of the modern entrepreneur.

If the potential for innovation generated by the increased "technological literacy" and mobility of workers is to be realized then a proper environment must be created for the integration of human and intellectual resources. Japanese and other experience suggests that the function of the entrepreneur is critical. As noted by Horie,

A supply of entrepreneurs...who are able and willing to vigorously perform the key functions of innovation and risk taking and management is the decisive element in economic progress. ¹⁵

While an individual entrepreneur may be able to recognize opportunity and integrate resources in a creative fashion, long-term exploitation requires the use of a variety of skills and abilities. More specifically, modern entrepreneurial ability is characterized not so much as being that of one person but more so as consisting of an integrated workplace composed of scientists, engineers, technicians, managers, market specialists, design experts, and quality control technicians performing as an experienced industrial team.

The specific process whereby technological innovation proceeds from the concentration of human and intellectual resources can be seen as a function of both the experience of the industrial team and the scale of the organization that is involved.¹⁶ While the particular temporal threshold at which

15. Zasuho Horie, "Modern Entrepreneurships in Meiji Japan", The State and Economic Enterprise in Japan, (Princeton: Princeton University Press, 1965), p. 183.

16. Devendra Sahel, "Technological Progress and Policy", Research, Development and Technological Innovation. (Toronto: Lexington, 1980), p. 193.

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THE DAWN'S EARLY LIGHT:
THE LESSONS OF THE AURORA
INDUSTRIAL BENEFIT AND OFFSET
PROGRAM

By

Allan E Jones, BA(Winnipeg), CD

c(March 1986) by Allan E.. Jones

A THESIS SUBMITTED TO THE FACULTY OF
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March, 1986

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"THE DAWN'S EARLY LIGHT: THE LESSONS OF THE AURORA
INDUSTRIAL BENEFIT AND OFFSET PROGRAM"

submitted by Allan Jones, B.A., Q. Yr.
in partial fulfilment of the requirements for
the degree of Master of Arts

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ABSTRACT

According to Dependency theory, the asymmetric power relationship existing between core and peripheral states fragments the internal structures of peripheral societies. Both internal and external linkages are necessary for the maintenance of dependency.

This case study establishes clear linkages between dependency, the innovation process and the course of economic underdevelopment. The innovation process, a specific subset of internal and external linkages, is seen as the key intervening variable in explaining the failure of industrial benefit and offset programs to alleviate the problems of dependency.

Four interrelated hypotheses, each linking dependency to an attempt to increase benefits, are examined.

The general contentions of dependency theory are confirmed. This study finds that not only was there a lack of appreciation of the innovation process, but that dependency oriented attitudes and poor industrial structures combined so as to make the Aurofa program virtually meaningless as far as domestic economic development was concerned.

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CHAPTER 1

DEPENDENCY AND BENEFITS

INTRODUCTION

On 21 July 1976, after much internal debate and a great deal of indecision, the Government of Canada agreed to purchase 18 Long Range Patrol Aircraft (LRPA) from Lockheed Corporation of California (LCC) at a total cost of nearly 1 billion dollars. As part of the purchase contract, Lockheed agreed to the inclusion of an industrial benefit and offset (IB and O) package that totalled 938 million dollars, nearly the total cost of the aircraft. Of this amount, there was a "firm" contractual commitment to spend 414 million dollars from July 1976, to December 1993, in Canada. This commitment was, in fact, for two specific programs, the Basic Benefit Program for 213.2 million and the Future Benefits Program for 201.4 million. Penalties of 10% and 5% respectively were associated with any failure to meet these commitments. There was a further "best efforts" commitment to spend 300-400 million dollars from 1981 to 1995. No penalty was attached for failure to meet this latter obligation.¹

In May 1980, the CP140 Aurora, probably the world's most advanced anti-submarine warfare (ASW) aircraft, went into service with the Maritime Air Group of the Canadian Forces (CF). The Aurora combines the airframe, engines and flight control system of the United States Navy (USN) anti-submarine warfare (ASW) aircraft, the P-3C Orion, with the sensor systems of the USN

1. Undated working copy of Section 39.00, CP 140 Canadian Industrial Benefits LRPA Contract, p.56. Details confirmed from other sources. Chapter seven will discuss the contract in greater detail.

carrier-based S-3A Viking. To these standard systems, certain state-of-the-art Canadian designed systems were added. Like the Argus LRPA that it replaced, the Aurora carries out ASW operations, sovereignty and fishing patrols, shipping surveillance tasks, and search and rescue missions. To meet these demands, the Aurora has a range of 4000 nautical miles and an endurance of up to 17 hours. With a 5600 lb payload the Aurora can transit at 375 knots true airspeed at 25,000 feet and be "on station" for 7.9 hours in a patrol area 1000 nautical miles from base. Crewed by eleven officers and other ranks, the Aurora is probably the most effective ASW aircraft in the world today.² While the aircraft purchased was an undoubted success, such cannot be said of the IB and O program that accompanied it.

In the end the CF were able to deploy an aircraft that was suitable for combat. While this should be considered the logical outcome of such a purchase, it reveals little of the tortured path by which this specific aircraft was chosen or of the multitude of other factors and considerations that had to be evaluated in the procurement process.³ It also says little of the policy contradiction(s) that existed within the Government of Canada.

BACKGROUND

In the early 1970s the Government of Canada reassessed its defence industrial policies and decided upon a significantly more

2. David Godfrey, "Goddess of the Dawn", Canadian Aviation, December 1976, p. 1. The author, a former RCAF/CF Navigator on the Argus LRPA, has approximately 6000 hours flying Maritime Patrol and from contacts in the CF has good reason to believe that the Aurora is indeed the best in the world.

3. Reference will occasionally be made to other IB and O programs.

comprehensive purchasing strategy that had previously been the case. What was really new about this strategy of IB and O was not the concept itself but the degree to which the federal government was prepared to employ defence procurement as an instrument of economic development. The government fully intended to use the bargaining leverage inherent in its large defence procurement programs to achieve a variety of socio-economic objectives. According to Middlemiss, the objectives of this policy were:

to stimulate production and employment, especially in high technology industries; to improve the international competitive position of Canadian industry by encouraging technology transfers to defence and non-defence firms; to contribute to improvements in Canada's balance of trade and international payments; and to achieve a variety of other economic objectives (that is, assisting small businesses, alleviating regional economic disparities, rationalizing and restructuring certain segments of Canadian industry, etc).⁴

While laudable in intent, these politically-generated objectives operated at cross-purposes with those of DND. DND policy specifically stated that the primary objective of DND procurement programs was to provide the material and facilities required to maintain the fighting capability of Canada's Sea, Land, and Air Forces. Given Canada's small defence industrial base, DND's need (and preference) was that weapons systems be purchased "off-the-

4. Dan Middlemiss, "Defence Policy and Canadian Industrial Development", Industrial Preparedness and National Security, (Toronto: Canadian Institute of Strategic Studies, 1980), p.7. These "general" aims are much the same as those specified for the Aurora program. See page 68 below.

shelf" from foreign (mostly U.S.) suppliers. The first priority, however, was that the Canadian Forces be suitably equipped for combat.⁵ There was, as a result, an inherent contradiction between the aims of DND and the developmental objectives of IB and O programs.

Referring to IB and O programs in 1978, the Minister of National Defence, Mr. B. Danson, was quoted in part as saying,

We want at the same time to develop new skills, new technologies and new product lines in Canada through industrial benefits. We want to use our leverage to transfer the latest sophisticated technology including systems and software, technology that might, otherwise be unavailable or which could not normally be imported economically. Again I look to Aerospace as an obvious recipient, since it must be at the leading edge of technology to be efficient and competitive.⁶

Given this and other political pronouncements, it would be reasonable to conclude that IB and O programs make a significant contribution to the aircraft (and defence) industries. Even given the expected gap between political rhetoric and economic reality, there is now evidence that IB and O programs contribute little to economic development. According to Mr. H. Halton, a former executive with Canadair and honorary director of Aerospace Industries Association of Canada (AIAC), the industrial offsets that are routinely demanded as part of large military contracts are "an unmitigated failure".⁷

5. DND Procurement Policy, NDHQ Policy Directive P16. (Issue 2), (September 1981).
6. Barney Danson, Press Release of a speech given to Air Industries Association of Canada, (Ottawa: 10 April 1978), p. 10.
7. David Stewart-Patterson, "Aerospace Industry urges US to share military work", Globe and Mail, 16 April 1985, B10: 1-9.

With the benefit of hindsight, it is now apparent that IB and O programs represented a superficial response to the deeper issues that were and are involved. Indeed, the very magnitude of present IB and O programs, which often seek to have the seller make offsetting purchases equal to the contract price of whatever system is being purchased, serves only to emphasize the degree of dependency they are designed to offset. More fundamentally, they represent a failure to understand the peripheral position into which Canada has allowed its aircraft and defence industries to fall. They assume that a level of benefits commensurate with a state of relative (inter)dependence would become available. Such is not possible, given the state of dependency that exists in the Canadian defence and aircraft industries.

AIM OF THE STUDY

The aim of this study is to examine the purchase of the Aurora aircraft, and, employing certain perspectives from dependency theory, assess the contribution that the Aurora IB and O program made to Canadian economic development.

Understanding the reasons for this policy failure is a matter of some importance because these programs are one of the few strategic approaches now being employed by the Government of Canada in an attempt to increase Canada's industrial and technological strength. The reasons for failure are complicated and not at all apparent, at least at first glance.

In order to analyse them it will be necessary to discuss various theoretical considerations related to dependency theory, the issue of innovation, the political and military background at the time of the purchase and the state of the aircraft and defence

industries, before proceeding to the Aurora program itself. Matters of policy regarding defence procurement and the restructuring of the aircraft industry will be discussed in the context of the program, as will the "negative" consequences and "benefits" of Aurora.

DEPENDENCY THEORY

Two contradictory trends have marked the post-World War II political and economic landscape. The first, representing the desire on the behalf of politically-dependent states for independence and self-determination, has resulted in the creation of dozens of new states. The second, has been the trend towards the economic integration of states into larger, more economically-beneficial "communities", such as the European Economic Community. Much of the post-war political and economic debate can be seen as an attempt to understand the relationship between these two apparently contradictory trends.⁸

Dependency theory, with its stress on the cause of under-development of peripheral states, provides the basis for such an understanding. In both trends, dependency theory sees the asymmetric nature of the political, economic and military relationships between "core" and "peripheral" states as creating the impetus for change. Both trends represent an attempt to strike some new balance between the needs of self-determination and political independence, on the one hand, and economic technological and military dependency on the other. Not only does

8. James A. Caporaso, "Introduction to the Special Issue of International Organization on Dependence and Dependency in the Global System", International Organization, XXXII, No. 1. Winter 1978, pp. 16-17.

dependency theory describe the various social, economic and political characteristics of this relationship, but, according to Caporaso, it also provides a set of causal connections linking the condition of dependency to a state of underdevelopment.⁹

In dependency theory, underdevelopment is seen from systemic, historical and structural perspectives. It is systemic because it sees underdevelopment, at least in part, as the result of an international division of labour (IDL) into which emerging states (and others such as Canada) are integrated in an asymmetric fashion. It is historical because it also sees underdevelopment as the result of the evolution of relations among members of a state system dominated by the core, industrially-advanced capitalist states. Lastly, dependency theory is structural. Underdevelopment is seen as the result of the asymmetric internal political and economic structures created by asymmetric external forces. In short, both the systemic linkages of the IDL and the evolution of international relations give rise to or maintain states whose internal political and economic linkages give priority to the needs of the core states over those of the periphery.

Not surprisingly, the result is often a level of domestic underdevelopment and internal fragmentation wherein economic benefits flow to external centres at the expense of some or all domestic sectors. In summary:

9. Ibid., p. 19.

dependency is a condition created by a historical process, is typified by a structure, and is maintained by a system of relations.¹⁰

Scholarly debate has now distinguished two generally distinctive asymmetrical power relationships between the core and periphery, one dependence the other dependency. While similar, they do reflect a qualitative difference in the degree of the asymmetrical relationship. According to Caparaso:

Dependence is the pattern of external reliance of well-integrated nation-states on one another while dependency, which is closer to the dependencia tradition, involves a more complex set of relations centering on the incorporation of less-developed, less homogeneous societies into the global division of labour.¹¹

While dependence can be highly asymmetrical, there is a range of autonomous action that is possible. Dependency on the other hand is marked by an absence of autonomy on the part of the dependent state, sector, etc. The degree to which dependency theory applies to Canada is a matter of some debate. There can be no doubt that Canada as a whole is not a dependency in the same fashion as many Latin American states. Although some sectors of the Canadian economy, such as manufacturing, are in a state of dependency, others are virtually free of foreign control and suffer few of the disadvantages of outright dependency. Such was the case of the defence and aircraft industries until the late 1950s. As chapter three will demonstrate, however, after the

10. N.J. Gumpala, "Technological Change and Underdevelopment: A Study of Public Policy and Organizational Behaviour in the Rubber Industry in Sri Lanka", An unpublished Ph.D. Thesis, (Ottawa: Carleton University, December 1979), p. 4.

11. Caporaso, op. cit., p. 13.

collapse of the Avro Arrow these industries fell into a state of dependency vis-a-vis the United States. Subsequent chapters will demonstrate that, because dependency is an inter-related condition, once a sector (or an economy) is placed in a position of dependency it is a most difficult situation to alter to any significant degree. Indeed, because its effects tend to spread into other economic sectors, time tends to reinforce its effects. Once dependency has occurred, therefore, the new internal structures, be they institutional or behavioural, may be sufficient in themselves to prevent any significant beneficial change from occurring.

SCOPE OF THE STUDY

While this analysis will examine each of the three main factors that contribute to a state of dependency, all will not receive the same degree of attention. Although a systemic approach to dependency assumes a clear link between internal and external factors, the focus of this analysis will be on internal factors, particularly as they relate to the innovation process. As far as specific systemic factors are concerned, it should suffice to discuss Canada's import substitution industrialization (ISI) and its relationship to the defence and aircraft industries in the post World War II period. Similarly, a relatively brief discussion of the Canadian American Defence Production Sharing Agreement (DPSA) and its relationship with both the defence and aircraft industries should be sufficient to place the historical relationship in perspective. While each is important, they will not form the prime focus of this study. Rather, this study will focus on the structural linkages between dependency theory and the

internal innovation process.¹² As a result, it has been necessary to clearly differentiate internal and external linkages.

HYPOTHESES

It is the general contention of this study that the Canadian defence and aircraft manufacturing industries will not provide a satisfactory level of industrial and economic benefits because of internal factors, particularly as they relate to the innovation process. It is anticipated that poorly developed internal linkages will play a paramount role in the maintenance of dependency and the reduction of benefits. The criteria implicit in the model (of the innovation process) discussed in chapter two will be used to develop the subsequent arguments relating to each hypothesis.

Given the above, it is hypothesized that if a state of dependency exists in a manufacturing sector then,

- H1: attempts to make structural changes will fail due to a lack of internal political consensus;
- H2: attempts to extract additional benefits will result in unanticipated, negative consequences;
- H3: attempts to increase the transfer of technological information will achieve little because of internal bureaucratic and industrial structures; and
- H4: attempts to increase the flow of benefits will generate linkages that bind the periphery even more closely to the core.

While at one level of analysis, the failure of the Aurora IB and O program was the result of several specific factors, there is also a clear causal link between the condition of dependency and

12. In this study, structures are seen as being either institutional, such as those in government departments, industry, etc, or behavioural, such as personal attitudes, interests, etc.

the developmental failures posited in the various hypotheses. More specifically, innovation, dependency, restructuring and the "negative consequences" and "benefits" of Aurora are linked in a causal chain of some complexity. An examination of these "links" commences with a discussion of the "innovation process" and leads logically to an examination of the state of dependency of the defence and aircraft industries. Prior to the latter discussion, however, it is desirable that some background material covering political and military considerations be covered.

CHAPTER 2

A MODEL OF THE INNOVATION PROCESS

INNOVATION AND BENEFITS

Understanding the relationship between benefits and innovation is critical to understanding the failure of the Aurora program. Accordingly, this chapter will suggest a model of the innovation process; a model against which the various "benefits" of the program can later be judged.

INNOVATION

Unlike Keynes and the classical economists who considered innovation to be outside the economic system, Schumpeter insisted that "innovation—that is, entrepreneurship that moves resources from old and obsolescent to new and more productive employments—is the very essence of economics and most certainly of a modern economy."¹ In the capitalist system the more traditional firm often opts for a market approach that increases the probability of short-term profit. The risk of long-term market failure is compounded, however, if it focuses too closely on immediate profits at the expense of Research and Development (R and D) and innovation. By failing to innovate, a firm, or an industry, risks being overtaken by a more dynamic, innovative competitor who focuses more on the long-term production of goods, systems, processes etc., through the use of ever-advancing levels of technology. So long as there is a focus on short-term profit, there will be a tendency to remain with the older, proven but still profitable technology, long after it should, for long-run

1. Peter F. Drucker, "Schumpeter and Keynes", Forbes, (23 May 1983), p. 126.

viability, have been replaced.

While the process of innovation and technological replacement referred to by Schumpeter as "creative destruction", does undoubtedly create problems, its long-term results can only enhance productivity, create jobs, support a positive balance of trade etc. By creating an indigenous innovative capability, it is possible for a country to reduce its technological dependence and the pattern of reduced benefits that results from such a situation. Technological innovation is, therefore, critical to the creation of a dynamic industrial economy.

Countries and firms that previously relied on borrowed technology can no longer hope to realize increased manufacturing productivity and rising manufacturing sales without expanding innovative activity.²

Accordingly, the level of technological innovation is a matter of critical concern to industrialized states intent on preserving social harmony by maintaining a satisfactory distribution of economic benefits, despite technological change. According to Abonyi and Atkinson,

The most pressing problem is that of creating an indigenous innovative capacity.³

By the mid 1970s, several aspects of the overall problem of

2. Arpad Abonyi and Michael Atkinson, "Technological Innovation and Industrial Policy: Canada in the International Context", The Politics of Canadian Public Policy. (Toronto: University of Toronto Press, 1983), p. 98.
3. Ibid., p. 94. Significant technological change falls into two categories; one, the adaptation of current technology to new uses and; two, the use of new technology to innovate new products, processes, systems, etc. While both are important for an industrial/information economy, there is no doubt that innovation is the more important. While necessary, the adaptation of foreign technology is not sufficient to capture niches in the world market because it does not produce unique products.

economic and technological dependency had been identified. Several researchers identified various causes and suggested specific remedies for the lack of an internationally competitive manufacturing capability by Canada. Whether the essential defect was identified as a lack of entrepreneurial ability or the patent system, it is now obvious that the essential problem is a multi-faceted one, incorporating elements of technology transfer, R and D, entrepreneurial ability, technological training, tariffs, patents, etc. For example, while R and D "provides no guarantee that commercially-viable products will be created, without such investments it is unlikely that a country will gain the initial comparative advantage."⁴ From conception to production, products move through a series of stages. Unless all links in the process are properly forged, the process will not produce internationally competitive products. The key is to see the various elements as part of the "innovative process."

THE MODEL

Conceptually at least, either the importation of new technology via foreign direct investment (FDI), licencing, purchase or through joint ventures (JV), or its creation through internal R and D, can be seen as the beginning of the innovative process, the end being the production of a new product. While other structural components of the process such as human resources also appear obvious, it is not altogether apparent how these elements are specifically interrelated. What is most apparent, however, is that no single factor, be it low levels of R and D or

4. Fred Lazar, The New Protectionism: Non Tariff Barriers and Their Effects on Canada, (Toronto: James Lorimer and Company, 1981), p. 56.

supposedly poor entrepreneurial ability, is, in itself, sufficient to explain the relative lack of innovation in Canada. Past experience clearly indicates that there are no "quick fixes" by which the economy can be made to be innovative. It was long believed, for example, that the low level of R and D in Canada was a cause of industrial inefficiency and that by supporting more R and D the course of industrial decline could be reversed. The very limited success of such efforts (in relation to the funds expended) now indicates that there has been a "fundamental misunderstanding of the contribution of R and D to industrial strength and excellence".⁵ As noted by the Science Council:

Policies structured on the assumption that R and D alone creates industrial strength, are bound to be insufficient. In fact, the reverse is true: industrial strength creates the fertile ground necessary to promote excellence in research and development.⁶

While attempting to learn from the mistakes of the past, the author is quite aware that the innovation process is far more complicated than that indicated in the model to be presented below. This structural approach to the problem does, however, provide some means of assessing how well programs such as Aurora contribute to the production of industrial benefits. Starting with technology transfer, the variables will be discussed in an order consistent with the operation of the model. A schematic diagram of the "Innovation Process" is included on page 27.

5. Claude Fortier, "Industrial Strength Through Innovation", Statement of the Chairman, Annual Review. (Ottawa: Science Council of Canada, 1980), p. 28.
6. John Britton and James Gilmour, The Weakest Link, (Ottawa: Science Council of Canada, 1978), p. 51.

