NATO in the 1990s: Conflict and Competition over the Defence Industrial Base-- The Case of the European Fighter Aircraft.

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Abstract

The central argument of this paper is that efforts to rationalise the European defence industrial base are both pre-requisite to and incompatible with the broader goal of Alliance-wide specialisation and rationalisation, at least within NATO as it is presently configured. Broadly, the contention is that rising weapons costs in the context of stable or shrinking defence budgets are moving the NATO alliance toward structural disarmament. In response to this trend, the Alliance has been forced to consider means of reforming its highly wasteful defence industrial effort so that the price of military preparedness can be kept within reasonable limits. From a simple economic perpective, the creation of a NATO-wide free-trade regime in defence goods would seem to be the optimal approach to this problem. Free trade, however, is fraught with political hazards that make it largely unacceptable to most Alliance governments.

An apparently attainable alternative to free trade in this connexion is "managed specialisation." Managed specialisation, however, also has its limitations. Put simply, in order to rationallise the Allied development and production effort, Europe must first of all "get itself

together" and begin producing competitive equipment at competitive prices. In order to achieve this, however, Europe must reform its own domestic market in order to realise US-scale production economies and capitalisation rates. The crux of the problem is that this necessarily requires greater European collaboration and protectionism, and ultimately suggests that Europe will begin to offer the US more global competition. As this is unlikely to sit well with the Americans, it would seem that-- contrary to the original intent-- European rationalisation seems destined to result in more, not less, fracture within the Alliance defence industrial base. Although the verdict is not yet final, the Eurofighter programme would seem to confirm this hypothesis.

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In the period immediately following the Second World War, traditional concerns regarding the cost of military preparedness became somewhat muted within the Atlantic Alliance. America's nuclear monopoly provided the West with the means to pursue the goal of security without recourse to heavy dependence on expensive ground forces, and effectively eclipsed any interest in maintaining Allied conventional forces at levels close to those of the Soviets. As a result of this nuclear dependence, however, Allied (particularly Western European) governments were largely insulated from the strategic implications of the contracting Alliance defence industrial base.(1) Relieved of the need to secure conventional parity with the Warsaw Pact, Allied governments were able to avoid making difficult decisions with respect to defence industrial preparedness, and to concentrate instead on expanding and developing other sectors of their economies. Over time, as one might expect, this neglect generated profound changes in the Alliance defence-economies. Western European

nations (and to a lesser extent the United States) experienced a severe contraction in defence-related industrial capacity and a marked reduction in their ability to develop and produce the military wherewithal required for conventional warfare. Of course, as long as Massive Retaliation remained stable and credible as the foundation of deterrence this was of little military consequence--under these conditions, the security of the Alliance was ultimately guaranteed without reference to NATO's conventional posture. As the nuclear bedrock began to crumble in the mid-1960s, however, concern over the Alliance's defence industrial base began to resurface, and NATO planners were forced to come to grips with the strategic implications of a stunted and inadequate defence-industrial infrastructure.

The advent of Soviet-American strategic parity sometime in the late 1960s seriously challenged then-dominant Allied attitudes toward defence industrial preparedness. With the credibility of America's nuclear umbrella seriously undermined, the European allies began to rediscover the threat posed by the Soviet Union and the associated need for effective non-nuclear military forces. This, coupled with emerging doubts about America's long-term commitment to Europe (as well as concern over the political and economic implications of dependence on the American defence industry), suggested to Western European governments the need to expand the European armaments base and develop a

more robust indigenous defence-industrial capacity. Similarly, strategic parity rekindled dormant American interest in the defence industrial capacity of the Alliance. Confronted with the reality that nuclear war now threatened the physical security of the United States, American political and military leaders desperately sought to reduce the risks associated the all-or-nothing nature of Massive Retaliation. Accordingly, the US government not only took steps to protect and enhance its own conventional deterrent and defence industrial base, but also strongly encouraged the new European consciousness. To be sure, this response was quite obviously based on American perceptions of the US national interest and the belief that a more effective conventional capability in Europe would ultimately limit any future war to a protracted conventional conflict in the European theatre. Whatever the reason, however, early American support for the rationalisation and expansion of the European defence industrial base set in motion a process that would ultimately generate significant levels of conflict within the Alliance-- over the long run threatening to seriously impair the economic efficiency of the Alliance defence industrial base.

Strategic parity and the renewed conventional threat, then, have forced the NATO allies to pay attention to some of the more serious problems associated with the Alliance's ailing defence industrial base. Put simply, the alliance

has come to realise that its production of conventional weapons systems is extraordinarily wasteful and inefficient. NATO is unable to muster an adequate conventional deterrent (both in term of readiness and sustainability) largely because it cannot maximise the military output obtained for a given input of resources. Wasteful duplication of research and development, unexploited economies of scale and learning, and expensive parallel support facilities have all tended to erode NATO's defence industrial base and have quite naturally resulted in a seriously attenuated capacity for conventional defence.

