admiral H.T.W. Grant	1947-1951
Vice-Admiral E.R. Mainguy	1951-1956
Vice-Admiral H.G. DeWolf	1956-1960
Vice-Admiral H.S. Rayner	1960-1964

APPENDIX II

SENIOR OFFICERS FOR NAVAL AVIATION

Officers	From	To
ACNS (Plans)(Air)		
Commodore H.N. Lay. RCN, (Act.) April 1948	Dec 1948	
Commodore H.N. Lay	Jan 1949	April 1949
ACNS (Air)		
Commodore C.N. Lentaigne, RN	April 1949	March 1951
Commodore C.L. Keighly-Peach, RN	March 1951	June 1953
Commodore W.L.M. Brown, RN	June 1953	June 1955
Commodore H.P. Sears, RN	June 1955	Sept 1957
ACNS (Air & Warfare)		
Commodore A.H.G. Storrs, RCN	Sept 1957	July 1958
Commodore J.V. Brock, RCN	July 1958	April 1961
Commodore R.P. Welland	April 1961	October 1962
Commodore Fraser-Harris, RN	October 1957	July 1964

APPENDIX III

DIRECTORS OF NAVAL AIR DIVISION, DIRECTORS OF NAVAL AVIATION AND DIRECTORS OF NAVAL AIRCRAFT REQUIREMENTS

Officers	From	To
Directors of Naval Air Division		
Commander J.S. Stead, RCN	April 1944	April 1945
Commander J.H. Arbick, RCNVR	May 1945	Feb 1946
Captain R.E.S. Bidwell, RCN	Feb 1946	Dec 1946
Captain G.A. Rotherham, RN	Jan 1947	May 1948
Directors of Naval Aviation		
Captain G.A. Rotherham, RN	May 1948	Jan 1949
Captain C.N. Lentaigne, RN	Jan 1949	April 1949
Captain H.C. Rolfe, RN	Sept 1949	Oct 1951
Captain Fraser-Harris, RCN	March 1955	Oct 1955
Captain G.C. Edwards, RCN	Oct 1955	June 1956
Captain G.C. Edwards, RCN	June 1956	Aug 1957
Commander V.J. Wilgress, RCN	Sept 1957	July 1958
Commander J.B. Fotheringham, RCN	July 1958	June 1960
Captain G.C. Edwards, RCN	June 1960	August 1960
Directors of Naval Aircraft Requirements		
Captain G.C. Edwards, RCN	Aug 1960	May 1961
Captain V.J. Wilgress, RCN	May 1961	Dec 1963
Captain J.B. Fotheringham, RCN	Jan 1964	July 1964

APPENDIX IV

COMMANDING OFFICERS OF AIRCRAFT CARRIERS AND AIR STATIONS

Officers	From	To
HMCS Magnificent		
Commodore H.G. DeWolf, RCN	April 1948	Aug 1948
Commodore G.R. Miles, RCN	Aug 1948	June 1949
Commander A.G. Boulton, RCN	June 1949	Sept 1949
Commodore K.F. Adams, RCN	Sept 1949	Oct 1951
Captain K.L. Dyer, RCN	Oct 1951	March 1953
Commodore H.S. Rayner, RCN	March 1953	Jan 1955
Captain A.H.G. Storrs, RCN	Jan 1955	Aug 1956
Captain Fraser-Harris, RCN	Aug 1956	June 1957
HMCS Bonaventure		
Captain H.V.W. Gross, RCN	Jan 1957	Jan 1958
Captain W.M. Landymore, RCN	Jan 1958	Sept 1959
Captain J.C. O'Brien, RCN	Sept 1959	Aug 1961
Captain F.C. Frewer, RCN	Aug 1961	Aug 1963
Captain R.W. Timbrell, RCN	August 1963	
RCNAS, Dartmouth		
Commander H.J. Gibbs, RCNVR	Nov 1945	Dec 1945
Commander H.J. Gibbs, RCNR	Jan 1946	Sept 1946
Commander A.E. Johnson, RCNR	Sept 1946	June 1947
Captain H.S. Rayner, RCN	June 1947	June 1948
Commander Fraser-Harris, RCN	July 1948	Nov 1948