In broad terms, technology transfer takes place, "whenever technical knowledge, a technique or a device which emerges from, or is developed by, one group becomes taken up and used or applied by another."⁷ In terms of the state's ability to achieve beneficial results, the source of the technology is critical. While it can, at least to some degree control, direct, or reduce internal impediments to technology transfer, it cannot exert similar pressure or influence on foreign sources. The main problem therefore is to ensure continued access and control of ever-advancing levels of technology on terms favourable to the host economy, not on those dictated by multi-national corporations (MNCs) headquartered in other industrially-competitive states. In this regard, there are four traditional means whereby international technology transfer can be achieved: purchase, FDI, JVs and licencing. It is assumed that, while there may be specific financial or technical problems associated with the transfer of American technological information to Canada, there are no cultural barriers which would significantly hinder the implementation of higher levels of technology.

Technology is, unfortunately, not just another product that can be purchased fairly on a market basis. The outright purchase of technology does not necessarily ensure its successful transfer. In this case, the operation of supply and demand does not tend to create a fair market price. Considered as a commodity, information has certain properties which weaken the position of the purchaser because,

7. Science Council of Canada. "Technology Transfer: Government Laboratories to Manufacturing Industries", (Ottawa: Science Council of Canada, December 1975), p. 14.

in order to buy information, the purchaser must already have some facts as to the characteristics of the desired information, and in the case of technical knowledge, on the available alternatives from other sources. However, experience shows that if the purchaser has this information needed to correctly (or optimally) formulate his demand, he would not need to buy more information...the technology that is desired is precisely the body of knowledge necessary to acquire it under rational conditions.⁸

The situation is essentially a paradox.

While the marginal cost to transfer the technology is, from the seller's perspective, often quite low, the paradoxical nature of the purchase frequently requires that the purchaser must spend unexpectedly large amounts to put the technology into production. Its use is often embodied in an entire system of production, distribution, marketing, training, etc. which can only be purchased as a package, often somewhat incomplete. Non-competitive conditions can further weaken the position of the purchaser. It is often impossible to break down the total package, yet failure to do so threatens technological and industrial development because purchasing of a package, "tends to create dependence of the purchasing nation, and this dependence tends to be cumulative."⁹ Accordingly, the direct purchase of technology would not appear to add significantly to the innovation process.

From the perspective of the MNC, if a set of technological information is difficult to control, FDI is the chosen instrument which allows the corporation to obtain the maximum benefits with

8. Alejandro Nadal, Transfer of Technology and Multinational Corporations in Mexico, (Paris: Organization for Economic Cooperation and Development, November 1975), p. 3.

9. Britton and Gilmour, op. cit., p. 140.

the minimum risk to the preservation of its monopoly or quasi-monopoly. Through FDI, the modern MNC unites the various factors of production so as to perpetuate the comparative advantage of the corporation, an advantage that, if the various factors and elements had to be considered independently, might not be sustained by the market. The highly integrated nature of FDI makes it a significant economic force, particularly in a technologically-dependent state such as Canada. However one perceives the historical failings of the Canadian economy, there can be little doubt that the very high levels of FDI have exploited those weaknesses. As a result of FDI, "Canadian manufacturing is concerned primarily with establishing and protecting a position for foreign technology, brand names, product concept and market power in Canada. Large corporations are interested in selling products, technology, managerial and entrepreneurial skills, not in developing them."¹⁰ Not surprisingly, such firms, sustained by the resources of the parent company, can remain competitive in Canada without being competitive on the world market. Such firms do not carry out all the functions necessary to develop, produce and market goods. They often only import a "mature" level of technology, a level associated with processes late in the product cycle. One of the most insidious side effects of FDI, therefore, has been the tendency for such "truncated" firms, both foreign and domestically-controlled, to view innovation as having been achieved so long as old technology has been replaced. In many cases the change merely substitutes one level of mature technology

10. Ibid., p. 92.

for another. In short, the economic benefits that do flow from FDI are not part of a self-sustaining process related to innovation and hence long-term development, but are related more to the growth of jobs, sales, etc.

If the level of a patented technology is such that, once it is used, it will diffuse readily throughout the host economy, then significant advantages accrue to the MNC if it decides to licence technology rather than investing directly in production. This is particularly true whenever the supply of capital and/or entrepreneurial ability available to the MNC is limited. Licencing enables the MNC to dictate the terms upon which the technology will be diffused throughout the host economy. Many such licencing agreements specifically exclude the licensee from supplying other than the domestic market. (In most cases, the licensor has already granted access to "foreign markets" to other licensees.) While export restrictions are only the most obvious case, the licence "package" can be divided into sets of information, the modular technology that is being licenced and the other peripheral data surrounding its use. As stated by Britton and Gilmour,

The modular component is that which is specific and inherent to the process under study, (that) which distinguishes it from similar processes of products... The peripheral component is generally common to different processes or products...and is relatively more freely available than the modular components. ¹¹

Several advantages can accrue to the host economy if the licenced technology can be "unbundled". Unbundling, that is to differentiate between the core and peripheral aspects of the

11. Ibid., p. 191.

technology, reduces the time lag between the introduction of a technology and its absorption into the technological mainstream. It allows the purchaser to more readily identify the components of the technical knowledge and their degree of complexity. As a result, technology separated in this fashion more readily promotes the creation of an indigenous innovative capability, free of external restrictions.¹² Without such separation the net effect is to "rent licenced technology." This creates a disposition on the part of the tenant to neglect his own R and D in favour of the package dictated by the foreign MNC. As a result, while ownership may reside in Canada, little is achieved in terms of the ability to innovate.

In general, a JV can be considered half-way between FDI and "bundled" licencing as far as the accrual of domestic benefits is concerned. Given the strong market position of MNCs, JVs are an unsuitable vehicle for smaller domestic firms which are neither technologically innovative nor internationally competitive.¹³ Their potential to obtain technological upgrading via JVs is severely weakened by their poor competitive position. Larger domestic firms, that is those that are either internationally competitive or on the threshold of being so, are in a much better position to bargain with foreign MNCs for mutually-advantageous JVs. JVs which are essentially free of the procurement and export restrictions so common in "bundled" licencing and FDI. JVs, therefore, base the transfer of technology (and hence the increased potential for innovation) on those sectors of the

12. Ibid.

13. Ibid., p. 192.

economy that are already strong, competitive, and technologically capable.

According to Britton and Gilmour, advanced economies have entered a period where the quality of manpower is becoming much more important than the amount of manpower. Similarly, it is now critical that business have the ability to utilize this higher quality manpower.¹⁴ However it is perceived, production in the "third wave" will require a significantly more highly skilled worker than those who were trained for the now mature technologies of the "second wave." Indeed, it is no exaggeration to state that, because the innovative process aims at embodying new knowledge in the form of new products, processes, etc. at a competitive price, skilled workers and entrepreneurs are now equally important. Such was not generally true in technologies of the second wave. Accordingly, any program that increases the level of technologically-oriented education, performs technological retraining, increases the scope of such training, or relocates personnel to perform in a more productive environment can be seen as adding to the capability to innovate. In "third wave" production, therefore, the training and movement of people is almost as important an input as the generation and movement of ideas. Unlike second wave technologies which tended to be taught in public institutions, third wave technologies require that the entrepreneur constantly up-grade his human resources, either as part of his own program or, in cooperation with public institutions. The rigid, bureaucratic structures of public training are now simply too slow and inflexible to meet the needs

14. Ibid., p. 64.

of the modern entrepreneur.

If the potential for innovation generated by the increased "technological literacy" and mobility of workers is to be realized then a proper environment must be created for the integration of human and intellectual resources. Japanese and other experience suggests that the function of the entrepreneur is critical. As noted by Horie,

A supply of entrepreneurs...who are able and willing to vigorously perform the key functions of innovation and risk taking and management is the decisive element in economic progress. 15

While an individual entrepreneur may be able to recognize opportunity and integrate resources in a creative fashion, long-term exploitation requires the use of a variety of skills and abilities. More specifically, modern entrepreneurial ability is characterized not so much as being that of one person but more so as consisting of an integrated workplace composed of scientists, engineers, technicians, managers, market specialists, design experts, and quality control technicians performing as an experienced industrial team.

The specific process whereby technological innovation proceeds from the concentration of human and intellectual resources can be seen as a function of both the experience of the industrial team and the scale of the organization that is involved.¹⁶ While the particular temporal threshold at which

15. Zasuho Horie, "Modern Entrepreneurships in Meiji Japan", The State and Economic Enterprise in Japan, (Princeton: Princeton University Press, 1965), p. 183.

16. Devendra Sahel, "Technological Progress and Policy", Research, Development and Technological Innovation. (Toronto: Lexington, 1980), p. 193.

firms become innovative is difficult to predict, "threshold companies share a common path to success that seems to require an in-house capability for research and development as well as design and engineering functions."¹⁷ By performing these and other functions, such as quality control (QC), medium-sized firms are able to create and grasp specific opportunities in foreign markets. Their successful exploitation, however, is often dependent on the acquisition of foreign firms. As a result of this market orientation, technologically innovative firms tend to develop even greater independence as far as the production, employment and extension of innovative ideas is concerned. By reducing their dependence on the intellectual base of foreign-owned competitors, domestic firms multiply their beneficial effects in the domestic economy.

If the full value of innovation is to be achieved, however, it may be necessary to direct the transfer of R and D from government laboratories to the domestic firm best able to become and/or remain internationally competitive. In short, if the innovative process is to become self-sustaining, all human and intellectual resources have to focus on the creation of a centre or centres of excellence. Discussing such knowledge, Mytelka notes,

it appears that knowledge inputs are displacing capital, land and labour as the primary defining feature of the production process in advanced industrial capitalism.¹⁸

17. Guy Steed, Threshold Firms: Backing Canada's Winners. (Ottawa: Science Council of Canada, 1982), p. 9.

18. Lynn Krieger Mytelka, "Knowledge-based Capitalism and the Changing Strategies of Manufacturing Firms", (Ottawa: Carleton University), n.d. p.2.

In terms of this analysis, any change that allows internal and external R and D information to flow to a particularly innovative firm, that aids internal engineering and design (E and D) and improves its QC function can be seen as adding to the innovation process.

The importance of patented innovation should not be underrated. Patenting is an invaluable source of market power which denies competitors, except through licencing, the comparative advantage that has been achieved through innovation. It is not the possession of domestic patents by MNCs that is, in itself, critical. As early as 1900, Americans controlled as much as 70% of the patents issued in Canada.¹⁹ Large numbers of these patents, however, are only held for "defensive" purposes, that is, they are not controlled as part of the productive process but are used as a mechanism to achieve control over markets without making either direct investment or licencing arrangements. According to Nadal's analysis of the patent system in Latin America, the operation of the patent system there does not maintain any relationship with domestic innovation. Indeed, patent protection is often used by MNCs to restrict the rapid flow of technological innovation throughout the host economies.²⁰ In terms of this analysis, therefore, foreign control of patents can be seen as producing less than optimal benefits to the domestic economy, while local control should contribute positively to the innovation process.

19. Glen Williams, "The National Policy Tariff: Industrial Underdevelopment Through Import Substitution", Canadian Journal of Political Science. (XII, June 1979), p.347.

20. Nadal, op. cit., pp. 13-15.

When innovative, competitively-priced products and processes are placed on the market natural economic forces create a pulling effect that diffuses the benefits of innovation to both the domestic and international economies. Once established, these economic links become the means by which an economy is integrated regionally, nationally or internationally. The degree of diffusion, however, depends on the level of competition within the domestic economy. The greater the competition, the greater the market pull for innovative change. The domestic demand for sophisticated products and processes tends to become mutually reinforcing, with the beneficial outputs becoming, through economic linkages, the inputs for further technological development. In Canada's case, however, the existence of a high level of foreign-owned subsidiaries significantly reduces the benefits of innovation because they accrue to the parent firm. The dispersal of benefits is in accordance with the global strategy of the MNC and is not related to any need of the host economy.

Be this as it may, no country can maintain its industrial status unless it has enough strength to capture the beneficial spinoffs and multiplier effects that are a feature of all modern technology. If, as in Canada's case, the creation of such linkages is left entirely to market forces, then just as in the second wave, the links now being created will tend to transfer the benefits outside of Canada. Referring to second wave technology, Britton and Gilmour, noted that there already was "an unproductive degree of disintegration in the Canadian industrial system." 21

21. Britton and Gilmour, op. cit., p. 18.

OPERATION OF THE MODEL: A SUMMARY

With reference to diagram 2-1 on page 27, it can be seen that when the more beneficial means of transfer of external technology, i.e. JVs and licencing, is combined with internal R and D and integrated with improved human resources in the form of an industrial team, the result is an increased capability to innovate (and adapt). Given the highly interdependent nature of technological innovation, it is not possible for the internal production of R and D, for example, to generate enough momentum to set the innovative process in motion by itself. Neither is it believed that the simple infusion of external technology is sufficient to commence the process. When the required linkages are created and a sufficient stimulus of intellectual and human resources is focussed at a point of industrial excellence then the inherent inertia of the process is overcome and a dynamic, self-sustaining, benefit-producing process will commence. Given the "pull" of the market, the products of innovation reinforce the internal innovative process by adding to the available base of patented R and D. Benefits, in the form of improved productivity, increased competition, improvement in the balance of payments, a more integrated industrial infrastructure and jobs are the result.

Conversely, it can be seen that severing of some links or an exclusive reliance on others will result in a reduced capability to innovate. At some point, so much momentum is lost that fewer benefits are generated and a state of technological dependency occurs. The restoration of a capacity to innovate is still possible, however, if the linkages between the variables are manipulated so as to duplicate the innovative process.

THE INNOVATION PROCESS

DIAGRAM 2-1

CHAPTER 3

POLITICAL, ECONOMIC AND MILITARY CONSIDERATIONS

INTRODUCTION

It is no exaggeration to state that the years from 1966 to 1976 were traumatic ones for the Canadian military. The Navy, Army and Air Force were still adjusting to the requirements of "integration" when the government proceeded with the highly controversial and emotionally-charged process of "unification". In his analysis of the Aurora weapons purchase, Pennie describes these years as being marked by "an arduous decision-making process, punctuated with governmental delay, competing priorities, foreign intervention, intense political and bureaucratic lobbying, scandal, and a heightening of civil-military tensions in Canada."¹

The unification of three individual services proceeded under a tacit agreement between the government and the military: if, in the name of efficiency, the separate services accepted the government's proposed reorganization, then, for its part, the government would re-equip the unified forces with modern weapons systems. According to this understanding, the money saved through integration and unification could be used, at least in part, to replace the Forces' obsolete and obsolescent weapons systems.² Unfortunately for the Canadian Forces (CF), there were to be no savings.

By the early 1970s, the CF were reduced to their lowest man-

1. Kenneth Pennie, Light on Aurora: An Analysis of a Canadian Weapons Procurement Decision, An unpublished M.A. Research Essay, (Ottawa: Carleton University, 1981), p. 1.
2. For example, at this time the Canadian Army was still using the Centurian tanks first used in the late 1940s.

power levels (approximately 78,000 personnel) since World War II. The budget was frozen, and purchases of replacement weapons systems virtually ceased.³ The ability of the CF to carry out their assigned roles had been seriously impaired. Besides the budget freeze, high rates of inflation and increases in military pay had eroded the defence dollar to a point where capital expenditures on equipment, which had represented 22% of the budget in 1961, fell to 8.8% in 1973.⁴ Three relatively short-term ministers were unable to correct the situation.⁵

The need to re-equip the Forces, however, could not be continually postponed. Eventually, several major re-equipment proposals came before the government. Among them was a proposal to purchase new Long Range Patrol Aircraft (LRPA). The LRPA replacement program derived its importance by being the first and one of the largest of the equipment purchase proposals. It was to total nearly one billion dollars. During the course of the decision-making process several inter-related factors had to be considered in order to determine which aircraft to purchase. An understanding of the competing political and military claims that had to be resolved and a knowledge of the state of the defence and aircraft industries will provide the background necessary to understand the LRPA purchase and the associated Industrial Benefit and Offset (IB and O) program. Annex A to this chapter defines

3. Undoubtedly some purchases were made but the limited expenditures that were involved did not create any serious controversy within the government.
4. Canada, Defence 1977, (Ottawa: Department of National Defence, 1978), p.98.
5. Pennie, op. cit., p. 55.

some of the terms and categories used throughout the study.

POLITICAL CONSIDERATIONS

Despite the authority that the Canadian military derived from its understanding of Canada's alliance commitments, the influence of the military on national policy was not what it was during the cold war. Rather, as the cold war eased, the influence of the military suffered a marked decline.⁶ While this decline was, in part, an "inevitable consequence of the apparent passing of that era into one of detente",⁷ it was also a result of political factors. In particular, changes in the Department of National Defence (DND) organization and in defence policy seemed to reflect the personal disposition of Prime Minister Trudeau. Procedural changes in the way in which the government made decisions were directly related to the Prime Minister's desire to impose a more rational set of political controls on the state bureaucracy, including the sorely-troubled DND.⁸ The last major DND purchase program prior to the LRPA was that of the CF5 aircraft. That purchase, in 1966, seemed to have been made more for its employment possibilities than for its military usefulness. It was to correct such "blunders" that an elaborate, rationalized,

6. Michael Tucker, Canadian Foreign Policy Contemporary Issues and Themes. (Toronto: McGraw-Hill, 1980), p. 152.

7. Ibid.

8. G.Bruce Doern, "The Policy-Making Philosophy of Prime Minister Trudeau and his Advisors", Apex of Power. ed. T.A. Hockin (Scarborough, Ontario: Prentice-Hall of Canada, 1977), pp. 192-3.

decision-making process was instituted.⁹ It was hoped that a stronger civilian presence would result in the purchase of equipment that would "fulfill rather than shape Canadian defence policy".¹⁰

As a result of the Trudeau government's 1971 re-examination of Canadian defence policy, the North Atlantic Treaty Organization (NATO) role, which had previously been given first priority in defence planning, was reduced to third place. In its stead, the "protection of Canadian sovereignty" was given top priority.¹¹ In view of the political mood at that time, this change was not surprising. During the late 1960s, some highly-publicized political events, such as the Arctic voyage of the United States ship Manhattan, drew the attention of Canadians to areas where Canadian sovereignty could be challenged. The heightened sense of nationalism that had emerged in the 1960s made it politically expedient for the government to take effective counter-measures to protect national interests in such remote areas. Several national functions that had not been done, or were being done only intermittently, would not only have to be carried out but be seen to be carried out.

Thus, the government was faced with growing dilemma.

Should it purchase an LRPA which did only anti-submarine warfare

9. It seems almost generous to refer to the CF5 purchase as a "blunder". Some aircraft went directly from the assembly line to storage. Others, (possibly the same aircraft) were quickly sold to other countries.

10. Pennie, op. cit., p. 2.

11. Tucker, op. cit., pp. 143-144. It has been argued that this restatement of tasks was not a "prioritization" but was done only to give the appearance of downgrading the NATO role.

(ASW), as, was suggested by the Minister of National Defence in 1969? Should it purchase an LRPA which, besides its traditional ASW role, could also be used to carry out sovereignty roles related to resources, the ecology, fishery protection and search and rescue. Should it purchase a mixed-fleet of aircraft, some for each of the main roles under consideration? At first, the government intended to purchase an aircraft that could perform both main roles. This accorded with the Prime Minister's thinking on defence. Assuming that detente would last and that it would be inadvisable to take any action that would upset the strategic environment, the Prime Minister perceived that the ASW role of the Maritime forces should be reduced. Trudeau believed that a highly-sophisticated ASW aircraft capable of strategic deployment would upset the strategic balance because it could threaten the second-strike capability of Soviet submarines. This in turn would have a negative effect on detente.¹² For this and other reasons, Trudeau sympathized with those who argued that non-military sovereignty roles ought to be assigned to the LRPA replacement.¹³ In keeping with this reduced role for Maritime Command, the replacement aircraft would only be equipped to maintain a capability in the more restricted field of tactical ASW. It was believed that, as a result of restricting the overall ASW capability of the aircraft to tactical work, it would still have the capacity to carry the other sensors and equipment needed for the various sovereignty-related tasks. The replacement aircraft would then have no difficulty performing both

12. Tucker, op. cit., pp. 145-146.

13. Pennie, op. cit., pp. 52-53.

the tactical ASW and sovereignty roles. It was politically expedient to reduce the military potential of the new LRPA.

Beyond such considerations, no contradiction was seen between the performance of the military and sovereignty roles; that is, between the "protection of sovereignty tasks", on the one hand, and the performance of various military tasks (mainly ASW) in conjunction with our allies, on the other. As noted by Tucker, however, the White Paper on Defence was more of a "philosophical treatise" than a practical program for defence policy-making. While the tasks related to sovereignty protection were, at best, quasi-military, Canada's commitment to its allies was purely military. In terms of military professionalism and of the type of weapons required, the two roles were practically irreconcilable.¹⁴ At a minimum, sovereignty protection implied that a degree of independent military force be made available to deter any military probe into Canada's vast northern areas. Unfortunately, Canadian planners perceived the sovereignty role in a rather narrow, watch-keeping manner. There would be surveillance and patrol but no effective military deterrence. It was assumed that, like defence, the protection of sovereignty would be carried out in conjunction with Canada's allies. As noted in the Report of the Sub-committee on National Defence, however, "Through inertia, encroachments on sovereignty can easily be invited from friend or foe."¹⁵

14. Tucker, op. cit., p.147.

15. Canada. Canada's Maritime Defence. Report of the Sub-committee on National Defence of the Standing Senate Committee on Foreign Affairs. (Ottawa: Minister of Supply and Services, 1983), p. 28.

In summary, the initial decision to perform both the tactical ASW and sovereignty roles and the perception of what each role entailed, indicated that both would be done in a less-than-effective manner. The ASW role would be limited to tactical operations, while the sovereignty role would lack military credibility.

MILITARY CONSIDERATIONS

By 1973 the number of all-weather patrol aircraft available to Maritime Command had been reduced from over 70 (in 1969) to 26 - 26 aging Argus aircraft. At the same time, and in accordance with the new defence policy, Arctic sovereignty patrols, ice surveillance, fishing patrols and search and rescue tasks had also been assigned to the Command. These tasks severely limited Maritime Command's capacity to carry out its prime role, ASW. It was hoped that the replacement LRPA, with its state-of-the-art technology, would redress this imbalance.

The leaders of the CF perceived Canadian participation in NATO as central to their entire defence mission. The ASW role in the North Atlantic, however, required that an ASW aircraft be employed both tactically, to protect convoys, and strategically, to counter nuclear-armed Soviet submarines. As a result, DND initially proposed that the new LRPA be out fitted to carry out "ASW" and that it have the capacity to incorporate future avionics improvements.¹⁶ This requirement left the ultimate role of the aircraft up in the air, so to speak. Further improvements to the basic ASW avionics configuration would result in an aircraft that

16. Avionics is an acronym for aviation electronics and includes various types of search, detection, localization and navigation devices.

could conduct both tactical and strategic ASW missions. The addition of a civilian-oriented sensor package, however, would allow both the tactical ASW and sovereignty roles to be performed.

In retrospect, the key issue in the debate was the role that was perceived for the aircraft. Three factors were critical in finally defining that role: money, the distinction between tactical and strategic ASW, and international pressure.

First, DND's funding had finally been unfrozen. The department was now committed to purchasing new fighter aircraft, patrol frigates and tanks. The original decision to acquire an aircraft that could perform both military and sovereignty roles meant that expensive sovereignty-related sensors would have to be added to the aircraft.¹⁷ Given the limited carrying capacity of any aircraft, only so many sovereignty-related sensors could be added before they would have a negative effect on the performance of its ASW role. More critically, however, although DND was responsible for the funding of the LRPA as well as defining its specifications, it was the task of the Department of Finance to attempt to keep the costs of the purchase to a minimum. As Tucker notes, "It was never clear how the DND was to get the best plane available if cost was a factor, especially since the Department was also seeking new tanks, patrol frigates, and fighter aircraft."¹⁸ Further, it was not clear how financial restraints could be harmonized with the requirements for industrial offsets, as proposed by the Department of Industry, Trade

17. Sovereignty-related sensors would include mapping cameras, airborne radiation thermometers, pollution sensors, etc.

18. Tucker, op. cit., p. 156.

and Commerce (ITC). In the end, financial constraints made it impossible to purchase the aircraft and both types of sensors. Given the absolute necessity to purchase a given number of aircraft, once it had been decided to perform the ASW role little funding was left for the purchase of sovereignty-related sensors.¹⁹

Second, the relatively clear distinction that had existed between the tactical and strategic deployment of ASW aircraft began to fade. Strategic ASW, clearly associated with the destruction of nuclear-powered, nuclear-armed submarines (SSBNs) as they transit to, from and within their patrol areas, aims to prevent the launching of ballistic missiles against North American targets. Tactical ASW, formerly associated with the protection of convoys transiting the sea lanes of communication (SLOC) between North America and Europe, was now both more important and more difficult to perform. Soviet expansion of its attack submarine fleet (SSGN), now equipped with surface-to-surface anti-shipping missiles, significantly increased the threat to the SLOC. It was this increased threat that caused great concern for both the Supreme Commander Atlantic (SACLANT) and the Canadian Maritime Commander. The capability of the Soviet attack submarine fleet to make long-range attacks on convoys made it necessary for tactically-employed ASW aircraft to be deployed at a greater distance from the convoy, i.e. to act in a more strategic fashion. Further, the technological demands of tactical ASW had also increased. A state-of-the-art avionics package was now necessary

19. Pennie, op. cit., p. 66. As noted earlier, however, the Aurora has been tasked to do sovereignty-related roles even though it does not have the sovereignty-related sensors.

if tactical ASW aircraft were to be effective in the defence of convoys. "The most effective means of countering a SSGN could also threaten the SSBN."²⁰ The technology needed to operate tactically was now the same as that required for strategic deployment. If the ASW role were to be performed at all, it was necessary to purchase costly avionics, sensors, and weapons packages for what was now essentially one role, ASW.

Finally, there could be no doubt that Canada's membership in NATO had a significant impact on the roles proposed for the aircraft and, therefore, on its type. While it would be an exaggeration to state that Canadian military leaders saw the world in strictly bipolar terms, there is no doubt that their views of both NATO and the United States were essentially positive. Accordingly, they wished to purchase replacement equipment that would enhance Canada's relatively low status vis-a-vis both the alliance and the United States. Their continued influence and sense of professionalism required no less. ASW was the one NATO role where Canada had, despite all the cutbacks, managed to maintain a relatively high level of expertise and capability. NATO officials valued this contribution and did not want to see it diminished in any way. The extraordinary growth of Soviet sea power justified the procurement of a technologically-sophisticated ASW aircraft, capable of being deployed on both tactical and strategic missions. Any failure to provide a replacement ASW aircraft would require the United States Navy to fill the gap left in North Atlantic defences. This was something the United States government was determined

20. Ibid., pp. 33-40.

to avoid.²¹ The Canadian government was well aware of both NATO's concerns and the views of the United States government in this matter.²²

Recurring delays in the LRPA procurement process were of particular concern to Canada's European allies.²³ European statesmen had expressed a clear concern that Canada's failure to fulfill its ASW commitment would not only jeopardize their lines of communications with North America but harm Canada's desire for closer trade and economic links.²⁴ In particular, Helmut Schmidt, then Chancellor of West Germany, made it quite clear that consideration of a "contractual link" between Canada and the European Community was out of the question until Canada embarked on a general re-equipment program. The LRPA replacement was seen as evidence of Canada's intentions to embark upon such a program.

It was only during the latter part of the LRPA procurement process, therefore, that the Canadian government came to recognize that failure to re-equip the military would, in fact, weaken Canada's external relations vis-a-vis both U.S and Europe, and harm its trade with Europe. The purchase of an effective ASW aircraft would, at least in part, mute such criticism. The purchase of a sovereignty-oriented aircraft would not. Even so, of all the

21. Ibid., pp. 39-40.

22. Ibid., pp. 39-41.

23. Ibid., pp. 40-41. For a complete description of the tangled course of events whereby the government not only delayed its decision to purchase a replacement LRPA but revoked its first contract and then hastily re-negotiated a more costly one, see Tucker, op. cit., pp. 155-163.

24. Ibid., pp. 40-41.

factors considered in the LRPA purchase, European pressure figured least in the final decision.

In summary, it can be seen that financial constraints, considerations of strategy and technology, and pressure from Canada's allies had all acted in one direction - toward the purchase of a highly sophisticated ASW aircraft. Any destabilizing effect that such a purchase would have on the strategic balance was now seen as "far less significant than the stabilizing contribution that such a weapons system would make to NATO's conventional maritime defence".²⁵ The Aurora decision signalled the return of Canada to its traditional military role in the NATO alliance.

By the late 1970s, then, defence priorities had in fact, if not in policy, evolved to a point where they were strikingly similar to those of the 1950s and early 1960s. Despite clear intentions to the contrary, the government had allowed a weapons procurement program to determine policy. The Aurora purchase signalled a reversion to the more military roles with which the CF had traditionally identified. In this sense, Aurora was indeed the "dawn" of a new era for the CF.

There could be no new "dawn" for the Canadian defence industries, however, without a new defence industrial policy. The cumulative result of the Arrow cancellation, frozen military budgets and reduced Research and Development (R and D) had undermined the previous defence industrial strategy. By the late 1960s, the impressive defence industrial structure that had supported the Canadian military up to that time declined into dependency.

25. Ibid., p. 8.

THE CANADIAN DEFENCE AND AIRCRAFT INDUSTRIES

Rather than "sacrificing the many years and large capital investment required to develop independent industrial roots",²⁶ Canada, as many other underdeveloped countries were to do later, opted to stress the needs of the domestic consumer. The machinery, technology, skills, money, etc. required to set up such "instant industries" were almost always imported, in the form of branch plants. Unlike the more successful industrial powers, such as Germany, Japan and Sweden, Canada followed a strategy of industrialization by import substitution (ISI). It is now obvious that branch plants were never established in Canada to become independent entities capable of competing on the world market. As Williams notes, their "technological dependence prevents import substitution industries from growing beyond the level of the domestic market."²⁷ The parent company was always able to maintain a competitive edge in other markets. Rather, such firms were components of an international marketing strategy by American firms aimed at capturing and holding a share of the Canadian domestic market. As time passed, Canadian manufacturing industries became progressively more dependent on American parent companies for their reproduction and were never in a position to compete on a world scale. In short, ISI did not provide the basis for self-sustained industrial growth.

The aircraft and defence industries that emerged after World

26. Glen Williams, "The National Policy Tariff: Industrial Underdevelopment Through Import Substitution", Canadian Journal of Political Science. (XII, June 1979), p. 7.

27. Ibid.

War II, however, were an exception to a generally "truncated" manufacturing sector served by the branch plant system. Despite the rapid dismantling of some elements of the Canadian defence industry, many retained sufficient human and material resources to provide the foundation for further expansion. After the formation of NATO in 1949 and the start of the Korean War in 1950, defence production was re-organized under a single agency, the Department of Defence Production.

By the mid-1950s, A.V. Roe was producing a wholly Canadian designed all-weather jet fighter, the CF100. A supersonic replacement, the Arrow, had reached the flight test stage. De Havilland was producing short take off and landing aircraft (STOL) and Canadair was producing the Sabre and T-33 aircraft under licence from North American and Lockheed, respectively. Over half of the aircraft needs of the Royal Canadian Air Force (RCAF) were supplied domestically. According to Gelling:

By 1959 Canada had developed a substantial indigenous capability to design and manufacture a wide range of military equipment to meet the needs of the armed services.²⁸

Three major shipyards produced a line of advanced destroyers designed by a group integral to the DND.²⁹ As Gelling concludes:

Proliferating around the major ship and aircraft companies were a wide range of sub system suppliers, many of them subsidiaries of foreign corporations but with increasing

28. W.C. Gelling, "Defence Policy and Canadian Industrial Strategy", Course Paper (Kingston:National Defence College, 1977), pp. 6-7.

29. Ibid., p. 7.

design and development capabilities to support the prime contractors.³⁰

The defence and aircraft industries exhibited a high level of interdependence and were certainly not in any state of dependency vis-a-vis the American defence industrial structure. Indeed, the successful development of the Arrow was a direct threat to the technological and innovative supremacy that the U.S. held in this field. These highly integrated industries provided a technologically dynamic core around which further industrialization and development could coalesce. The defence and aircraft industries were the key to the generation of industrial benefits on a self-sustaining basis. They provided Canada with the core of a highly-integrated industrial structure similar to other highly industrialized states. It was a structure that had just started to outgrow the disabilities of its origins as a producer of import substitutions and of licenced production. For example, the Iroquois engine, being developed by Orenda Engines to power the Arrow, was quite simply the most powerful jet engine built up to that time. The 25,000 pounds of thrust generated by the Iroquois was only equalled by Pratt and Whitney's F100-PW-100 engine on the F15 Eagle in the late 1970s. In retrospect, the cancellation of the Arrow (and the Iroquois) was a devastating blow to Canadian economic development. Approximately 12,000 jobs were lost.

THE DEFENCE PRODUCTION SHARING AGREEMENT (DPSA)

While it may be an exaggeration to see the DPSA solely as a result of the cancellation of the Arrow, there can be no doubt that the cancellation hastened the signing of such an

30. Ibid.

agreement.³¹ The Conservative government, having dealt what was widely seen as a fatal blow to the domestic aircraft industry, wished to limit the political damage. If modern military aircraft were too costly to produce in Canada then it was politically expedient to gain access to the American military market for domestic sub-contractors. Only in this way could the blow to employment be softened and some nominal level of defence manufacturing activity be preserved.

In general, the DPSA allowed Canadian defence industries to sell a wide range of military supplies and services to the United States Armed Forces, free of tariffs and most of the other restrictive legislation which had previously regulated commerce in this sector. Canadian firms now became eligible for R and D grants and gained access to information that was previously classified. The DPSA was not, however, a selfless gesture by the United States (US). In return for guaranteeing a market for Canadian component and engine manufacturers, the United States expected Canada not only to purchase "proprietary" weapons systems from its defence manufacturers but also to agree to defence planning on a continental basis. The US was primarily interested in having Canadian defence industries support, and not compete with, large American firms. While, for example, the American military originally considered purchasing a few of the Arrow aircraft, the American defence industries successfully lobbied against any such move. With the Prime Minister of Canada talking about reducing American imports, it was not hard for the American government to

31. Barney Danson, Press Release, (Ottawa: 29 September 1978), p.5.

side with their own industrial firms. According to Peden, after the U.S. aircraft industry has exerted its influence,

the President would simply be courting embarrassment were he to send to Congress a defence appropriation incorporating 200 or 300 million dollars for the purchase of Canadian aircraft.³²

Following that decision, low procurement activity, restricted funds for R and D, and a frozen military budget all had their affect on the aircraft industry. By the early 1970s, the Canadian aircraft industry - the chief beneficiary of the DPSA - suffered a sharp downturn. According to Middlemiss, this was

a reversal that reflected the shortcomings and problems of the Canadian defence industry as a whole.³³

In contrast to the 1950s, the 1960s represented "a backing away from the policies which had put this impressive defense industrial complex in place".³⁴ The domestic defence industries were reduced to being dependent upon maintenance contracts for obsolete or obsolescent equipment, such as the CF101 Voodoo, in order to survive. The virtual cessation of replacement programs meant that the gap between existing equipment and its potential replacement continued to grow. As a result the defence and aircraft industries gradually fell behind state-of-the-art technologies and became less and less competitive with respect to

32. Murray Peden, Fall of an Arrow, (Stittsville, Ontario: Canada's Wings, 1978), p. 166. The British also refused to purchase the Arrow. However, their refusal is much more understandable given the geo-military position of Britain and the role that the Arrow was designed to carry out.

33. Dan Middlemiss, "Defence Policy and Canadian Industrial Development", Canadian Institute of Strategic Studies. (Toronto: November 1980), p.7.

34. Gelling, op. cit., p. 8.

costs and delivery schedules. Canada had forfeited its ability to develop and maintain an autonomous, technologically up-to-date defence and aircraft industry, an industry capable of designing and producing "proprietary" weapons systems. In the future, Canada would, as the Vietnam war demonstrated, provide the US with additional productive capacity in areas such as ammunition and, as a result, enlarge the defence base of North America, on American terms.

While this reciprocal trade in defence production brought benefits in the form of jobs to Canada, its negative aspects were largely hidden. Declines in American defence spending, for example, moved through the American parent to the Canadian branch plant and often resulted in layoffs in Canada. The branch-plant nature of many Canadian industries, including many defence subcontractors, meant that they were entirely reliant on their American parent for R and D, machine tools, components, expertise, etc.³⁵ While the superficial benefits of such contracts came to Canada, the long-term benefits could easily be patriated. Increasingly, the Canadian defence industry was integrated on a continental basis and purchases of major defence systems, such as the CF101 Voodoo, were made "off-the-shelf" from American suppliers. With limited funds available for both purchase and modification, "off-the-shelf" procurement created few problems for the military. Such was not true of the defence industries. For defence industries "off-the-shelf" procurement results

35. Stephen Clarkson, Canada and the Reagan Challenge, (Ottawa: Canadian Institute for Economic Policy, 1982), p. 260.

in an erosion of the domestic capability to advance with the state-of-the-art and a weakening of the industrial support for new equipment after it enters service.³⁶

Because domestic aerospace industries, for example, could no longer rely on defence contracts they came to rely on commercial contracts such as the Challenger for their long-term survival. Accordingly, the structure, planning, and organization of the major aircraft firms quickly "evolved from being mainly a supplier of military products to an export-oriented producer of commercial civil products".³⁷ Rather than trying to compete "head on" with the well-established producers of civilian aircraft, Canada's industry had, through the 1960s, concentrated increasingly on the development of specialty type aerospace products such as STOL utility aircraft and airborne surveillance drones. By the mid-1970s, the Canadian civilian aerospace and avionics sectors were in a much better position to absorb new technology than most other sectors of Canadian industry. Although foreign ownership remained around 50%, most of the major firms, both Canadian and foreign-owned, were not "truncated". The industry exported over 80% of its production.³⁸ By that time, however, the links between the Canadian military and the Canadian aircraft industry had been severed and the military sub-component and avionics manufacturers were essentially integrated into the American military-industrial complex. Given the low demand by the CF, most Canadian defence industries were now

36. Gelling, op. cit., p. 19.

37. David Godfrey, "A Resurgent Canadian Aerospace Industry", Foreign Investment Review, (Spring 1981), p. 13.

38. Ibid., p. 16.

dependent upon the level of American demand.³⁹ Canadair, once the producer of the F86 Sabre, now concentrated its efforts on water bombers, remote piloted vehicles and executive jets. As noted by Shepherd,

In Canada, the cancellation of the Arrow program in 1959 ended any sustained attempt to link military procurement to the achievement of Canadian industrial strength and excellence. The Defence (Production) Sharing Agreement with the United States promised us production work on the implicit understanding that Canada would never again attempt to develop major systems.⁴⁰

In short, where the technological demands were the highest, Canadian expertise was now the weakest. Although the capability of Canadian defence industries had declined, the technical requirements of the CF had not. Given the demanding performance specifications of the CF, only foreign manufacturers could now seriously consider entering into competition for the production of defence "systems".

Prior to the fall of the Arrow, for example, the Canadian defence and aircraft industries were able to supply 95% of the needs of the Canadian military. While some of the firms were little more than sales outlets for foreign firms, many were the bases for the later development of competitive domestic facilities. At present, Canada is self-sufficient only in the areas of clothing, footwear, small arms and some types of

39. Clarkson, op. cit., p. 260.

40. John T. Shepherd, The Transition to Reality-Directions for Canadian Industrial Strategy, (Ottawa: Canadian Institute for Economic Policy, 1980), pp. 32-33.

ammunition.⁴¹ In terms of production and internal linkages and benefits, therefore, dependency in these industries is marked by an inability to produce whole, technologically up-to-date weapons systems, either on their own or under licence.

The trend towards "off-the-shelf" foreign purchases was also hastened by the serious underfunding experienced by DND. For years, a lack of financial resources made it imperative that DND obtain the best equipment for the lowest cost. In most cases it was no longer practical to place orders with Canadian defence industries because the short production lines inevitably meant higher costs and longer delivery times. To purchase domestic products entailed not only a financial premium but also an element of risk that DND simply could not afford. The DND budget did not provide enough funds for both weapons systems and spares. As a result, the common practice has been for DND to purchase the systems, hoping to "cannibalize" and/or "make do" in some manner until more funds were made available for spares. Under such severe financial constraints, DND could not afford cost premiums or delays. The requirements of the domestic defence industries, however, could not be completely ignored and IB and O programs came to be seen as a means of "compensating" the domestic defence and aircraft industries for this "lost" production; production lost to American (or European) competitors.

EARLY IB AND O PROGRAMS

As originally practiced, government officials faced with large "off-shore" purchases approached American and European firms with

⁴¹. Briefing to Defence Management Committee, 28 March 1985, by proposed DND Defence Industrial Preparedness Task Force, p. 7.

a shopping list of specific sub-components, products and services that could be provided by Canadian firms and a list of technological and other benefits that had to be supplied. This approach, dictated by political necessity, presented major multinational corporations (MNCs) with a list of benefits determined solely by Canadian officials. The firm that was willing to meet all requirements received the contract, given a competitive price.

Out of necessity, this "dirigiste" strategy targeted certain firms as being the key to future national development. Early programs concentrated on creating in Canada a firm that, with help, would be able to establish a niche for itself on the world market, be it independently or as a result of a world product mandate (WPM) from the parent MNC. As a result, Leigh Instruments, Canadian Marconi, Litton, and Garrett Manufacturing all became well established in the avionics sector of the aerospace industry.⁴²

According to one official, the development of that sector was almost entirely as a result of offsets and benefits from the CF104 and CF5 programs in 1960 and 1965 respectively. Other early IB and O programs included Air Canada's purchase of the DC10 in which Douglas agreed to design and build wings in Canada. With the CF104 purchase, Litton agreed to set up a plant to produce the LN3 Navigation system in Canada.⁴³

42. G. McFarlane and H. Horne, 25 January and 22 March 1984, respectively. All interviews carried out in the course of this study took place in the Ottawa offices of the Canadian Forces officers or Government officials being interviewed. For ease of footnoting only the name and date have been included. Complete data are available in the bibliography.