HMCS Shearwater

Captain Fraser-Harris, RCN	Dec 1948	Aug 1949
Captain E.W. Finch-Noyes, RCN	Aug 1949	June 1951
Captain D.L. Raymond, RCN	June 1951	Feb 1953
Captain A.H.G. Storrs, RCN	Feb 1953	Jan 1955
Captain D.G. King, RCN	Jan 1955	July 1957
Commander R.W. Timbrell, RCN	July 1957	Sept 1957
Captain R.P. Welland, RCN	Sept 1957	July 1960
Captain T.C. Pullen, RCN	July 1960	Oct 1962
Captain G.C. Edwards, RCN	Oct 1962	Oct 1964
Captain D.H.P. Ryan, RCN	Oct 1964	

APPENDIX V

COMMANDING OFFICERS OF AIR SQUADRONS

Officers	From	To
Number #1 Helicopter Flight		
LCdr. J.D. Lowe, RCN	Sept 1951	May 1953
VH 21		
LCdr. J.D. Lowe, RCN	May 1953	Aug 1953
LCdr. J.H. Beeman, RCN	Aug 1953	April 1955
HU 21		
LCdr. J.H. Beeman, RCN	April 1955	Jan 1956
LCdr. R.V. Bays, RCN	Jan 1956	Nov 1956
LCdr. H.R. Welsh, RCN	Nov 1956	June 1958
LCdr. W.H. Frayn, RCN	June 1958	Jan 1961
LCdr. W.E. James, RCN	Jan 1961	Aug 1962
LCdr. R.T. Murray, RCN	Aug 1962	July 1964
LCdr. D.A. Muncaster, RCN	July 1964	
HS 50		
LCdr. G.H. Marlow, RCN	July 1955	Sept 1957
LCdr. F.R. Fink, RCN	Sept 1957	July 1960
LCdr. K.L. Gibbs, RCN	July 1960	Jan 1962
LCdr. E.A. Fallen, RCN	Jan 1962	Sept 1964
LCdr. J.D. Lowe, RCN	Sept 1964	

VX 10

LCdr. W.H. Fearon, RCN	March 1953	Sept 1954
LCdr. R.O. DeNevers, RCN	Sept 1954	Nov 1956
LCdr. J.C. Sloan, RCN	Nov 1956	April 1959
LCdr. B.W. Mead, RCN	April 1959	July 1962
LCdr. S.M. Rowell, RCN	July 1962	

APPENDIX VI

RCN HELICOPTER SPECIFICATIONS, 1943-1964

Sikorsky R-5

Description	Two-seat General Utility Helicopter
Engine	450hp. Pratt and Whitney R-985
Performance	Maximum speed, 103mph. Range, 250 miles. Service ceiling, unknown. Cost $70,000 dollars

Bell HTL-1

Description	Two-seat General Utility Helicopter.
Engine	178hp. Franklin six-cylinder fan cooled.
Performance	Maximum speed, 92mph. Range, 212 miles. Service ceiling, 11,500 feet.
Accommodation	Side-by-side seating in convertible open or covered compartment. Cost $31,000 dollars

SG Mark VI-D

Description	Two-seat General Utility Helicopter
Engine	165hp. Franklin

Performance	Maximum speed. 90mph. Range. 400 miles. Service ceiling. unknown Cost $25.000 dollars

Bell HTL-4 & 6

Description	Two-seat General Utility Helicopter
Engine	200hp. Franklin 6V4-200
Performance	Maximum speed. 100mph. Range. 300 miles. Service ceiling. unknown
Crew	Two pilots

Piasecki, or Vertol (Hup-3)

Description	Medical evacuation and light cargo helicopter.
Engine	One 550hp Continental R-975-46.
Performance	Maximum speed. 105mph. Range 340 miles. Service ceiling. 10.000 feet.
Accommodation	Crew of two and four passengers or three stretchers cases.

Sikorsky S-55 (HO4S-3)

Description	Twelve-seat Utility or Anti-Submarine Helicopter.
Engine	One 700hp. Wright R1300.
Performance	Maximum speed. 112mph. Range. 360 miles. Service ceiling. 10.600 feet.

Accommodation	Pilot's compartment seats two side-by-side. Cabin located below main lifting rotors. Seats from seven to ten passengers. Can carry up to six stretchers, which can be loaded by hydraulic power-operated hoist while aircraft is hovering.
Armament	Homing torpedo (Mk. 43) or depth-bombs.

Sikorsky CHSS-2 (Sea King)

Description	Anti-Submarine Helicopter.
Engine	Two GE T-58-110 gas turbine engines, 1250hp.
Performance	Maximum speed, 160mph. Range, 571 miles (four hours). Service ceiling, 11,500 feet. Weight, 19,100lbs.
Accommodation	Two pilots side-by-side, and two sonarmen.
Equipment	AQS-10 sonar, its transducer suspended by 200 feet of cable, as compared with the 60 feet of cable carried by the S-55 aircraft.
Armament	Four Mk. 43 torpedoes, depth-bombs, and one nuclear depth-bomb.

APPENDIX VII

POSSIBLE SUBMARINE TARGETS IN THE CANADIAN AREA

Atlantic Ocean Targets

Thule, Greenland

Frobisher Bay, Baffin Island

Sondestrom, Greenland

Goose Bay, Labrador

Harmon Air Force Base, Newfoundland

Halifax, Nova Scotia

Montreal, Quebec

Argentia, Newfoundland

St. John's/Torbay, Newfoundland

Pacific Ocean Targets

Vancouver, B.C.

Victoria/Esquimalt, B.C.

APPENDIX VIII

RCN SHIPS BY CLASS: PARTICULARS

St. Laurent Class

Displacement	2,263
Dimensions	366' x 42' x 13' 2"
Speed	28 knots
Crew	12 officers and 237 ratings
Armament	4-3" (2xII), 2-40mm, 2 Limbo, homing torpedoes. As DDH's; 2-3" (1xII), 1 Limbo, homing torpedoes 1 Sea King helicopter

Restigouche Class

Displacement	2,366
Dimensions	366' x 42' x 13' 6"
Speed	28 knots
Crew	12 officers and 237 ratings
Armament	4-3" (2xII), 2 Limbo, homing torpedoes Modified; 2-3" (1xII), 1 Limbo, 1 ASROC, 1 Sea Sparrow, homing torpedoes

Annapolis Class

Displacement	2,400
Dimensions	371' x 42' x 13' 8"
Speed	28 knots
Crew	12 officers and 234 ratings
Armament	2-3" (1xII), 1 Limbo, homing torpedoes, 1 Sea King helicopter

Iroquois Class (DDH 280's)

Displacement	3,551
Dimensions	398' x 50' x 14'
Speed	30 knots
Crew	14 officers and 230 ratings
Armament	1-5", 1 Limbo, homing torpedoes, 2 Sea Sparrow, 2 Sea King helicopters

APPENDIX IX

CONVERSION SCHEDULE

Ship	Completed	Converted	Operational
DDH205 St. Laurent	Oct 1955	Oct 1963	Sept 1968
DDH206 Saguenay	Dec 1956	May 1965	May 1967
DDH207 Skeena	Mar 1957	Aug 1965	May 1968
DDH229 Ottawa	Nov 1956	Oct 1964	June 1967
DDH230 Margaree	Oct 1957	Oct 1965	Nov 1968
DDH233 Fraser	June 1957	Aug 1966	May 1967
DDH234 Assiniboine	Aug 1956	June 1963	Sept 1967
DDH265 Annapolis	Dec 1964		Apr 1967
DDH266 Nipigon	May 1964		Nov 1966
DDH280 Iroquois	July 1972		July 1972
DDH281 Huron	June 1973		June 1973
DDH282 Athabaskan	Nov 1972		Nov 1972
DDH283 Algonquin	Sept 1973		Sept 1973

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RG 2 Cabinet Defence Committee Minutes. (1945-1964)

RG 2 Cabinet Conclusions. (1945-1964)

RG 24 Department of National Defence Records

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Vice-Admiral H.G. DeWolf, RCN (Ret'd)

Captain K.P Farrell, RCN (Ret'd)

Lieutenant-Commander Stewart Graham, USCG (Ret'd)

Sean Milligan, USMC (Ret'd)

Lieutenant L.F. Page, RCNVR (Ret'd)

Rear-Admiral A.H. Storrs, RCN (Ret'd)

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