43. Ibid.

There was, however, a price. Considerable government financing was necessary before these new or upgraded domestic firms could successfully compete on the world market and carry out extensive Research and Development (R and D) on their own. As originally practiced, therefore, IB and O programs were an innovative approach to the problem. They focused on the generation of long-term benefits through the creation of innovative products by world class firms doing their own R and D. This government financing implicitly acknowledged that there was a premium for Canadian production and that the premium would be paid to promote world class firms in the avionics industry.

CONCLUSION

Prior to the cancellation of the Arrow and the introduction of DPSA, the post-war defence industries in Canada-particularly the aircraft industry-were an exception to the general pattern of industrial and technological dependence. With the cancellation of the Arrow, the defence industries were quickly re-moulded into the "normal" Canadian pattern. Although the importance of innovation had been known for some time, few appreciated that the growing lack of industrial integration and beneficial "spinoffs" were a direct result of the loss of the Arrow and Orenda as a focus for technological excellence, a loss which resulted in an inability to produce innovative defence products and systems.

Implicit in the model described in chapter two is the clear understanding that if structural change is required it must occur prior to, or at least be coincident with, the regeneration of benefits. It would be illogical to expect increased benefits out of a dependency-created structure. Yet this is precisely what the

Government eventually attempted to do. As chapter four will demonstrate, Aurora failed, at least in part, because the restructuring of the aircraft industry, a prior condition for its full success, did not occur. It is now clear that the overall effect of dependency was to "structure out" many of the industrial benefits that had previously accrued to the domestic economy as a result of defence procurement programs.

DEFINITIONS

OFFICIAL CATEGORIES OF INDUSTRIAL BENEFITS AND OFFSETS

1. Official ITC statistics on Industrial Benefits are broken down in accordance with the main Industrial Benefits sections of the contract and in the List of Ministerial Discretion Awards.

a. Sections 39.11(a) and 39.11(b) refer to the Industrial Benefits Periods; they are,

- 1) 39.11(a) the Basic Benefit Period and
- 2) 39.11(b) the Future Benefit Period.

ITC data referring to benefits claimed against these sections further sub-divides benefits into three categories; aerospace, electronics (and avionics), and other.

b. Section 39.30 refers to the P3C Structural Components Program,

c. Section 39.40 refers to the Best Efforts Program, and

d. The Ministerial Discretion Clause refers to new ventures and undertakings specifically approved by the Minister of ITC.

SUGGESTED CATEGORIES OF INDUSTRIAL BENEFITS AND OFFSETS

2. While the official ITC statistics refer to the terms noted above, various other data from ITC, DND, DSS, and other sources employ other terms which, for their explanatory power, are far more revealing. Accordingly, IB and O programs should be divided into three categories, they are:

a. Program Related Content This category includes those contracts awarded to Canadian firms which supplied goods and services that contributed directly to the manufacture or subsequent support of the LRPA program. The contracts awarded Canadian Aviation Electric, Leigh, Litton, Marconi and

Canadair fall into this category. (Some data refer to this category as Canadian Content.)

- b. Offsets This category refers to those contracts for goods and services which have no direct relationship to the LRPA program. Offset contracts generally entailed little or no market premium and were awarded at the discretion of Lockheed or its suppliers in accordance with market forces.
- c. New Ventures This category includes those benefits which accrued as a result of new business undertakings arranged directly or indirectly by Lockheed and approved under the Ministerial Discretion Clause. Pages 115-116 list all 23 items.

OTHER TERMS

3. Two other terms are included for ease of the reader's understanding, they are:

- a. Co-Production There were two significant instances of co-production in the Aurora program, both went to Canadair. The first was for the "Canadian Content" of the LRPA. The second was for the production of 150 P3C "shipsets". Contractually speaking, the "co-production" of 150 P3C "ship-sets" of structural components was an "offset" arrangement; and
- b. LRPA Program/Aurora Program The terms LRPA Program and Aurora Program are virtually interchangeable. Similarly, Project Management (PM) LRPA and PM Aurora are essentially identical. The difference simply reflects the transition of the project from a point where the type of aircraft to be selected was not yet known to the selection of the P3 LRPA, subsequently named the Aurora. The official Canadian designation for the Aurora is CP-140.

CHAPTER 4

POLICY FAILURE

INTRODUCTION

Given that economic and technological dependency is marked by its links to external sources, the successful (re)generation of economic development should, at least logically, be an internal process. The policy linkage that was made by the government between "benefits" and "restructuring" was critical to the success of the Aurora program because it altered the focus of the question that had to be addressed. The question to be answered was not, as all the data suggest, "How do we use the benefits of an offset program to restructure the aircraft industry?" but, more to the point, "How do we restructure the aircraft industry so that the benefits of offset production can be used to stimulate the internal innovation process?" While addressing the wrong question made success problematic, it was not the sole factor in this policy failure. Several other, more mundane internal obstacles demonstrated the full difficulty of attempting significant internal change within the overall context of dependency. This chapter will demonstrate that attempts to make structural changes will fail and that that failure can be linked to the existence of dependency-created structures.

BACKGROUND

In retrospect, it is not surprising that the government should associate the long-established practice of Industrial Benefit and Offset (IB and O) programs with the need to restructure the aircraft industry. Since 1969, at least, sporadic attempts had been made to forge an overall policy for the

aerospace industry. Both De Havilland and Canadair were, in the government's opinion, not developing in a satisfactory fashion. The parent multi-national corporations (MNC) were not encouraging the firms to become and remain as competitive as possible on a world scale. In 1978, for example, Barney Danson, then Minister of National Defence, recalled that:

in 1974, after Hawker-Siddeley had stated that unless it received massive government aid it would stop work on Canadian-designed STOL aircraft in Canada, we bought De Havilland.¹

Particular concern was also expressed by politicians over the continued viability of the Douglas Aircraft of Canada (DACAN) facility in Toronto. Should this airframe facility, owned by McDonnell-Douglas and employing over 5,000 people, be forced to close, then, as Jean-Pierre Goyer the then Minister of Supply and Services noted in a letter to another colleague, "the economic and political consequences (of a DACAN closure) would be most harmful and it is imperative that we face up to this situation now."² Given the long established practice of "requesting" offsets and of the long-acknowledged need to restructure the industry, it is not surprising that one was seen as complementing the other.³ Accordingly, when the Cabinet gave approval in principle for the procurement of a replacement Long Range Patrol Aircraft (LRPA), it

1. Barnett Danson, Press Release, (Ottawa: 29 September 1978), p. 6.

2. Letter, DND file 11500 LRP 558, 30 October 1973: All memoranda, aides-memoire, etc. used in this research were obtained from Volumes 1 and 2 of DND file 11500 LRP 558. For ease of footnoting each item has been cited in the following order; nature of the item, the DND file number and the date.

3. Ibid.

specifically directed that:

in pursuing negotiations concerning proposals from manufacturers, officials should solicit offsets which would maximize the beneficial effect of the LRPA procurement on the Canadian aerospace industry and which would best compliment Government efforts to rationalize that industry.⁴

Cabinet direction, however, could not overcome various internal obstacles to any significant policy change. Policy conflicts had to be first resolved within the Federal government.

PROBLEMS

Probably the most difficult obstacle to be overcome was that at the federal level there is no one department charged with the responsibility of drawing together science and technology policy on the one hand, and economic policy on the other. While the mandate of the Ministry of State for Economic and Regional Development (MSERD) was to coordinate and reconcile policy differences, the Ministry of State for Science and Technology's (MOSST) remaining function was to assess technological and scientific possibilities and communicate with other departments and agencies. For its part, the Department of Finance, was the government's primary articulator of economic policy and promoted the economically orthodox attitude of non-intervention in the economy. The Department of Industry, Trade and Commerce (ITC), an uneasy amalgam of two formerly separate departments, was too divided between its trade and industrial sides to be effective in bringing together the requisite bureaucratic resources. As Abonyi and Atkinson sum up,

The bureaucratic power relations of the late

4. Task Sheet, DND file 11500 LRP 558, 12 January 1973.

1970s permitted only incremental, pragmatic adjustments to Canada's industrial policy.⁵

The differences between various government departments (on an overall strategy) - were to be reflected in the general lack of consensus that also existed on the issue of restructuring.

Because no consensus existed, the Cabinet's directive led to a series of internal bureaucratic manoeuvres reflecting the main concerns of each department involved in the LRPA purchase. In October 1973, the Department of Supply and Services (DSS), through its Minister Mr. Goyer, argued most eloquently that:

It is imperative that a policy framework be established before any decisions are taken... Unless decisions... are made in the context of an overall strategy, we will lose the opportunity to use these buys to meaningfully restructure the aerospace industry.⁶

Mr. Goyer argued that when viewed from a policy framework the answers would not be the same as those that emerged from a case-by-case study. The clear requirement was for policy to be determined first, with restructuring needs determined as clearly as possible prior to the commencement of negotiations.

ITC, charged with determining and evaluating what benefits were possible, did not agree with Mr. Goyer's contention that a restructuring policy was logically prior to the determination of benefits. Rather, ITC suggested that the original policy memorandum to Cabinet, a memorandum Mr. Goyer refused to sign because it failed "to develop a clear set of policy objectives for

5. Arpad Abonyi and Michael Atkinson, "Technological Innovation and Industrial Policy: Canada in the International Context", The Politics of Canadian Public Policy, (Toronto: University of Toronto Press, 1983), p. 115..

6. Letter, DND file 11500 LRP 558, 30 October 1973. Purchases other than the LRPA were also under consideration.

the aerospace industry",⁷ would indeed satisfy the policy objective of the government as far as restructuring the aerospace industry was concerned. Although the Minister of ITC, Mr. Gillespie, was moderately "nationalist" in orientation, he had few illusions about any overall industrial policy. Rather, he favoured a sectoral approach that relied on consultation and participation by industry. He appears to have seen reflected in Mr. Goyer's concerns the "dirigiste" approach then being developed by the Privy Council Office (PCO) and TB Secretariat.⁸ Those opposing an overall industrial strategy, who were located mainly in the senior levels of ITC, favoured a policy that was largely incrementalist and designed to support "the status quo in terms of both the location of industry and the process of industrial adjustment."⁹ For many in ITC, therefore, a restructuring policy had little to do with the problem of obtaining industrial benefits. The aim was not to create new or alter existing infrastructure(s) but to allow more of a free market approach. An IB and O program was to enable entrepreneurs to gain access to markets that had been previously denied. The economic viability of the aerospace industry was associated with its obtaining contracts, not with its being restructured. ITC dismissed Goyer's concerns as being "more

7. Ibid.

8. Richard D. French, How Ottawa Decides: Planning and Industrial Policy Making, 1968-1980. (Toronto: James Lorimer and Company, 1980), pp. 115-118. French provides an illuminating account of the larger struggle between those favouring an overall industrial strategy and those opposing such an approach. It was within this larger context that the struggle over a restructuring policy was played out.

9. Michael Jenkin, The Challenge of Diversity, (Ottawa: Science Council of Canada, 1983), p. 160.

a matter of procedure than of substance."¹⁰

The Department of National Defence's (DND) position reflected its overwhelming concern over the role, configuration and numbers of aircraft that had to be obtained in order for it to carry out its anti-submarine warfare (ASW) role in the alliance. Years of budget cuts had made DND wary of agreeing to allot capital funds to any purpose other than the purchase of equipment.

Project Management (PM) LRPA, dominated by DND, realized that additional costs would be incurred if, for example, testing, flight testing, and installation of avionics on the last 12 aircraft were done at Canadair instead of Lockheed. PM LRPA maintained that a premium was not a proper charge to the LRPA procurement program and ought not to be accepted as part of Lockheed's proposal. It was most logical, therefore, for DND to also object to any suggestion that any DND funds be used to promote industrial benefits or be used to aid in restructuring. Responding to DND's objections to the premium for testing and flight testing, the Secretary to the Treasury Board (TB) noted:

From your draft memo it appears that DND should not be encouraged; nor expected, to fund a larger program than can be justified by military requirements for the sake of Canadian industrial benefit.¹¹

DND remained convinced that the first priority was to determine the cost of the operational requirements, that is, the cost of a given number of aircraft having a specific internal configuration and fitted for a specific role, prior to considering industrial benefits. This accorded with DND's first priority, that the

10. Letter, DND file 11500 LRP 558, 22 November 1973.

11. Letter, DND file 11500 LRP 558, 9 July 1974.

Canadian forces be suitably equipped for combat. As a result, ITC officials in Project Management LRPA were authorized to negotiate industrial benefits and offsets, but by implication, not to attempt to restructure the industry.

Before the issue of a restructuring policy could be resolved, time constraints made it necessary to address the second part of the Cabinet's directive of July 14 1972. This part of the directive stated that:

The request for proposal should indicate the Government's interest in regional development and in the possibility of creating increased industrial activities outside the heavily industrialized areas of Canada.¹²

By January of 1974, it was necessary to prepare a schedule of recommendations for Cabinet, a schedule "recommending the amount and geographical distribution of the industrial benefits to be negotiated during the contract definition."¹³

The first draft of industrial benefits objectives, prepared by ITC in the Spring of 1974, was a disappointment to TB. The statement of objectives did not discuss the restructuring of the aircraft industry, touched only lightly on the regional distribution of benefits, made no reference to the trade implications of offset programs, nor did it include an assessment of the implications of purchasing equipment "off-the-shelf." TB noted that the document was not only quite general but also that ITC should have been able to provide "more comprehensive, quantitative and strategically oriented document(s)."¹⁴ Even so,

12. Letter, DND file 11500 LRP 558, 15 January 1973.

13. Letter, DND file 11500 LRP 558, 25 January 1974.

14. Letter, DND file 11500 LRP 558, 9 July 1974.

TB's direction to ITC confirmed DND's general approach. In TB's view, a new estimate of industrial benefit objectives, including restructuring, was not needed until the basic issues of operational requirements and funding were satisfactorily resolved.

Given the urgency of the Cabinet's request and DND's strong inclination not to involve itself in industrial benefits for fear of their cost, it was not possible for PM LRPA to have sufficient information available within the required time limits. Even so, on 17 April L.H. Stopforth, the Deputy PM LRPA, noted to E.A. Booth, the Assistant Deputy Minister (ADM) of ITC for Science and Engineering, that:

it was essential that The Project Office have agreed objectives for restructuring early in Phase 2 so that we can direct our activities accordingly.¹⁵

By late April, however, PM LRPA acknowledged to Mr. B.C. Barrow, the Senior, Assistant Deputy Minister of ITC, that, while a precise evaluation of benefits to be negotiated could not be made until the aircraft configuration was determined,

both Lockheed and Boeing have studied the problem in enough depth to permit them to provide at this time realistic estimates of the levels of Canadian Industrial Benefits that they will be able to offer.¹⁶

At least by implication, restructuring now appears to have been considered as a benefit that would be determined, at least in part, by PM LRPA's requirement to obtain the best possible IB and O package from the prime contractors. The focus of restructuring, however, was still not entirely on an external solution.

15. Memorandum, DND file 11500 LRP 558, 17 April 1974.

16. Memorandum, DND file 11500 LRP 558, 22 April 1974.

In early 1975, immediately prior to the Cabinet's consideration of the restructuring issue, letters were received from a group of Canadian aerospace industries urging the Cabinet to drop the major LRPA proposals in favour of refurbishing the Argus. Canadair, leading the Canadian consortium, proposed that the government refit 16 Argus for ASW, purchase eight De Havilland Dash 7s and four Boeing 707s for coastal and Arctic surveillance. Litton and other Canadian avionics firms would refit the Argus "shell" with Canadian avionics and electronic systems and, as a result, create more high-tech jobs in Canada.¹⁷ This proposal, "Project Phoenix", was eventually rejected because it would have produced a hybrid aircraft combining an obsolescent airframe with new engines and avionics. In any case, it was not a proposal to restructure the industry, but simply to produce the LRPA in Canada.

The result of the "Phoenix" proposal, however, was to prompt the Cabinet to expand the variety of LRPA-linked restructuring proposals that would be considered. Every possible opportunity to increase support for the aircraft industry was to be examined. The restructuring discussion now centred around increased participation by the various MNCs. Eventually, both prime contractors, and others, were encouraged by the Government to submit proposals for the restructuring of virtually all of the Canadian aerospace industry as part of their industrial benefit offers. An aide-memoire dated 6 August 1975, proposed that,

The US based company will be requested to

17. K.R. Pennie, Light on Aurora: An Analysis of a Canadian Weapons Procurement Decision. An unpublished M.A. Research Essay, (Ottawa: Carleton University, 1981), pp. 27-28.

respond to a proposal which offers majority ownership of DHC, Canadair and DACAN in exchange for

- (1) Minority ownership of shares in US based company
- (2) A number of Canadian directors on the US firm's board with unrestricted access to corporate information and commensurate involvement with corporate decision making.
- (3) A contractual commitment to place a stated percentage of the US based firm's annual workload in Canada with full disclosure of actual performance.
- (4) US government (SEC etc.) approval of the share exchange proposal is to be obtained by the US firm submitting the proposal.¹⁸

Both Lockheed and Boeing had each submitted more than one proposal. Lockheed, for example, had proposals for 18 or 23 LRPA, and for 23 P3C Orions. Boeing had submitted a proposal for the use of its 707 as an ASW aircraft.¹⁹ Ultimately, a total of five LRPA-linked proposals plus a surprising proposal from McDonnell-Douglas had to be evaluated by the Airframe Restructuring Committee of ITC. This latter proposal centred around the purchase of the F15 Eagle aircraft as Canada's New Fighter Aircraft (NFA) and offered to merge all of the important airframe facilities as part of a 1.5 billion dollar deal. Because McDonnell-Douglas operated the important DACAN facility, this proposal had to be considered. By linking its impressive restructuring proposal to the purchase of the NFA, however, McDonnell-Douglas had linked the purchase of the NFA to the LRPA

18. Proposal, DND file 11500 LRP 558, 6 August 1975. DHC refers to De Havilland Canada.

19. Memorandum, DND file 11500 LRP 558, June 1975 (no specific date).

and to the industry's restructuring.²⁰ The Cabinet now not only had to evaluate the restructuring proposals themselves but also to consider the possibility of making a simultaneous purchase of the NFA and LRPA.

THE PROPOSALS

Without discussing in detail each of the two original proposals made by Boeing and Lockheed, it is sufficient to note that once the industrial packages had been assessed by ITC it was concluded that they did

not offer substantial benefits to Canadian industry in relation to the acquisition costs of the aircraft nor do they contribute in any meaningful way to the achievement of the objectives for restructuring established by Cabinet...clearly this program is not capable by itself of providing a solution to the restructuring problem.²¹

As far as can be determined, Boeing did not significantly increase its offer to aid in the restructuring of the Canadian aircraft industry, Lockheed did.

By November 1975, Lockheed, in order to make its bid even more competitive, agreed to commitments over and above those outlined in the original proposal. The original proposal was simply an offer to purchase a five million dollar equity position in a restructured industry and to provide management support to Canadair. The offer of additional support, however, included marketing, financial, and technical assistance to Canadair for the CL-215 Airborne Tanker and to De Havilland for the DHC-7 Commercial Short Takeoff and Landing aircraft (STOL) and the DHC-7

20. Letter, DND file 11500 LRP 558, 11 July 1975.

21. Memorandum, DND file 11500 LRP 558, June 1975, p.8. (no specific date).

Reconnaissance aircraft. Training, logistical and facilities support would also be given to De Havilland in the licencing, production and support of its aircraft.²²

The McDonnell-Douglas offer included some very attractive restructuring proposals; proposals which might have provided significant benefits to Canadian industry. Specifically, McDonnell-Douglas offered to purchase 75% of the cost of the F15 Eagle, its NFA competitor, in Canadian industry. This would have created approximately 2500 new jobs, of which 1700 would have been in the airframe industry. They also offered to re-establish a large proportion of its (and North America's) "5 axis" gantry machining capacity in Canada.²³ As attractive as it was, it was impossible for the Cabinet to assess the McDonnell-Douglas proposal fairly. Not only were the operational specifications for the NFA not yet available, and hence the need for any Canadian modifications not yet determined, but the actual number of aircraft could not yet be decided upon. Lacking a policy framework, the Cabinet could not cut the "Gordian knot" that bound the LRPA, NFA and a restructured aerospace industry. Neither Boeing's first nor Lockheed's second restructuring proposal was acceptable, yet funds would not allow the simultaneous purchase of both the LRPA and NFA. Failure to give the restructuring agreement to McDonnell-Douglas would jeopardize the DACAN operation. Even if funds had been available, giving the restructuring proposal to McDonnell-Douglas severely restricted any future options regarding the NFA. Its cost would probably be

22. Letter, DND file 11500 LRP 558, 24 June 1976.

23. Letter, DND file 11500 LRP 558, 16 July 1975.

higher than if it were to result from some future LRPA-like competition. No matter how the problem was viewed, the political risk was considerable.

In short, from the perspective of jobs and actual structural change the best restructuring proposal, that of McDonnell-Douglas, restricted future NFA options and made the simultaneous consideration and purchase of the NFA and the LRPA a possibility. This was financially impossible. The second best restructuring offer, that of Lockheed, could not be accepted because by so doing it would jeopardize jobs at DACAN.²⁴

By mid-1976, the policy thrust to restructure the aircraft industry came to a halt. The search for an external solution had been overtaken by events; the search for an internal one had hardly been considered. No overall consensus could be achieved as to how to simultaneously restructure the aircraft industry, purchase the LRPA and/or NFA and to provide for jobs. The only consensus was to preserve jobs.

CONCLUSION

Failure to carry out any restructuring had ramifications that went far beyond the simple fact of failure. It created a policy vacuum. As will be discussed, more reliance than ever was placed on IB and O programs as an approach to industrial development, particularly in the aircraft sector of the defence industries. What had begun in the early 1960s as an ad hoc approach, on the assumption that a policy would be developed, now became an unofficial policy. As far as can be determined, the efficacy of IB

24. Letter, DND file 11500 LRP 558, 11 July 1975. Lockheed won the competition nonetheless.

and O programs has yet to be questioned and despite their problems and negative consequences they remain a central feature in the industrial development strategy of the government of Canada.

While, in retrospect, it is difficult to say just what type of internal restructuring proposal might have worked, it is known that none was seriously considered. The gradual evolution of a policy linkage between the two policy thrusts diverted attention from any internally-oriented solution to restructuring. As a result, attention became focussed on the politically-desirable, externally-generated benefits that were perceived to be available as a result of an external solution to restructuring. Politicians and bureaucrats assumed that external contractual arrangements could be used to generate benefits without prior internal changes. When the policy thrust to restructure the aircraft industry failed, the effect was to leave the benefits program isolated and essentially meaningless. There was to be no change to the structure(s) created as a result of dependency, either prior to or coincident with the benefits program.

While the structures left by dependency clearly complicated the issue, they were not the prime factor. In terms of hypothesis one, that is, that "attempts to make structural changes will fail due to a lack of internal political consensus", it can be seen that a political concern for employment was critical in determining the outcome. Previous dependency was a contributing factor to the failure.

CHAPTER 5

NEGATIVE CONSEQUENCES OF THE AURORA PROGRAM

INTRODUCTION

Although "requests" for offsets originated in the early 1960s, the Aurora program of 1976 represented a quantum leap in the absolute amount of offsets sought in the course of any military procurement program. As such, it represented a break with some of the international understandings that had marked world trade up to that time. However marginal their effect in terms of internal development, offsets represent an attempt to alter a state of dependency by extracting more benefits from the core than has normally been the case. Not surprisingly, therefore, certain problems and contradictions emerged as both core and periphery reacted to this politically-generated demand for change. This chapter will demonstrate that, consistent with dependency theory, several unanticipated, negative consequences will result when attempts are made to extract additional benefits.

AIMS OF THE AURORA PROGRAM

The hopes for the Aurora Industrial Benefits and Offset (IB and O) program were praiseworthy. Early in 1974, the Department of Industry Trade and Commerce (ITC) and the Department of Regional Economic Expansion (DREE) submitted to Cabinet the specific Industrial Benefits Objectives to be negotiated during Phase II of the Longe Range Patrol Aircraft (LRPA) Program. Briefly stated, they were :

- a. to stabilize employment in the aerospace industry;
- b. to assist in the restructuring of the aerospace industry;
- c. to assist in maintaining Canadian competence in high

technology sectors of the aerospace industry;

- d. to provide support for Canadian investors in achieving greater Canadian ownership and control of the industry;
- e. to provide for the allocation of benefits on as wide a regional basis as possible; and
- f. to obtain major long-term commitments providing lasting benefits without adding to the cost of the LRPA.¹

As laudable as the aims were, they were not in themselves sufficient to enable administrators to judge highly complicated and technical proposals. Accordingly, various "profiles," that is sets of criteria, were needed whereby industrial benefit and offset proposals could be more accurately judged. A great deal of effort went into their determination. The general evaluation criteria, quite similar to the aims of the program, were to encourage:

- a. Employment: An assessment will be made of the number of jobs created and the distribution of jobs among professional, skilled, semi-skilled and unskilled workers;
- b. Canadian Sales: The export and domestic sales potential, both short and long-term, arising from the activity;
- c. Long-Term Stability of the Activity: Preference will be given to activities likely to provide continuing benefits beyond the duration of the LRPA Project;
- d. New Industry and Technology: Preference will be given to activities that introduce new industry or significant new technology compatible with the capabilities of Canadian industry and world market opportunities;
- e. Regional Work Distribution: The level of sub-contracts and other offsets placed in regions designated by the Department of Regional Economic Expansion;

1. Memorandum, DND file 11500 LRP 558, 20 June 1974.

- f. Work Distribution: The balanced nature of the work, that is, the contribution made to the various industrial sectors; and
- g. Government Support: The level and type of Canadian Government support, direct and indirect, required to initiate the activity and make it viable over the long-term.²

THE PROBLEMS AND CONTRADICTIONS

An examination of the provisions of the industrial benefits sections of the contract indicates that neither the aims nor the profiles were successfully translated into contractual obligations. As will be seen, the contract was of a most general nature and simply assured that a maximum dollar value of offsetting goods and services would be purchased in Canada. As the Defence Procurement Review of 1982 noted,

The guidance available to contract bidders (and for that matter to contract negotiators) as to the kind of benefits desired is too broad and does not focus on precise goals.³

Unable to translate their various aims and criteria into contractual obligations, the administration of the Aurora program gradually took on aspects of a bookkeeping exercise. Each claim, however small, was processed by Project Management (PM) Aurora with the offset work audited and analyzed for "Canadian content". ITC administrators in PM Aurora kept track of the agreed upon offsets and benefits and, considering both the total value of the claim and its perceived quality, assessed how much of the various claims qualified as an offset. The original rationale of offset programs - to rebuild an integrated, national aerospace and

- 2. Memorandum, DND file 11500 LRP 558, 17 April 1974.
- 3. Canada. Defence Procurement Review. (Ottawa: Privy Council Office, 1982). p. 22.

avionics sector, was lost in a maze of graphs, reports, etc. As one former official commented sadly, "The program ended up as a clerical operation. It simply kept track of figures."⁴ A disproportionately high level of resources had to be expended just to ensure that the various contractors fulfilled their obligations.

Other failures were far more serious, however. Because each department, for example, formulated its own approach to the problem, there was little administrative consistency, either over time or between the various IB and O programs. Air Canada, for example, made offset arrangements that were not contractual. It was "not equipped with the necessary staff to monitor and enforce a contractual offset arrangement."⁵ The basis for the practice of "requesting" offsets seems to be a Treasury Board (TB) guideline that requires each department to maximize socio-economic benefits when negotiating "off-shore" purchases. As a result, negotiations are based on policy directives separately arrived at by each government department. Not surprisingly, they reflected the economic situation at the time that negotiations took place and the interpretation of the specific department that was in charge of negotiations. The requirement for offsets created confusion and misunderstanding for both the aerospace industry and for Canada's trading partners, particularly the United States.⁶ Other countries were never quite sure as to what was wanted or what was eligible as an offset. For example, while

4. Interview with Mr. Harold Horne, 22 March 1984.

5. Discussion Paper, DND file 11500 LRP 558, 15 November 1978.

6. Ibid.

PM LRPA was in the process of agreeing to a contract committing Lockheed to use its "best efforts" to place contracts in Canada for commercial and/or cargo aircraft (section 39.40 refers to this item in full), it was also resisting De Havilland's efforts to have the purchase of its Buffalo aircraft considered by the U.S. Marines as an LRPA offset. One official noted,

it is our opinion that De Havilland's marketing initiative could be misinterpreted as a change in our policy⁷

The official further noted that De Havilland's initiative was not "endorsed" by the Canadian government. Given De Havilland's size and importance it seems odd that they would not understand the policy of the government in this area.

According to the LRPA contract between the Government of Canada and Lockheed, a given volume of industrial benefits and offsets - set out over a time schedule - had to be purchased from Canada. For its part, Lockheed could select any Canadian contractor that it pleased, so long as the "required" and "best efforts" schedules of the contract were met. Data related to the distribution of contracts across Canada reveal how no additional costs were anticipated so long as Canadian firms were selected on the basis of price and capability.⁸ While this was generally true for offsets in other areas, it simply did not apply to aircraft co-production in Canada. According to one ITC official,

there is no doubt that co-production will involve a premium, since even under the

7. Memorandum, DND file 11500 LRP 558, 7 August 1974.

8. Aide Memoire, DND file 11500 LRP 558, 27 April 1976.

best of conditions, Canadair could not compete on a cost basis with the learning curve already established on the P3C production line by Lockheed and its present subcontractor.⁹

Without some premium it would be impossible for a company, even one like Canadair, to compete on cost basis with a multi-national corporation (MNC) like Lockheed. If costs were the same, there would be no need to make an "offshore" purchase in the first place. The cost for the P3C Structures Offset Program would have been \$130 million if the work had been done in the United States.¹⁰ Canadian co-production would cost \$168 million. Yet, in much of the data examined, various DND officials insisted that no premium was required for Canadian co-production. The only reasonable explanation is that the cost had already been included in the overall contract price and that a "built-in" premium enabled Lockheed to pay the Canadian firm more than it would have had production taken place in the United States.

As opposed to earlier IB and O programs, where the premium was "up front" and was used to aid Canadian firms to become more competitive, this "no risk" policy simply meant that the premium served only to ensure that production jobs took place in Canada.¹¹ It did not go toward the development of world class firms.

Indeed, in order to keep the LRPA project "on track" and avoid any cost overruns that could give rise to political embarrassment, great attention was paid by PM Aurora to program

9. Letter, DND file 11500 LRP 558, 17 June 1974.

10. Letter, DND file 11500 LRP 558, 13 February 1975.

11. The P3C structural work was, contractually speaking, part of the "offset" section and not an example of "co-production".

and management procedures, particularly to keeping technical and financial risks to a minimum. The technical risk, essentially the risk involved in integrating "off-the-shelf" P3C airframes and engines with yet-to-be-developed avionics and computer systems, was considered to be low. Under the contract, Lockheed was responsible for the total system. The financial risk was minimized by various provisions that held back payment and/or assessed damages for non-performance of the contract. The Basic Benefits Program, extending from July 1976, to December 1981, had a maximum penalty of 10% of the contract price while the Future Benefits Program, extending from January 1982, to December 1983, had a 5% penalty. According to Gelling, "Methods of reducing risk were assiduously pursued and assessments of all aspects of risk became a critical factor in the evaluation of contract proposals."¹²

In summary, the program reflected a "no risk", "no premium" but "maximum benefits" approach. To expect maximum benefits at little or no risk is, almost by definition, contradictory. In the capitalist system benefits tend to flow to those who take the risks. They do not flow to those who reject them.

Much more important, however, offsets are inherently counter-productive. Once Canada's trading partners perceived that offsets were part of Canada's overall strategy, they also demanded offsets when making purchases in Canada.¹³ Bombardier's current sale of

12. W.C. Gelling, "Defence Policy and Canadian Industrial Strategy", Course Paper, (Kingston: National Defence College, 1979), p. 13.

13. Interview with Mr. Archie Campbell, 24 May 1984.

military equipment to Belgium is a case in point. Bombardier, a Quebec-based company, acquired the rights to produce Volkswagen's "ILTIS" jeeps in Canada. It was hoped that by being a licensee for this product, Bombardier could generate a certain level of export sales. When Bombardier contracted with the Government of Belgium to provide jeeps for its armed forces, however, Belgium negotiated offset arrangements that transferred the final assembly of the jeeps to Belgium. This work could easily have been done in Canada. Although the offset arrangements were far more complicated than noted, they were instrumental in exporting this production and its associated jobs. Bombardier, supported by the Canadian government, also guaranteed that offset spending in Belgium will be equal to three times the value of the purchase.¹⁴ While this example was in the area of standard technology, the effects of offsets are even more dramatic in highly - sophisticated, highly - specialized capital intensive companies. In such cases, a "high tech" firm can either find a partner to make the offset purchase, go through a trading house for an offset, or, as United Technology did recently, simply walk away from a contract because the costs of offsets were too great.¹⁵ However one judges offsets, there is little doubt that they add to the costs of trade, do not necessarily insure that the buyer gets the best product and that they export jobs.

In summary, the overall lack of integration and sophistication of Canadian industry plus the medium size of most

14. Christopher Waddell, "Being 1st Iltis buyer costly for Ottawa", (Globe and Mail, 14 February 1985), B1: 1-4.

15. Interview with Mr. Archie Campbell, 24 May 1984.

companies means that few firms are in a position to make the offsetting purchases and hence do not even bid on such contracts. More critically, however, the long-term effect of IB and O programs is to reduce trade to a simple one-for-one-basis. Rather than the simple sale of aircraft and equipment for cash, offset arrangements now require that Canadian firms set up companies in the host country and/or purchase local products, such as wine, in return. Although a one-to-one sale-to-offset ratio is now the norm, some offsets, such as the Belgium-Bombardier contract have exceeded the sale price by some 300%.¹⁶

As a result of these demands-and they are now very common-any export in a sector like aerospace and avionics creates an import in either the same or another sector. In a sector like aerospace, where over 80% of the output is now exported, the eventual result would be an overall balance of trade. This would have a negative impact on both the aerospace industry and on Canada's overall balance of payments. The irony, of course, is that Canada, having pioneered this form of "industrial strategy," is now not always in a position to benefit from its use. As a result, offsets are often placed in most inappropriate sectors. The Aurora contract, for example, had an offset related to Banff Ski-Trips, a sector entirely unrelated to the program as a whole.¹⁷ As at least two officials stated bluntly, "Offsets are a two-edged sword."¹⁸

16. Waddell, op. cit., B1:1-4.

17. Computer printout, DND file 1150 LRP 558, 28 March 1984.

18. Interviews with Mr. R. Hilyer and Mr. Harold Horne. 2 March and 22 March 1984, respectively.

In some respects, however, the Aurora IB and O program created unique problems. From the perspective of continental defence, the Defence Production Sharing Agreement (DPSA) was already an "offset" program; a program designed to ensure that defence expenditures between Canada and the United States do not greatly favour one nation over the other. That Canada has been successful in overlaying DPSA with another offset program indicates a certain cunning not normally associated with Canada's dependent position vis-a-vis the United States in defence matters.

In accordance with the 1963 memorandum of understanding, the DPSA account was to be kept generally balanced. By 1971, mainly as a result of the Vietnam war, it was approximately one-half billion dollars in Canada's favour. The purchase of an American LRPA would, in the opinion of American officials, resolve this problem in a most satisfactory manner. The purchase would more than balance the American deficit on the account. Some American officials implied that if the imbalance were not addressed, the US might cancel the DPSA.¹⁹ This reflected the larger American concern over their critical balance of payments problems. Military offsets, of course, created no problem because they are also added to or subtracted from the DPSA account. It was the civilian-oriented aerospace offsets in Aurora, such as those noted in section 39.40, that were in dispute. The American concern over DPSA reflected their frustration at Canada's not-so-subtle use of a military treaty to evade the General Agreement on Tariff and

19. Letter, DND file 11500 LRP 558, 24 July 1974.

Trade (GATT) prohibition on offsets in commercial aviation.²⁰ To include such items was clearly contradictory to the concept of DPSA. In the end, the Americans seemed willing to ignore the implications for GATT so long as the impending LRPA purchase was made in the United States. It would help to balance the DPSA account and hence help their overall balance of payments problems.

Rather ironically, the Canadian requirement for IB and O programs also reflected a concern over the balance of payments. The government did not want to place a billion dollar order off-shore lest it add to its own balance of payments problem. Canada, as one of the world's largest purchasers and users of aircraft, imports both military and commercial aircraft in large numbers. The government, through the Department of National Defence (DND) and Air Canada, is the largest single importer. In 1977, for example, Canada imported \$26,005 million in end products and exported only \$14,903 million. To Canada, it seemed reasonable to use the leverage available in military purchases to address the overall deficit in manufactured products.²¹ For Canada, offsets in civilian-oriented areas were needed because even a rough balance in the DPSA account would not compensate for the overall deficit that Canada had in all aerospace purchases, not to mention manufactured products as a whole. As one report noted:

²⁰. Since the Aurora purchase, the situation has changed somewhat. According to a presentation by Mrs. S. Ostry to the Aerospace Industries Association of Canada in Ottawa, 16 April 1984, "Since 1980, tariffs and quotas have been eliminated by most industrialized countries on civil aircraft and parts..... under the GATT Agreement on Trade in Civil Aircraft."

²¹. Discussion Paper, DND file 11500 LRP 558, 15 November 1978.

Agreements such as the DPSA .... do not fully recognize the overall deficit that exists. They do not take into account the large imbalance in high technology aircraft purchases or the dilution of the impact of Canada's offset arrangements for aerospace purchases if offsets are credited to other industries or products and services.²²

The possibility of American retaliation was studied by DND and it was decided that because the LRPA purchase would tip the balance of the DPSA account in favour of the United States and because much of the offset work was of a commercial nature and would not count under DPSA, it was unlikely that the United States would be upset.²³ By playing down the importance of the civilian aerospace aspects of the Aurora Program, Canadian negotiators obtained DPSA military credit (or more accurately reduced a credit balance already received) plus civilian aerospace offsets from Lockheed, contrary to GATT. Not surprisingly, American officials saw such civilian offset arrangements with U.S. firms as a non-tariff barrier (NTB). As a recent study notes:

Canada's persistent pursuit of substantial offsets in Canadian-U.S. defense trade, often facilitated by competition between two or more potential U.S. suppliers, has had a decidedly negative impact on U.S. attitudes toward defense trade with Canada.²⁴

CONCLUSION

The Aurora program generated problems and contradictions which detracted considerably from those benefits that were

22. Ibid.

23. Briefing Note, DND file 11500 LRP 558, 25 October 1973.

24. "The View from the South: A U.S. Perspective on Key Bilateral Issues Affecting U.S.-Canadian Relations", Significant Issues Series. (Vol. VII, No. 4), p. 44.

achieved. While some of the problems were surely not too serious, the most damning criticism relates to its negative impact on trade as a whole. In particular, for little or no long-term benefit these programs put at risk whatever benefits did result from DPSA and Canadian-U.S. defence trade. As has been seen, IB and O programs also inhibit technological development and tend to restrict trade in one of the most dynamic sectors of the economy.

Viewed from the perspective of hypothesis two, that is, that "attempts to extract additional benefits will result in unanticipated negative consequences", the negative aspects of the Aurora program exhibit one marked characteristic. Almost without exception, the problems and consequences were internally-generated; only one external link, DPSA, was found to be relevant. It is difficult to attribute these problems to any lack of internal institutional linkages or structures. While their negative effects would undoubtedly have been reduced by proper planning, it is doubtful whether any program could progress without creating some internally-generated negative "side effects". Indeed, some of these problems are typical of those generated by any bureaucracy. Rather, it is not that institutional structures were not in place, but that there was no consensus as to how or even if they would be used to effect change. In this sense then, while these problems are also indicative of a lack of internal cohesion, they seem to relate more to the attitudes that animate the political and bureaucratic process than to any direct external link to internal structures. In any case, the overall effect was much the same. The problems were greater and the benefits fewer than needed be the case.

CHAPTER 6

REDISTRIBUTION AND EMPLOYMENT

INTRODUCTION

On July 14 1972, the Cabinet gave approval in principle to procurement of an LRPA to replace the Argus. It directed in part, that:

The request for proposal should indicate the Government's interest in regional development and in the possibility of creating increased industrial activities outside the heavily industrialized areas of Canada. ¹

The expressed desire of Cabinet for a stronger, more competitive aerospace industry, as implied in the first part of its directive, does not appear, even intuitively, to be compatible with the second part - to create increased industrial activity outside the core industrial areas.

REDISTRIBUTION

Given the degree of political emphasis placed by the Cabinet on the need to diversify the industrial base of the non-core regions of the country, however, it might have been expected that the benefits, as a whole, would indeed have been spread relatively evenly across the country. Such was not the case. The aerospace and electronics industry, heavily concentrated in the Toronto-Montreal core, was guaranteed 66% of contracts in the Basic Benefit Period - contracts totalling \$213.2 million up to December 31 1981. During the period from 1 February 1975, to 30 June 1983, the aerospace and electronics sectors received orders totalling \$425.8 million or 75.7% of all non-structural benefits claimed. Of that total, \$321.5 million or 74.3%, was granted as

1. Task Sheet, DND file 11500 LRP 558, 12 January 1973.

an offset. Table 6-1 on page 92 gives the distribution by industry/sector.²

It was in the distribution of the P3C structural work where political intervention did succeed in transferring some part of the work to other regions. Lockheed had been selected as the prime contractor and had, in turn, selected Canadair (and to a lesser degree Bristol of Winnipeg) to produce the majority of the structural work. At this point, others in the aerospace industry and provincial and municipal governments all made strong representations to ITC to obtain a share of the work. As a result, ITC requested that Lockheed seek bids from Fleet Manufacturing in Fort Erie, North-West Industries in Edmonton, En Heat in Amherst, and International Marine Products (IMP) in Dartmouth. Even so, the resulting distribution of structural work still favoured the core industrial area. During the period 1 February 1975, to 30 June 1983, Ontario and Quebec accounted for \$112.6 million of \$143 million in structural work. The remaining \$30.4 million was distributed relatively evenly between Manitoba and Nova Scotia. In percentage terms, the two central provinces accounted for 85.8% of all industrial benefits granted in this period. Table 6-2 on page 92 gives the distribution by province.

Most of the provinces and regions did not have an industrial base that was able to take advantage of either aspect of the benefit program. Indeed, even the smaller Canadian firms in both the aerospace and avionics sectors were limited in their ability to exploit the program. As noted by ITC, the requirements for

2. These data are copied directly from Chart A to CP140 Industrial Benefits Year 8, Mid-Year Report, results to 30 June 1983. Prepared by Aerospace Industries Directorate of ITC.

planning, documentation, quality control and the costs due to geography alone, made it difficult for these firms to compete. Many were too small to deal with large MNCs such as Lockheed.³

The perception of the Canadian aircraft industry at that time was somewhat different. For them, industrial benefits and offsets should have been used exclusively to compensate the industry for "lost" production, that is, all IB and O programs should have been directed solely towards the aerospace, avionics, and airframe sectors of the economy. Such was not the case. While each section of the contract had a total dollar value, there were large amounts which were left "unspecified", that is, they were not program-related and could be fulfilled by simple offset contracts in any sector or industry. More specifically, while the program-related items, in the Basic Benefits Program totalled \$206.5 million, \$130.85 million was left unspecified. In the area of Future Benefits, \$160 million of \$210 million was unspecified and all of the \$350 million of Additional Benefits was unspecified. Of the \$927.5 million total, therefore, fully \$670.85 million or some 72%, was unspecified.⁴ The one provision related to aerospace and electronics (and avionics) simply stated that 66% of the Basic Benefits Period totalling \$213.2 million would go to that sector.

The contractors had been told that both "content" and "offsets" should be in line with the policy for restructuring the aerospace industry. There being no policy and because the contract made no distinction between "content" and "offset", it was feared that contractors would direct both their (Canadian) content and

3. CP140 Industrial Benefits Progress Report, July 1982, p.8.

4. Memorandum, DND file 11500 LRP 558, 14 November 1975.

offsets away from the aerospace/airframe field.⁵ Such was not an illogical approach, given the premium that was associated with aircraft production in Canada. No premium was attached to offsets in other sectors of the economy. As Mr. D. B. Munday, President of the Air Industries Association of Canada (AIAC) noted,

In summary, we are concerned that the LRPA program, which represents the single largest procurement ever made by the government in the aerospace field will do little if anything to strengthen our industry.⁶

As of January 1985, little had changed. Mr. Bishop, vice-president of AIAC, expressed much the same fear as had been previously noted by Mr. Munday.

Offset agreements lead to a situation where there is an absolute minimum involvement by Canadian industry in the procured product and consequently, very little technology transferred.⁷

For politicians, the Aurora IB and O program served as a means of disguising the fact that over \$1 billion had to be spent abroad. It was politically more beneficial to talk of technology, jobs etc., than to talk of defence needs. As might be expected, distortions occurred. Politicians were quick to imply to the public that the mere purchase of a modern aircraft was tantamount to a transfer of technology, a transfer which would significantly increase the technological base of Canadian industry. For example, as late as 1978 the Honourable Barnett Danson, Minister of national Defence, was quoted as saying,

5. Letter, DND file 1500 LRP 558, 23 May 1974.

6. Ibid.

7. Canada, The Senate, Canada's Territorial Air Defence. Report of the special Committee of the Senate on National Defence. (Ottawa: Minister of Supply and Services, 1985), p. 46.

Take, for example, our contract with Lockheed for patrol planes. Lockheed is obligated to spend 400 million dollars in Canada, two-thirds of it in high technology areas.⁸

While the first part of the statement is, of course, true, the second is quite misleading in at least two respects. First, there is the general equating of the Aurora program with high technology work. As will be seen in chapter seven, this is not justified by the facts. Second, given that a great deal of the contract was "unspecified", that is, unrelated to the LRPA aircraft or to the aircraft and avionics sector, most of the 400 million could be spent on offsets in areas wholly determined by Lockheed or its suppliers.

While not critical during the first part of a competition, the politically generated stress to create employment carries with it another danger. Near the end of an LRPA-like competition it is possible that, if the purchase prices are close, the industrial benefits could be critical as to who wins the contract and hence what type of equipment is supplied. AS C.D. Arthur, the General Director of the Transport Industries Branch noted, in another context,

we must come to grips with the real problem, industrial benefits may well play a crucial part in the determination of the successful prime contractor...⁹

As noted, this did not occur with the Aurora LRPA and the Canadian Forces (CF) choice of aircraft won the competition.

Far and away the greatest concern of politicians was the

8. Barnett Danson, "Defence Spending: How to get the Most from a Burden", Press Release: (Winnipeg: 5 October 1978), p. 10.

9. Memorandum, DND file 11500 LRP 558, 31 October 1974.

effect that the LRPA purchase (and restructuring) would have on employment. There were three areas of concern, the P3C structural work, the effect that restructuring would have on employment, and in offsets in general. However misplaced in the larger sense, politicians did attempt to be as "fair" as possible in the redistribution of the P3C structural work across the country. All wanted, for obvious political reasons, to be seen to support employment in their areas of the country. As one cabinet minister noted in a memorandum to Mr. Goyer, the Minister of Supply and Services at that time:

As you are aware, (other) companies such as Fleet, Enheat and IMP and the communities they represent are depending to a large extent on LRPA work to survive.¹⁰

While it was reasonable to assume that employment in the aircraft industry would increase considerably as a result of the LRPA offset program, plans to restructure the industry posed a high political risk. They threatened some of the jobs that were already in place. As one Deputy Minister noted,

I also realize that a prime consideration regarding the restructuring is the presence of DACAN, and what would happen with that firm should Boeing undertake the restructuring.¹¹

In terms of employment, Douglas Aircraft of Canada (DACAN) was the largest single airframe facility in Canada. That the politicians did intrude into the dispersion of other offsets (as opposed to structural work) is known, but cannot be directly documented. Of the several senior bureaucrats and officials interviewed in the

10. Letter, DND file 11500 LRP 558, 8 June 1976.

11. Letter, DND file 11500 LRP 558, 11 July 1975.

course of this study, almost all were critical of the increased political intervention that commenced with the Aurora program. While they would not give details, some were scathing in their private comments. Most were critical to some degree. Their main criticism was that because direct political intervention distorted market forces but was not part of any overall strategy or approach to the problem, the result was the worst of both worlds. One official stated that as a result of their intervention, politicians had "taken something that was a proper intervention into trade and distorted it."¹² Another commented wryly that the politicians were now determined to use offset programs to exact "their pound of flesh."¹³ All in all, IB and O programs are politically attractive because, by providing employment, they make the government, its ministers and members, appear benevolent.

In summary, in the absence of an overall strategy, IB and O programs shifted away from their original concern with the strategic development of the Canadian avionics and aerospace industry to focus themselves almost entirely on their employment benefits. The sudden sense of importance that politicians attached to IB and O programs implicitly downgraded the idea of defence. What was purchased for defence was no longer militarily (or strategically) important, jobs were. The political popularity of these programs has served to mask their several drawbacks.

However logical in the immediate political circumstances, the dispersion of structural work could not help but impede the long-term integration of the industry as a whole. The essence of

12. Interview with Mr. Ronald Nash, 16 February 1984.

13. Interview with Mr. Archie Campbell, 24 May 1984.

any restructuring should have been to consolidate the industry in the one area where, given support, it would be in a position to compete even more successfully on the international market. Although the redistribution of structural work was a relatively small part of the overall benefits program, it went against the logical thrust of capitalism, that is, to consolidate and concentrate in core regions.

The wisdom of redistributing the P3C structural work out from the core, that is from Canadair to other companies such as Enheat in Amherst, Nova Scotia, must, therefore, be questioned. The redistribution of this work to other regions simply maintained, for some time at least, facilities which duplicated those already existing in the core. Not only does this create unemployment in the core, but, given the lower level of industrial infrastructure (not to mention aerospace infrastructure) in those non-core areas, the facilities probably could not be maintained over the long-term. A successful aerospace team must not only apply the latest techniques and technology but it must also have quick profitable linkages to a host of other organizations. While location in urban areas such as Montreal and Toronto is not a sufficient condition for success, the proximity of other aerospace companies, sub-contractors, government offices, and financial institutions all help to facilitate the maintenance of a profitable organization. Beyond this, large urban areas provide a ready supply of trained personnel and educational institutions where skills can be acquired and/or up-graded. Operating even sub-elements of the industry in out-of-the-way regions remote from the industrial core adds significantly to the costs of maintaining

2 OF/DE 2

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS
STANDARD REFERENCE MATERIAL 1010a
(ANSI and ISO TEST CHART No. 2)

the industry as a whole.

EMPLOYMENT

At one point, in the negotiations between Canadian and Lockheed officials, representatives of ITC were asked to summarize their approach to industrial benefits. Their response was that industrial benefits were basically "a function of the number of people employed, for how long, on what, and where".¹⁴ This response reflected their legitimate concern over employment in the aerospace industry and elsewhere.

While original estimates of the employment that would be generated were high, the number of jobs actually created was significant. Indeed, no objective of the Aurora program was anywhere as successful as that of creating employment.

Assuming that short-term benefits would account for one-third to one-half the program, an early ITC assessment estimated that "10 to 15,000 man years of work would be generated over a four or five year period. In the longer term, contracts in the order of \$500 million to \$650 million could be expected to account for a total of 30 to 45,000 man years of employment."¹⁵ Assuming, like ITC, that a job can be considered permanent if it entails ten years of work, then the long term result was estimated at 3,000 to 4,500 permanent jobs. While somewhat optimistic, this early estimate was not unrealistic. In 1979, three years after the program commenced, ITC estimated that the Aurora IB and O program had already created 2,200 jobs in the avionics and aerospace sectors alone and that the the number of those jobs would soon

14. Minutes, DND file 11500 LRP 558, 16 May 1974.

15. Memorandum, DND file 11500 LRP 558, 28 June 1972.

peak at 2,500.¹⁶ Another five or six thousand jobs have also been created by offsets in other sectors.

Only two parts of the Aurora IB and O program can be considered to have fostered the creation of linkages internal to Canadian industry. Disregarding the fact that all the principal contracts were held by Lockheed and its sub-contractors, both the P3C structural work and the LRPA program-related work linked Canadian companies in the production of the same product. These two programs were valued at \$161 and \$75.65 million, respectively. This totalled approximately 25% of the total contract and on a proportionate basis probably created some 750 jobs, 300 at Canadair for the P3C work and some 250 at Canadair and various avionics companies across the country.

In terms of jobs alone, only some 10% of the total can be seen as resulting from domestic linkages. No matter how one views these data, that is from the perspective of contracts, jobs or money spent, the vast majority of the links that were created were with American companies.

Both within the aerospace industry and the economy as a whole, the employment benefits of the basic benefits program, which ended 31 December 1981, have, of course, already been felt. The benefits of the structural program will continue so long as P3C aircraft can be sold on the world market. The employment opportunities associated with the future benefits and additional benefits programs will cease in 1993 and 1995, respectively. While future job creation benefits are hard to assess, it seems reasonable to conclude that employment from this program has

16. Memorandum, DND file 11500 LRP 558, 17 January 1979.

probably peaked and will gradually decline as the various phases of the contract are completed. Even so, the one significant benefit of this \$1 billion program was the creation of long-term employment.¹⁷

CONCLUSION

The Aurora IB and O program is best seen as a door opener for the more aggressive Canadian companies. Once a Canadian subcontractor has established a reputation for the on-time delivery of quality, competitive products, then business opportunities through but not exclusively with Lockheed should continue to be made available. Given Lockheed's need to offset hundreds of millions of dollars by 1995, it is not difficult to predict continued linkages between Lockheed (as a whole) and its suppliers on the one hand and hundreds of Canadian manufacturers on the other. In the case of Aurora, offsets represented a door to the continent, not to the world.

Given the no premium, low risk policy, one can only speculate as to how many more jobs could have been created had some premium been paid for certain technologically significant items. Undoubtedly, a long-range perspective would have resulted in even more work being done in Canada.

17. Recent evidence indicates that even the employment benefits of IB and O programs may have been over estimated. While not noted in this study, offset contracts were to be incremental, that is, the contracts were to be beyond those already planned by the prime contractor. A check of the benefits on the F18 (Hornet) aircraft program indicates that about 50% of the contracts were not incremental. Indeed, case studies of 12 large companies receiving offset contracts showed that they believed that they would have obtained other business if they had not received offset work.

CP-140 INDUSTRIAL BENEFITS PERFORMANCE
DISTRIBUTION BY INDUSTRY/SECTOR IN \$ MILLIONS
CUMULATIVE FROM 1 FEBRUARY 1975 TO 30 JUNE 1983

<u>INDUSTRY SECTOR</u>	<u>ORDERS PLACED</u>	<u>SHARE</u>	<u>CLAIMS (EVALUATED)</u>	<u>SHARE</u>
AEROSPACE	170.7	30.3%	130.7	30.2%
ELECTRONICS	255.1	45.4%	190.8	44.1%
OTHER	<u>137.0</u>	<u>24.3%</u>	<u>111.0</u>	<u>25.7%</u>
TOTAL	562.8	100%	432.5	100%

TABLE 6-1

CP-140 INDUSTRIAL BENEFITS PERFORMANCE
DISTRIBUTION BY PROVINCE IN \$ MILLIONS
CUMULATIVE FROM 1 FEBRUARY 1975 TO 30 JUNE 1983

ORDERS PLACED

<u>PROVINCE</u>	<u>STRUCTURAL COMPONENTS</u>	<u>OTHER WORK</u>	<u>TOTAL</u>	<u>SHARE OF TOTAL</u>
ALTA.		11.2	11.2	1.6%
B.C.		7.1	7.1	1.0%
MAN.	16.4	34.3	50.7	7.2%
N.S.	14.0	6.6	20.6	2.9%
ONT.	24.0	312.8	336.8	47.7%
QUE.	88.6	108.5	269.1	38.1%
OTHER		<u>10.3</u>	<u>10.3</u>	<u>1.5%</u>
TOTAL	143.0	562.8	705.8	100%

* OTHER includes aerospace, electronics and other non-structural contracts.

TABLE 6-2

CHAPTER 7

AN ANALYSIS OF THE "BENEFITS" OF THE AURORA PROGRAM

INTRODUCTION

Theoretical literature abounds with reference to the inability of dependent, peripheral societies to capture an adequate share of the benefits that accrue as a result of technological change. Referring to several Latin American states, Mytelka noted that because multi-national corporations (MNCs) were centralizing development with a view to creating a monopoly, they "inhibited the creation of linkages between local firms and local research institutions"¹ The result was a "disinclination" to generate local technology, that is, to be innovative. In this case, domestic linkages were broken or, probably more accurately, not established because externally-oriented linkages had already been set in place. Although this evidence is based on studies of Latin American states and, as has been noted, ought not to be applied to Canada without some reservations, it does not seem inappropriate to assume that the same result(s) could occur in the Canadian aircraft and defence industries where dependency has been clearly established.

By examining the actual (and promised) contractual benefits against the criterion of the "innovation process", this chapter will evaluate the linkages that determine the technological impact of Industrial Benefit and Offset (IB and O) programs like Aurora.

1. Lynn K. Mytelka, "Technological dependence in the Andean group", International Organization, Vol. 32, No. 1 (Winter 1978), p. 103.

THE CONTRACT

The procurement contract between Lockheed and the Government of Canada was for the design, test, evaluation, manufacture, production and delivery of 18 P3 Long Range Patrol Aircraft (LRPA), a variant of the United States' P-3C Orion. The last of the 18 aircraft were to be delivered to the Canadian Forces (CF) in the Spring of 1981. The total price for the contract was U.S. \$697 million. This included all support, maintenance, personnel training materials and systems, and made provision for adjustments affecting costs, depending on fluctuations in the economy.² Section 39 of the contract included several provisions regarding IB and Os.

The industrial benefits portion of the contract consisted of five main sections. The first, section 39.11(a), entitled the Basic Benefit Period, required the contractor "to order directly or cause to be ordered through its suppliers" ³ a certain dollar value of offsets from 1 February 1975, to 31 December 1981. Of the \$213.2 millions of offsets, a minimum of 66% had to be placed in the aerospace and electronics sectors. The contractor also agreed to use his "best efforts" to ensure that \$62 million of that sum was applied to the manufacture and support of aircraft, aircraft

2. Although the value of the prime contract with LCC was US \$697 million in 1976, by 1978 the addition of contract amendments to cover additional equipment and support services increased the prime contract to US \$ 722.6 million. The total program price however, including spares, publications, construction of the DIACs in CFBs Comox and Greenwood, the cost of sales tax, freight etc., increased the total cost to \$1031.7 million (in Canadian funds) by 1978.
3. Undated working copy of Section 39.00, CP140 Canadian Industrial Benefits LRPA Contract, p.56. Details confirmed from other sources.

parts and aircraft power plants."⁴ This first schedule, which ended 31 December 1981, was followed by the Future Benefit Period, section 39.11(b). In this latter schedule, a total of \$201.4 million was to be offset from 1 January 1982, to 31 December 1993. The third section, section 39.30, required that Lockheed designate certain Canadian companies to supply specified P3C structural components and spares. It also set forth a time schedule as to when the package was to be completed. The \$168 million associated with this third section was based on the sale of 150 P3C "shipsets", that is, 150 sets of structural components. In section 39.40, Lockheed agreed to support the Canadian aerospace industry by offering it the "opportunity to participate in the initial development and subsequent production of any new project entered into by the contractor in the fields of military transport aircraft, commercial passenger or cargo aircraft, and anti-submarine warfare aircraft."⁵ This offset, extending from 1981 to 1995, was valued by Project Management (PM) Aurora at between \$300 and \$400 million. The last section, section 39.60, formally confirmed Lockheed's earlier offer to give increased aid in the restructuring of the aerospace industry.⁶ The benefits section also contained administrative provisions related to submission of progress reports, holdbacks and damage assessment, termination, suspensions, extensions, etc.

The overwhelming thrust of the contract, therefore, was to

4. Ibid. p. 56.

5. Ibid. p. 68.

6. Ibid., pp. 68-69. Lockheed's offers to aid in the restructuring of the aerospace industry are covered in full in Chapter 4.

ensure that a maximum dollar value of offsetting goods and services was purchased from Canadian suppliers. The greater part of the contract would be achieved when the contractor, using his "best efforts", selected Canadian companies on a competitive basis to provide him or his suppliers with goods and services. Section 39.40 promised Canadian companies the opportunity to participate in the initial development and subsequent production of various aircraft. Beyond the two references to the aerospace industry, the contract did not designate any other sector or region that was to benefit directly from the contract. Employment and other benefits would be distributed in accordance with market forces.

There was also a clause in the contract giving the Minister of Industry Trade and Commerce (ITC) certain discretionary powers. This "ministerial" clause allowed the Minister to authorize offset credit for transactions, such as Joint Ventures (JVs) and Foreign Direct Investment (FDI), that he judged to be of economic benefit to Canada. In practice, this clause was used by Lockheed "in a general way to allow transactions which did not meet the general criteria of the contract",⁷ but were still deemed to be of economic benefit. As will be seen, it was through this more "dirigiste" approach that virtually all of the significant technologically-oriented benefits were acquired.

Determining the exact offset value to be granted,

7. CPL40 Industrial Benefits Report, July 1982, Appendix B, p. 1. As will be discussed later in this chapter, Lockheed's aid to Semco, a small instrument manufacturer, was not covered in the contract. Because it was considered beneficial to Canada, however, an offset award was made to Lockheed for its financial assistance in setting up the company.

particularly for those claims related to JVs, licencing, and technological transfer, took considerable time and effort. These items were considered "intangible" and hence difficult to assess precisely because little prior effort had been made to establish some theoretical basis for their understanding. Even so, using the criteria previously noted and another complex set of formulae, PM Aurora determined the net benefit to be credited to Lockheed's offset account.

The generalized nature of the industrial benefits clauses plus the use of the ministerial clause seems to indicate a lack of consensus as to how the aims of the program were to be accomplished. In the end, the overall result was more in accordance with market forces than in accordance with a more "dirigiste" approach.

Technology Transfer

That the Aurora contract should contain no provision for the transfer of technology is unfortunate, yet understandable. It was unfortunate because by the mid 1970s the Canadian aerospace and avionics sectors were in a much better position to absorb new technology than most other sectors of Canadian industry. As discussed earlier, the industry had successfully disengaged itself from the Canadian military and was now highly reliant on the world market for its sales, exporting some 80% of its production. It was understandable because much had changed from previous offset programs where new technology had been much more readily available. With the purchase of the DC10 in the late 1960s, Douglas agreed to upgrade Canadian competence in the design and building of wings. As of 1985, Douglas (now McDonnell-Douglas)

produces approximately 25% of all its airframes in Canada. Recent orders by American Airlines added approximately 800 permanent jobs to their facility (formally DACAN) in Toronto.⁸ Similarly, with the CF104 purchase Canada decided to buy the LN3 navigation system if Litton would manufacture it in Canada. Litton is now one of the major Canadian avionics firms. It is particularly noted for the production of guidance systems for cruise missiles.

With the Aurora, however, not only was technology transfer not part of the contract per se, but, because the estimated costs of Research and Development (R and D) for the Aurora were so high, Canada had to pay a "recoupment fee", the amount of which depended on the total R and D costs expended by the United States Navy.⁹ Discussing the issue of technology transfer, the official Aurora IB and O Program report notes,

It should be remembered that the Lockheed contract was negotiated in a period of reduced economic activity where a major objective was to obtain work for Canadian manufacturing firms. While some criticism has been directed at the program for the nature of the procurements placed with Canadian firms, it is not justified from a contractual point of view.¹⁰

The point, however, is that any criticism for the lack of technology transfer ought to be directed at Canadian bureaucrats who failed to understand its critical importance. Lockheed can hardly be blamed.

Not surprisingly, most multi-national corporations (MNCs) are now very reluctant to transfer access to their technology.

8. Globe and Mail, 5 June 1985, 11:3-5.

9. Memorandum, DND file 11500 LRP 558, 30 November 1978.

10. Appendix B, op. cit., p. 4.

According to the same report,

It must be recognized that American firms will not share in high technology for several reasons including the fact that technology is a key element of economic survival in the competition of the market place. As a result, sharing of research and development, data and know-how, is unlikely except in the rare instance where it is to the advantage of the American firms or where there is a specified contractual obligation.¹¹

The requirement noted in section 39.3, regarding the transfer to Canada of the "tooling" required for the P3C structural components, should not be interpreted as a transfer of technology, but more simply a transfer of standard technology production to Canada. As noted previously, the airframe and engines of the P3C (and hence of the Aurora) are 1960's technology.

While there was no such contractual requirement, Lockheed was sensitive to criticism that the Aurora IB and O program was not adding to Canada's technological base. In order to offset adverse publicity, Lockheed made use of the discretionary clause to either undertake directly or to arrange several commitments through its suppliers which did result in the transfer of technological information. Table 7-1 on pages 115 and 116 lists all 23 ministerially-approved items.¹²

Nine of these items, the transfer of Test Data T300/5209 to Canadair, the transfer of composite technology to Canadian Aviation Products, the transfer of General Surface Definition Computer program (GSDC) and the Computer Graphics Augmented

11. CP140 Industrial Benefits Report, op. cit., p. 8.

12. Table 7-1 is in accordance with a computer printout dated 28 March 1984.

Designs and Manufacturing system (CADAM) and associated software to De Havilland, the creation of Sperry Univac, Semco Instruments, and the transfer of licenced technology to Canadian Aviation Electric (CAE) did add to Canada's technological base.¹³ The transfers to De Havilland did result in increased innovation. An upgrading program, jointly established by Lockheed and De Havilland, trained De Havilland personnel in the use of various aircraft design and manufacturing software programs. This enabled De Havilland to later request and receive both the CADAM and GSDC programs. The total credit allowed Lockheed was \$3 million.¹⁴ In terms of the model of Innovation Process presented earlier, this is the only case where human and information resources were brought together as a direct result of the Aurora program.

Similarly, CAE's acquisition of licenced technology relating to state-of-the-art simulation also resulted in innovation taking place. While it is not known whether the technological information was "unbundled", so-to-speak, the agreement allowed Lockheed to claim the value of CAE's future export sales as a program offset. This credit-in-lieu of licence fee arrangement has allowed CAE to develop a line of even more sophisticated mission simulators for the export market. Lockheed was granted an offset award of \$3.2 million for relinquishing its proprietary rights in this area.¹⁵

By far the most significant technological transfer made as a

13. Appendix B, op. cit., pp. 1-4.

14. Ibid., p. 2.

15. Ibid., pp. 1-2.

result of the discretionary clause was the establishment by Sperry Univac (US) of a branch plant in Winnipeg. Lockheed was given a one-time award of \$550,000 as well as the right to claim export sales from the plant as offsets. This plant was granted a world product mandate (WPM) for the production of a line of defence-related computers, solid-state recorders, and associated equipment. Employing approximately 100 people, this plant was the only instance of FDI in the Aurora program. Although this branch plant is undoubtedly sustained by and controlled by its foreign parent, its WPM implies that it is not just another "truncated" firm. As the most modern electronics firm in Western Canada, Sperry Univac - now called Defence Systems Group - makes significant intra-firm exports to its parent American MNC. While the exact amount is hard to assess, exports have been estimated at \$4 to \$5 million per year. Considering its size, products, mandate, and exports it is undoubtedly innovative, at least on a small scale.¹⁶ In general, however, other IB and O programs have encouraged competing contractors to establish subsidiaries in Canada. This has simply reinforced the "branch plant" syndrome.

The transfer of Test Data T300/5209 technology to Canadair also contributed to the innovative process. These data, from a research program that Lockheed had performed, were related to composite materials and their use in aircraft structural design and analysis. It seems reasonable to assume that Canadair did use these data, quite possibly in the Challenger program.¹⁷

16. Ibid., pp. 1-2.

17. Ibid., p. 3.

Canadian Aviation Products used the briefing and technical documentation on composite technology to move into this type of manufacturing. Lockheed was credited with \$150,000 and \$250,000 respectively for these transfers.¹⁸

One significant, discretionary item related to the establishment of a small, independent, Canadian-owned company specializing in high technology instruments. This company, Semco Instruments, was established by Carl Zeiss, a supplier to Lockheed, and is undoubtedly innovative. Located in Ottawa, this firm devotes relatively large amounts to R and D and specializes in the manufacture of electron microscopes. It was formed specifically to produce an innovative attachment for Zeiss' normal transmission electron microscope. This attachment converted that item into a more modern scanning electron microscope. Having undergone expansion in 1980, it now employs approximately 60 - 70 people. For its efforts, Lockheed was granted a credit of \$2.2 million.¹⁹

One JV resulted from the use of the discretionary clause. Pacer Systems, a supplier to Lockheed, and International Marine Products (IMP) of Halifax entered into a joint agreement to establish Pacerlabs, a computer consulting firm. This venture, valued at \$2 million, employs only seven people. Even assuming that IMP, a medium-sized firm, is in a position to bargain with its foreign partner to obtain technological information for Pacerlabs, it is highly unlikely that it will be innovative. Pacerlab's size alone makes it insignificant.²⁰

18. Ibid.

19. Ibid., p. 1.

20. Ibid., p. 3.

When considered as part of the overall Aurora benefits program, the total value assigned to all 23 of the ministerial discretionary awards was very small, approximately 1.7% of the total \$1 billion contract. The nine technologically-related items represented an insignificant 1.1%.²¹

Litton (Canada), selected to perform system integration and software generation for the Data Interpretation and Analysis Centres (DIACs) at Canadian Forces Bases (CFBs) Greenwood and Comox, enhanced its capacity as a world class producer of high technology avionics products. The two DIACs consist of data processing systems, communications, display and control equipment. Sophisticated computer programs provide the capability to maintain up-to-date tactical information which can be used for operations planning, mission planning, and crew briefings and debriefings. It can only be assumed that Litton (Canada) relied on its parent American company for some of the technological information necessary to successfully carry out this work. The value of the contract was estimated at \$21.482 million in 1975 dollars.

While Lockheed offered various Canadian firms the right to licence its technology and thus enable Lockheed to fulfil its offset requirements, it is doubtful whether any lasting benefits were generated. As will be seen later, Lockheed had some difficulty even getting Canadian firms to bid on offset contracts. A review of the available data reveals no evidence that any other firms increased their innovative capacity as a result of using any of Lockheed's licenced data. Discussing just such arrangements,

21. The dollar value and the calculations are based entirely on the above-noted computer printout dated 28 March 1984.

the Report of the Advisory Committee on Aerospace Development noted, "The underlying technology.....belongs to the original manufacturer and is seldom transferred."²²

At the level of the firm, the Aurora program cannot be judged a complete failure. At least seven or eight firms, both within and outside the aerospace industry, were placed in a position where they could increase their innovative capability and most did. Taken together, however, the total value of all technologically-oriented contracts let in Canada was an insignificant 3.8% of the total contract.

Human Resources

While the industrial benefits sections of the contract made no contractual arrangements as far as the upgrading of human resources was concerned, the ministerial clause was used to authorize a series of lectures to Canadian companies. These seminars, relating to quality control (QC), computer-aided design/computer-aided manufacture (CAD/CAM), purchasing, and composite material technology were held all across Canada. Although the overall importance of the CAD/CAM lectures should not be underestimated (they instructed all kinds of businesses as to what process to follow to determine if they ought to move up to this new level of technology), they were of little value to many firms in the aerospace industry. Until the early 1970s, the structural design and manufacturing of aircraft in Canada was done essentially by hand. Numerically-controlled machines were then introduced as a result of an offset program. This enabled some

22. Canada. Aerospace in Canada - Outlook and Strategy. (Ottawa: 1983), p. 55.

aerospace firms to go beyond "build-to-print" by using computer-controlled technology to design and manufacture parts. These firms, are, almost at the forefront of such technology. Some smaller firms, however, were still operating on a "build-to-print" basis and were quite pleased with the work received as a result of the P3C structures program. Others, such as Canadair, Litton, De Havilland, Pratt & Whitney, which had moved beyond simple build-to-print, wished to further develop their own R and D and, as a result, create their own proprietary products for sale on the world market. What these firms required, apparently, were the highly complex computer software programs which the numerically-controlled machines needed to be fully competitive. Except for those programs transferred to De Havilland, none was forthcoming. These more advanced companies saw build-to-print work (which they could, of course, still do) simply as a means to survive. Offset contracts did little for their long-term development.

As early as 1974, Canadian aerospace companies, suspecting that most work would be build-to-print and that little technology would be transferred to them, concluded that "the LRPA would have only limited impact on their own operation."²³ In terms of the Innovation Process, the efforts to upgrade human resources were not only dispersed across all sectors and regions but were too late to help the more dynamic firms which had already made the transition to the new technology. As far as can be determined, no personnel were relocated to more productive environments. The value assigned to the seminars, \$2.5 million, represented an insignificant .25% of the total value of the contract.

23. Report, DND file 11500 LRP 558, 27 March 1975.

Engineering and Design/Research and Development(E andD)/(R and D)

Discussing "off-the-shelf" procurement programs, the Chairman of the National Research Council stated in part:

in the long run this practice leads to atrophication of in-house design capabilities. Hence, unless compensating efforts are made at the same time to sustain the industries own Research and Development programs and support the sales of Canadian aircraft in those markets in which we can compete effectively, the end result of sustained offset production will be a weakness leading to an indirect form of economic domination.²⁴

While it should have been possible to include some R and D funding as part of the Aurora program, this did not occur. The opportunity could not be grasped by the Department of National Defence (DND). The reasons are obvious. Defence R and D was an early victim of both frozen defence expenditures and administrative changes. Restricted funds allowed only a few small Defence R and D projects to proceed. Due to administrative changes, most Defence R and D was to be covered by funds from ITC. According to Gelling, "DND lost control over a very much reduced R and D effort".²⁵ In 1982, one DND report noted, "In the development areas, there have been almost no cooperative projects which have resulted in production."²⁶ Not surprisingly, Canadian firms have no confidence that joint DND-industrial projects will be supported up to the state of production -- not to mention export. The Defence Procurement Review refers to this situation as

24. Letter, DND file 11500 LRP 558, 16 October 1975.

25. W.C. Gelling, "Defence Policy and Canadian Industrial Strategy", (Kingston: 1979), p. 12.

26. Canada. Research and Development Evaluation Report, (Ottawa: 30 July 1982), p. 28.

an "uncertainty syndrome".²⁷

More significantly, what was developed by defence industries did not often go into production because Canadian restrictions on the export of defence products are the most restrictive of all the industrialized states.²⁸ In the other industrial states, governments see the armed forces and defence industries as a team; a team whose unity is essential to industrial and technological strength. DND, having been forced by economic circumstances to sever its links with industry, has little motivation to get involved in joint military-industrial R and D.

In any case, defence R and D expenditures are ridiculously low in comparison with most of Canada's main allies. For example, in 1973-74 Canadian Defence R and D was 7.6% of Government R and D. For the United States it was 56%, for the United Kingdom 47% and for France 33%.²⁹

DND needs equipment at the lowest cost. From its perspective, any DND-industrial link could result in production delays and in equipment which does not meet all CF specifications. Canada's failure to support any reasonable military-industrial connection through R and D and to promote defence exports has not been lost

27. Canada. Defence Procurement Review-The Barton Report. (Ottawa: Privy Council Office, May 1982), p. 22.

28. Research and Development Report, op. cit., Annex F, p. 4. Canadian restrictions stem from the desire of successive governments not to be seen as "merchants of death".

29. In particular, see Table 2 to a position paper entitled "Procurement, Including DND Orientation", presented by F.R. Kearns to the Annual General Meeting of the Air Industries Association of Canada, Murray Bay, Ontario: 24-28 September 1978. The principal source of statistics was the Institute Strategic Studies, London.

on Canada's allies. There is now evidence that the restrictive export policy, last reviewed in 1978, is beginning not only to affect joint military developments between Canada and its allies but also to restrict the flow of R and D information to Canada from military sources.³⁰

Although the Aurora IB and O program did little or nothing to directly increase Canadian R and D, it did offer some indirect aid to avionics R and D and provided some help to Engineering and Design (E and D). Because the aircraft were to be state-of-the-art, some avionics, computer and electronic components still in the process of being developed or just coming into production were included in the overall aircraft system. Several Canadian designed and engineered components were selected. This equipment includes doppler radar, an inertial navigation system, a magnetic anomaly detector, the flight deck simulator, the operational mission simulator and magnetic anomaly detection compensator. This indirect support allowed CAE, Marconi, Litton, etc. to at least continue the R and D programs that they had already developed. Marconi, for example, was able to have its dopplers installed on all P3C aircraft.³¹

As far as can be determined, the provisions that were made to add to Canada's E and D capability were not entirely successful. Specifically, Canadair was asked to provide engineers to join Lockheed in the development of the Aurora. Although they did provide some, they provided neither the numbers nor types of

30. Research and Development Evaluation Report, op. cit., p. 27.

31. Doppler radars determine the aircraft's drift and ground speed.

engineers needed. There is reason to believe that Canadair was concentrating its manpower resources on the Challenger project. This lack of complete response is indicative of the poor relationship between DND and the defence-related industries. Industries simply cannot organize themselves around a once-in-a-generation contract. Having few links with DND, industry is not in a position to respond to DND projects when they do occur.

In accordance with article 39.30 of the contract, Lockheed was obliged to purchase P3C parts (and spares) from the Canadian producer. The manufacture of some of these components required the use of technological data which was proprietary to Lockheed. Lockheed agreed to allow Canadian firms to sell spares directly to the Canadian government in exchange for an offset benefit.³² While not significant in itself, this transaction serves to highlight an obvious risk associated with off-the-shelf purchases. Because CF aircraft are often used for multiple missions, on unthought-of tasks and are used for much longer than planned, it is most desirable that the CF be as free as possible of foreign support for logistics, repair, modifications, and overhaul, etc.

Under previous purchasing arrangements, new aircraft such as the CF5 were produced under licence in Canada. As a result, Canada was left with a wealth of technical (and technological) know-how upon which it could draw. Such was not the case with the Aurora. The Aurora was assembled, the avionics installed, functional tests and checkouts, and flight testing were all done in California. Prior to final contract negotiations, however,

³². Letter, DND file 11500 LRP 558, 30 January 1979.

Lockheed proposed that Canadair carry out all these functions for the last 12 aircraft. It was stated by PM Aurora that if the work were done in Canada "some transfer of technology will be involved which would be useful for the subsequent in-service support of the LRPA aircraft".³³ During the discussions, however, PM Aurora was quite definite that any additional premium associated with this work being done in Montreal was not a proper charge against DND. No additional (R and D) funds being forthcoming from other sources, the work reverted to the United States. The premium for this work was estimated at \$7.156 million.³⁴ Had this work been done in Canada, there would undoubtedly have been some transfer of technologically-oriented processes, techniques, etc.

Because an off-the-shelf procurement policy leaves technological and technical knowledge in foreign hands, the domestic capability to both support and adapt the aircraft (or other equipment) to the CF's future requirements is limited. The very nature of the procurement policy hinders adaption and innovation. If changes to the military's original specifications are few, the costs and time delays created in order to place significant sub-contracts with the purchaser's domestic industries cannot be economically justified. If, however, large modifications are to be made to "off-the-shelf" units, then significantly greater costs are involved in the transfer of such work to another location. In this case, a great part of the foreign production system has to be re-created, at even greater cost. "Thus an off-the-shelf policy

33. Aide Memoire, DND file 11500 LRP 558, 23 December 1975.

34. Ibid.

not only results in off-shore procurement but also tends to drive the work of adapting the product...off-shore as well."³⁵

The Aurora program did little for Canadian R and D. Further, the lack of any significant link between DND and the defence industries (in this case Canadair), made it difficult for the firm to fully respond to requests to provide E and D support. More than any previous acquisition, it will be difficult to support and modify the Aurora.

Linkages

Much of the success for the creation of employment must go to Lockheed. The very size of Lockheed's corporate connections allowed it to enter a contract that had an extremely high dollar value of offsets. As early as 1974 Lockheed conducted five surveys of Canadian firms and visited 103 companies which might qualify as potential suppliers. Similarly, Lockheed representatives visited 85 of their U.S. suppliers and encouraged them to start establishing links with various Canadian firms.³⁶ Lockheed employed a two man Canadian team to perform these capability surveys and had a six man team at Burbank devote itself entirely to matching Lockheed's corporate-wide requirements with the industrial capabilities of various Canadian firms.³⁷

However the Aurora IB and O program is judged, there can be little doubt the Lockheed Corporation is more than meeting its commitments to the Government of Canada, both in the spirit and letter of the contract. For example, as of September 1978, the

35. Gelling, op. cit., p. 13.

36. Minutes, DND file 11500 LRP 558, 16 May 1974.

37. Memorandum, DND file 11500 LRP 558, 17 January 1979.

structural commitment related to the basic benefits program required that \$97 million be offset. At that point, ITC had already granted Lockheed credit for \$132 million. Reports dated in 1981 indicate that Lockheed was six years ahead of its overall offset commitment.³⁸

Although Lockheed's efforts to encourage Canadian suppliers to bid on contracts with it were extensive, they were not entirely successful. The response of Canadian manufacturers was less than overwhelming. As part of the contract, Lockheed made quarterly IB and O reports of its efforts, of the efforts of other Lockheed companies and of the efforts of their sub-contractors. According to one Lockheed memorandum, dated 22 September, 1978, considerable administrative difficulty was encountered in working with Canadian firms. Despite Lockheed's continued efforts, the percentage of Canadian contractors who, for example, bothered to acknowledge a request for a quotation was "depressingly small". In commenting on this problem, ITC noted that the problem was caused in a large part by the size of Lockheed.

Their planning systems require long lead times for programs. Stringent quality control requirement and proposal documentation which many small Canadian firms find onerous.³⁹

Notwithstanding the technological transfer that did take place and the contracts received, many Canadian firms were simply not in a position to benefit from offset contracts. Their internal structures were not sophisticated enough to respond to the demands of a MNC.

38. CP 140 Industrial Benefits Report, op. cit., p. 2.

39. Ibid., p. 8.

CONCLUSION

Implicit in the innovation process is the assumption the particular balance of forces required to generate technological adaption and innovation can operate at two discrete levels, that of the firm and that of the industry as a whole. At the level of the aerospace industry, little was accomplished. The amount of technology transfer that did occur was miniscule when compared to the program as a whole. Any improvement to human resources was scattered and insignificant. Efforts to increase the internal E and D capability of Canadair were less than successful. No provision was made for R and D. No structural changes were made in the only two firms (Canadair and De Havilland) which could become centre(s) of excellence for the industry. At no point were any of the structural deficiencies or linkages necessary for innovation on an industry-wide basis regenerated.

At the level of the firm, however, the Aurora program was somewhat more successful. At one point in the Aurora program there was a clear convergence of information, human, R and D resources at De Havilland. For avionics firms such as CAE and Litton and for new companies such as Sperry-Univac and Semco Instruments, the Aurora program provided an opportunity to be innovative. As demonstrated by CAE's expansion into highly sophisticated simulators, the program continues to be markedly successful in opening (continental) markets for the more aggressive Canadian firms.

As far as hypothesis three, which notes that that "attempts to increase the transfer of technological information will achieve little because of internal bureaucratic and industrial structures"

is concerned, certain implications are clear. Internal factors were paramount in impeding the transfer of technology to Canada. Through a lack of policy and foresight, on the one hand, and poor industrial mechanisms, on the other, Canadian defence, aerospace and other manufacturing industries were not in a position to profit from what new technology was offered.

Canadian bureaucrats failed utterly to understand and appreciate the vital importance of technology transfer and the innovation process when negotiating the Aurora IB and O program. Poor internal structures restricted the ability of many Canadian firms to profit from the little technology that was offered. Had it not been for the Ministerial discretion clause, nothing of technological significance whatsoever would have been achieved.

Both types of internal factors played a key role in reducing the long-term benefits of Aurora: both restricted the transfer of technology. As will be seen in chapter eight, however, there is a significant difference in the quality of these restraints.

LOCKHEED MINISTERIAL DISCRETION AWARDS

<u>PURCHASER/VENDOR</u>	<u>GOODS SERVICES</u>	<u>PLACED/CLAIMED VALUE</u>
Carl Zeiss Canada Ltd. Semco Instruments Co.	Financial * Arrangements	2,214,236.00
Lockheed-California Co. Pacerlabs Ltd.	Joint Venture *	2,000,000.00
Lockheed-California Co. B.C. Government	Q. A. Seminars	113,600.00
Lockheed-California Co. B.C. Government	Q. A. Seminars	35,000.00
Lockheed-California Co. Canadair Ltd.	Test Data T300/5209 *	150,000.00
Lockheed-California Co. De Havilland Aircraft of Canada Ltd.	Tech Transfer * (CADAM & PROGRAM SOFTWARE)	1,000,000.00
Lockheed-California Co. Rocky Mountain Precast Ltd.	Banff Ski Trips	123,118.00
Lockheed-California Co. B.C. Government	Q. A. Seminar	35,000.00
Lockheed-California Co. CAE Electronics Ltd.	Credit in Lieu of License Fee *	3,200,000.00
Lockheed-California Co. Canadian Aircraft Products Ltd.	Advanced Composite Tech. *	250,000.00
Lockheed-California Co. Quebec/Maritimes	Q. A. Seminars	201,600.00
Lockheed-California Co. Ontario	Q. A. Seminars	856,000.00
Lockheed-California Co. B.C. Government	Cadcam Seminar	300,000.00
Lockheed-California Co. Rocky Mountain Precast Ltd.	Banff Ski Trip	109,086.00
Lockheed-California Co. Manitoba	Q. A. Seminars	79,200.00

Lockheed-California Co. Field Aviation West Ltd.	Composite Seminars	250,000.00
Lockheed-California Co. Alberta	Q. A. Seminars	136,800.00
Lockheed-California Co. Ontario	CAD-CAM Seminar	234,000.00
Lockheed-California Co. Pacific Vocational Inst.	Transfer of Lock- Heed Jetstar	3,000,000.00
Lockheed-California Co. Quebec	Quebec CAD/CAM Seminar	291,600.00
Lockheed-California Co. Quebec	Purchasing Seminar	248,400.00
Lockheed-California Co. De Havilland Aircraft of Canada Ltd.	Tech Transfer * (GSDC)	2,000,000.00
Sperry Univac Sperry Univac Defence Systems Division	Viable MFG. Facility *	550,000.00

TOTAL

\$ 17,377,640.00

* Items related to significant technological transfer.
Dated: 28 March, 1984.

TABLE 7-1

CHAPTER 8

CONCLUSION

GENERAL

In terms of economic development, the Aurora program was a failure. While it undoubtedly helped to ease the "boom and bust" cycle that plagued the aerospace and avionics sectors, it failed to re-establish in any way the position of these industries as a strategic centre for economic development. Nor did it re-establish any of the crucial internal linkages that had been broken as a result of the demise of the Arrow. Its efforts were scattered and its long-term results restricted to employment.

Only one of the six objectives of the Aurora program - the provision of employment - was fully achieved. Another, the redistribution of industrial benefits and offsets was, at best, only partly achieved. Indeed, if Aurora is any example, Industrial Benefits and Offset (IB and O) programs have now evolved to a point where the unintended side-effects, contradictions, and costs built into these programs more than counterbalance their positive benefits. The Aurora program was contradictory in several of its aspects and almost meaningless as far as the transfer of technology was concerned. Continued reliance on these programs is highly problematic and disenchantment with this ad-hoc approach can only continue to grow.

In retrospect, the public's failure to fully appreciate the negative aspects of these programs is understandable. Most of the problems, as serious as some are, are essentially intra-bureaucratic and are of such a nature that they have little impact

on the public at large. Who, for example, is truly interested in the problems of GATT and DPSA as they relate to commercial aerospace offsets? Similarly, who in the general public is concerned if offset arrangements are essentially counter-productive for Canadian industry?

Conversely, the single positive aspect of IB and O programs—their provision of jobs is politically attractive and hence receives far more media exposure than it would normally deserve. The net result is a positive public image of a type of program whose benefits are dubious at best. The result of this misperception has been to suspend any serious discussion of their benefits and hinder any serious assessment of their suitability as an approach to economic development.

How then can one explain the pursuance of a highly problematic approach, long after it ought to have been reviewed and discarded? It appears that the political success of IB and O programs in providing jobs blinded successive governments to their growing deficiencies. This continued acquiescence to the status quo is related, at least in part, to the nature of political power. By assuming that each IB and O program was unique, by dealing with each on a case-by-case basis, and by following long-established political and bureaucratic processes, little political danger was encountered. The very lack of a policy, was, in this sense, politically beneficial. It allowed politicians (and bureaucrats) to exercise a discretionary authority that is central to the maintenance of power. Unfortunately, what is being done, if Aurora is any example, is politically self-defeating.

THE ISSUE OF INNOVATION

The issue of innovation is critical to an understanding of the failure of IB and O programs. The growing American desire to protect its technological information undercuts one of the main assumptions of IB and O programs - that they provided for technology transfer. It is most unfortunate for Canada that, just as IB and O programs became more job-oriented, technological change made the improvement of the nation's technological base more important than ever. The politically-generated desire to obtain "dollar-for-dollar" offsets, and hence a maximum of jobs, is essentially misplaced. As demonstrated by the model of the innovation process, it would have been much more productive, from the perspective of the generation of long-term benefits, to aim for fewer dollar offsets and contract for the transfer of a far greater level of technological information. While several other variables such as internal Research and Development (R and D), patents, etc are also involved, the process requires technology transfer as one of the two most critical inputs before it can even commence to generate benefits. By opting to remain at a generally lower level of technology and thereby saving jobs over the short-term, the whole issue of technological change and innovation was held in abeyance. The irony is that, in the end, many of these jobs will be lost and insufficient provision will have been made for their replacement. The stated aim of transferring technology was not achieved. Lacking technology transfer, little innovation was possible and few long-term benefits generated.

From a theoretical perspective, understanding the innovation process is critical to economic development because it

demonstrates how a specific cluster of internal and external linkages can be manipulated so as to reduce the effects of dependency.

THE AURORA PROGRAM AND ECONOMIC DEVELOPMENT

To the degree that the Aurora program is typical of later IB and O programs - and no evidence is known to the contrary - these programs represent an overly optimistic assessment of what can be gained by offset arrangements. As with Canada's initial industrialization, IB and O programs are a minimum risk, an almost something-for-nothing approach, one reflecting the belief that some easy route can be found in order to deal with the problems of technological change. The belief that long-term commitments and benefits are possible without some economic premium is essentially false, and indicates a misunderstanding of the capitalist system of production. With Aurora, the continued focus on something-for-nothing made it impossible to perceive other choices. Alternatives were available and the only way to perceive them was to have some long-term, overall strategy.

None of the Long Range Patrol Aircraft (LRPA) data examined indicated that the government or its bureaucracy was aware of the trade-offs implied as a result of this approach to economic development. Save for a document or two, the data available do not show any conceptual or intellectual understanding of the larger questions or issues. It is almost as if the government and bureaucracy were unaware of the extensive body of literature relating to technology transfer, innovation, joint ventures (JV), etc. Few, if any, of the long-term implications were recognized.

It is now apparent that there are limits as to what can be

achieved and that there are problems when industrially weak states, such as Canada, attempt to extract "benefits" from highly-industrialized states, such as the U.S. Their dependency limits the potential for benefit. The industrial weakness that leads to a demand for offsets results, at least in Canada's case, in links that intensify industrial and technological dependence. Such programs are only slightly better than Foreign Direct Investment (FDI). At best they result in the growth of sales, production, jobs, etc. but contribute little to long-term economic development. Their benefits are more illusory than real.

None of the data examined contradict the general contention made at the beginning of this study. The state of dependency that ties the Canadian defence and aircraft industries to the United States significantly reduces the potential industrial benefits available to Canada. An examination of the various findings supports the contention that internal factors or linkages are the primary cause of the reduced flow of benefits.

THE FINDINGS

The failure to restructure the aerospace industry is best seen as the result of what happens when no consensus exists as to how specific goals are to be achieved. Restructuring was eventually viewed by the bureaucracy as just another benefit flowing from the process and not as a factor which would direct the outcome - at least to some degree. The closely related aim of increasing Canadian equity - dependent upon successful restructuring - was also an outright failure.

Several rather mundane factors, such as inter-departmental struggles and lack of financial resources, have been cited as the

direct cause of failure to restructure. Theory suggests, however, that they, in turn, are indicative of a lack of internal political and bureaucratic cohesion brought on by a state of dependency. In terms of theory, two explanations seem possible. First, that the lack of internal cohesion indicated by the failure is the result of a lack of fully developed institutional structures; a condition often attributed to underdeveloped, peripheral states. Given Canada's relatively well developed internal structures and the lack of external linkages in this issue, this appears to be a somewhat less than satisfactory conclusion. A less generous, but more realistic, interpretation is to see this failure as the result of an almost unconscious acceptance of the limitations imposed by a condition of dependency. While there was no evidence to suggest that the Canadian government or its bureaucracy lacked the autonomy to proceed in this matter, had it possessed the will to do so, it proceeded as if it were so constrained. In this case, attitudinal structures seem to have limited the ability to pursue solutions that could significantly alter the status quo. Whatever the case, the failure to restructure clearly demonstrates the difficulty of attempting significant structural changes under conditions of dependency.

From the perspective of trade relations, the Aurora IB and O program not only constituted a non-tariff barrier in itself but, by including commercial aviation offsets, constituted economic "double dipping". Despite the continental links created by IB and O programs, it would be too optimistic to assume that the American government will continue to ignore this assault on its economic position. Up to the present, the American government has

been "content" to leave the issue of offsets up to the discretion of the various multi-national corporations (MNCs). It would not be surprising to find the U.S. leading other industrial states such as France, Britain and the Federal Republic of Germany in a collective approach aimed at limiting the demands that Canadians (and now others) can make in offset contracts.

IB and O programs have also created a dynamic in international trade which is highly counterproductive for some sectors of the Canadian economy. The demand for offsets reduces overall trade to a one-to-one basis and destroys the comparative advantage that certain sectors may have on the international market. Ironically, problems also occur when Canada cannot respond to offset demands because it lacks a fully integrated industrial base or when contracts require the export of certain industrial activities, bringing on a degree of de-industrialization. This is not to say that all countertrade is to be avoided, but rather that it ought to be used as part of an overall strategy and not as an ad hoc substitute for policy. There are areas where this form of countertrade could be mutually beneficial but aerospace is not now one of them.

At the policy level, present IB and O programs are neither openly "dirigiste", that is, formulated with clear, non-contradictory strategic goals (where considerations of state override those of the market) nor are they international contracts that emphasize the creation of business opportunities. The difference is not simply one of emphasis, but one of substance. Aurora reflected the continued failure of successive Canadian governments to achieve a consensus on industrial policy. Given such a

consensus, the bureaucracy would at least have had some guidelines with which to work. Lacking any substantive guidelines, the result was a program that attempted to achieve essentially contradictory aims, created unanticipated problems and encountered resistance and change due to its ambiguous nature. As a result, little of substance was achieved.

Clearly, the combination of low or no risk IB and O programs and low or no-risk off-the-shelf procurement policy has proved a failure. Even given the need to purchase systems off-the-shelf, IB and O programs should also have been used as a mechanism to coordinate civilian-military defence efforts. Rather, through neglect they have become less and less relevant to the real needs of their clients. The present difficulties being endured by both Canadair and De Havilland stem not from their failure to gain a niche in the world market, but from the expectation that they will survive generally independent of the needs of the Canadian Forces (CF). The lack of a defence industrial policy has denied industrial sectors such as shipbuilding and aerospace the military market (as small as it is) on which they should legitimately be able to depend. This has increased their market risk. If military production is to be re-introduced, the long lags between military purchases must be filled by civilian production, production that builds, at least in part, on the innovative technology developed from previous joint production. To do this, defence R and D spending must be linked to long-term production and planning, and given primarily to Canadian-owned companies. Those firms able to compete on the world market will be capable, either independently or as a result of JVs, of systems or sub-

systems production. The question is not whether the country can afford to have a military aerospace industry but whether any sort of aerospace industry at all can exist without strong links to the military. This, in turn, requires a defence industrial policy focussing on innovation.

While the fact that IB and O programs tend to obscure real defence needs is unfortunate, in itself it is of relatively little significance. As has been seen, the Department of National Defence (DND) was, in the end, able to determine if not dictate the type and operational specifications of the system. This, indeed, is as it should be. What is critical, however, is the failure of both government and bureaucracy to understand the proper role that defence industries in general and the aerospace industry in particular can play in the achievement of industrial growth and exports. If it is accepted that the long-term military interests of Canada require the preservation of a defence industrial structure more responsive to the state, then it is apparent that the economic leverage available from foreign off-the-shelf purchases has been largely misused.

An examination of the data related to hypothesis two, that positing a relationship between dependency and the discovery of several unanticipated negative consequences is, for the most part, supported. As with hypothesis one, these problems can be directly linked to factors internal to the Canadian government, specifically, its failure to evolve a coherent industrial policy. One aspect of these problems, however, did have an externally-oriented dependency link. The use of IB and O programs to obtain offset credits in civil aircraft, contrary to General Agreement on

Tariffs and Trade (GATT), did not provoke the U.S. to cancel the Defence Purchases Sharing Agreement (DPSA) as a means of keeping the Canadian sector dependent. Rather, the specific conditions in this case - the American balance of payments problem - seems to indicate that the adverse linkages created by dependency can, on occasion, be negated by the other factors. While the potential for economic retaliation certainly remains, it must be assessed as somewhat problematic.

A review of the data associated with hypothesis three, that related to technology transfer, again highlights the importance of internal factors in maintaining dependency. While the American government might wish to contain the outward flow of technological information, it has not directly restricted the ability of MNCs such as Lockheed to do so. Rather, two factors, both internal, seem to have resulted in a situation where the transfer of technological information is virtually insignificant. First, in the contract itself, the Canadian government and its bureaucracy failed to exploit this program so as to effect a meaningful transfer of technological information. Second, although Lockheed offered technological information to several Canadian companies, few accepted. With the exception of the eight or nine ministerial discretion items discussed in chapter six, few companies had the managerial and technological sophistication to make use of the proffered information.

The benefits of IB and O programs cannot be denied. The one undoubted success of the Aurora program was the creation of hundreds of jobs both within and out the aerospace and avionics sectors. These jobs were the direct result of hundreds of

contracts (mostly offset) between Lockheed and/or its suppliers and dozens of Canadian firms. Such programs open doors through which the more dynamic Canadian firms can obtain and maintain contracts. If Canadian firms gain access to MNCs and prove themselves competent as regards price, quality and delivery, there is no reason why these links should not continue. In a similar fashion, the co-production of P3C "shipsets" will continue to link Canadair to Lockheed as long as P3C aircraft can be sold.

If jobs alone are any indication, far more external linkages were and will continue to be created. The nature of this linkage is also important. Given the lack of any significant technology transfer, most of the contract work done in Canada remained in the category of standard technology, a level where Canada possesses no particular advantage and where increased challenges can be expected from any number of developing countries. The maintenance of employment, therefore, is clearly dependent on Canadian firms meeting American standards regarding quality control, lead times etc., and not necessarily adapting themselves to global standards and requirements. Hypothesis four, that positing a relationship between dependency and increased links to the core, is therefore fully supported.

THE PARADOX OF DEPENDENCY

While it was hypothesized that internal linkages would play a significant role in the maintenance of dependency, it was, nonetheless, anticipated that a number of external linkages would also be found. As demonstrated in the findings, however, such was not the case. In hypotheses one and three, all the restraints noted were internal. In hypothesis two only one factor out of

seven or eight was found to have an external link. From the opposite perspective, hypothesis four posited the existence of external linkages and these were confirmed.

While the data confirm the hypotheses set forth, the results are, from the perspective of theory, somewhat paradoxical. The reduction of benefits is obvious, yet there are few, if any, apparent external linkages by which dependency is being maintained. Given this and the relatively well-developed internal political and bureaucratic structures in Canada, it can only be concluded that, while the Government of Canada possessed the autonomy to act, it lacked the will to do so. It appears, therefore, that the restraints operating in the political and bureaucratic areas are of a somewhat different order than those anticipated, that is, they seem to be more the result of the acceptance of a set of attitudes consistent with a state of dependency. A less generous interpretation, therefore, is that, despite its autonomy, the government and its bureaucracy were dominated by attitudes favourable to the maintenance of the status quo and hence of dependency. Internal behavioural and attitudinal structures appear to have been just as effective in reducing benefits as any direct external linkages.

There is reason to believe, however, that the restraints operating in the defence and aircraft industries are more like those anticipated in theory. Although they are also internal, the requirements for higher quality control, increased documentation and planning, etc. are all "real" restraints, the solution to which entails significant market risk. In short, the freedom of the Canadian firms, particularly the smaller ones, to adopt and

adapt new technology may have been as restricted as much by internal structural constraints as by any reluctance to accept new technology.

For Canada, the legacy of dependency is not so much the existence of external constraints but the creation of internal attitudinal structures which, once in place, continue to hinder dynamic national enterprise long after the external constraints have (apparently) been removed. It appears as if external linkages are not necessary; Dependency appears to have been "internalized".

PRESCRIPTION

The solution for Canada, to recreate the internal structural links by capturing control of the innovation process, requires the successful co-ordination of policy between various government departments, industry, labour, and, not the least, a high degree of federal-provincial co-operation. This is a formidable political challenge. The achievement of a consensus is most unlikely because a state that has allowed all or part of its economy to fall into a state of dependency will find it very difficult to achieve the political and bureaucratic cohesion required to reach a policy consensus that will reduce the effects of dependency.

From a practical, political perspective, future "Benefits" programs should aim to achieve a far greater level of technology transfer than occurred with Aurora. The requirement for dollar-for-dollar offsetting purchases must be foresworn in favour of contractual requirements that transfer technology either directly, via "unbundled" licencing or by the creation of JVs. No risk, no-premium attitudes must be replaced by a realistic view of the world market and Canada's ability to compete in it. If a premium

is necessary then it is better that it is paid "up front" for technology rather than hidden in the cost of the product or traded for an offset. A more "dirigiste" approach to defence industrial policy is a must. "Off-the-shelf" defence purchasing does little for Canada. "Benefits" programs should be used as a means to regenerate the internal industrial linkages necessary to promote industrial strength, exports and to build up centres of excellence in key industrial sectors in the core industrial areas. Contractual arrangements must also ensure that the retraining (and movement) of the human resources, so necessary for innovation and adaption to take place, be coordinated with technology transfer. Like other countries Canada can also develop "advantage from necessity". It is one thing to be an un-military nation. It is another to be foolish about the benefits that increased innovation and excellence in certain core industries could provide - if they were released from the bonds of Dependency.

AFTERWORD

AREAS OF FUTURE STUDY

At the beginning of this study, the New Fighter Aircraft (NFA) program was just "taking off", so-to-speak. During the course of this research several items related to the NFA industrial benefits program were perused with great interest. There were suggestions in the data that the government had "learned" some of the lessons of Aurora.

Just as the first draft of this study was completed, the author became aware of a Government Task Force set up to study industrial benefits policy. Late in November 1984, the author was asked to discuss his findings with the Task Force. After discussing the general nature of his research methodology and findings, the author queried the Task Force on their findings to date. No substantial differences were noted at that time. The report of the Task Force, that is the "Report on a Review of Industrial Benefits Policy and Implementation for Major Crown Procurements" (the Cross Report), was published 31 December 1984. Although much wider in scope than this thesis, a perusal of the report confirmed the conclusions reached in this research.

Subsequent to the internal publication of the Cross Report, it has been learned that, as a result of bureaucratic interference at a high level, the results of the report were not sent to Cabinet. It is understood that the author refused to alter his report in order to make it politically acceptable. This thesis, therefore, may well be one of the first papers in the "public domain" to seriously question the present policy on industrial benefits. For this reason alone, it is most desirable that,

either individually or collectively, an independent, academic review be carried out on the various IB and O programs now underway, including NFA, the Canadian Patrol Frigate (CPF), and the Low Level Air Defence (LLAD) programs. 'It is apparent that the Government of Canada (and its higher bureaucracy) have not "learned the lessons of Aurora".

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