From a military perspective, of course, the simple and obvious remedy for NATO's preparedness ills is to reverse current trends by rationalising and standardising the Alliance's defence-industrial infrastructure. Such a move would enable NATO to produce and sustain a comprehensive range of conventional weapons without necessarily placing a further economic burden on the various Allied governments. Problems arise, however, when one moves out of the relatively simple world of military logic, and into the more complex universe of economic, politics, and alliance dynamics. Within this broader context, the solutions to NATO's defence industrial problems have been neither simple nor obvious-- indeed, despite a great deal of effort on the part of both scholars and politicians, in recent years they have proven particularly elusive.

As a result of divergent social conditions, economic concerns, and strategic perceptions, the "two-pillars" of the Atlantic Alliance (the US and Western Europe) have been conspicuously unable to forge a single integrated defence industrial base, or even to significantly co-ordinate defence production and industrial planning. Consequently, efforts to enhance and rationalise the defence industrial infrastructure of the Alliance have generally made within two separate political and institutional frameworks. On the one hand, the United States, with its huge domestic defence market and natural comparative advantage in the arms industry, has promoted specialisation and various forms of sectoral free trade as a means to Alliance-wide defence industrial rationalisation. This approach has been attractive to many (but by no means all) Americans largely because it affords the US improved opportunities to export defence systems and sub-systems to Western Europe, and thus partially offsets the US military balance of payments deficit while at the same time maintaining America's technological edge. The Europeans on the other hand, with their historically fragmented regional defence market, have attempted to enhance their regional defence industrial base through state-led intervention in the market-place. To the European allies, specialisation based on comparative advantage, while having some military merit, is perceived as threatening to both national sovereignty and regional

economic development. As a result, nationalisation, protectionism, and export-subsidisation are all important components of European defence industrial policy.

The result of this two-pillar approach to defence industrial production and procurement has been an increasing tension between America and Western Europe. In effect, the whole issue-area of preparedness has become a sort of battleground for the competing and conflicting interests of the Allies, with both sides accepting the goal of rationalisation but with neither side able to accept the other's vision of how to achieve that objective. While it is important at this point not to overemphasise the immediate threat this poses to the Alliance, it is perhaps equally important not to ignore the long-term implications of this type of centrifugal process; for within the context of what many perceive to be a "widening-Atlantic", conflict and competition over the defence industrial base does pose a serious threat, both to the short-term workability and long-term viability of the Atlantic Alliance.

THE PROBLEMATIC

Military Preparedness and the Threat of Structural Disarmament

National defence and security, it seems, are long-standing political concerns that are deeply rooted in the nature of the international economic order. Given the anarchic character of the global community, of course, and the pervasive competition among nations for security and power, this is not particularly surprising-- an international system lacking any "sovereign" or binding judicial power must typically subject disputes to the arbitration of military might and physical coercion.(2) Both history and a substantial body of political theory, then, suggest that the very structure of the global states-system tends to generate fear and insecurity (and ultimately war) among nations.

A corollary of this pervasive conflict and insecurity among nations is the near ubiquitous pre-occupation of states with the pursuit of military preparedness. In an

international system largely defined in terms of anarchy and discord, of course, it is military force which is both the most immediate and visible danger to the sovereign state, and the principal means of protecting the physical integrity and political values of the nation. In this connexion, Adam Smith argued over 200 years ago that military force was indispensible to the state, and that in fact it was the primary responsibility of government to ensure adequate levels of defence. To quote Smith:

> The first duty of the sovereign [is] protecting the society from the violence and invasion of other independent societies, [and that] can be performed only by means of military force.(3)

Given the nature of the international states-system, then, it would seem that military preparedness is intimately bound up with the core interests of the state--or, more precisely, national sovereignty and security. This being the case, it is perhaps not too surprising that states have almost invariably sought to provide themselves with some level of military capability; from the earliest times to the present, governments have been compelled to raise armies and navies (and later airforces) to protect their respective nations from the "violence and invasion" of others. And, if history has anything to teach us, as long as the international system remains premised on conflict and competition, it is difficult to imagine that the necessity for military preparedness will abate to any appreciable degree.

Having in some measure established the roots of the military preparedness issue, it is perhaps useful to consider more fully the nature and implications of the concept. Essentially, preparedness refers to the "readiness" of a state to employ military force in the pursuit of its national interest. Of course, as is usually the case in the social sciences this phenomenon does not lend itself particularly well to exact definition. It is possible, however, to enumerate some of the characteristics of the concept, and oultine some of its more significant political implications.

One of the more politically interesting features of military preparedness is that, regardless of whether it involves the pursuit of readiness (forces-in-being, available war stocks, etc.), or sustainability (industrial surge capacity, mobilisable resources), it seems that some form of economic penalty or cost is necessarily incurred. As Hitch and McKean argue,

> The problem of national security might in theory be regarded as one big economic problem. The nation has certain resources-- now and prospectively in the future-- which are classified by economists as various sorts of land, labor, and capital. These resources can be used to satisfy many objectives of the nation and its individual citizens-- national security, a high standard of living, a rapid rate of growth, and so on. These are, of course, competing objectives. In general, the more resources a nation devotes to national security, the less it will have for social security and vice versa.(4)

Clearly, then, the pursuit of military preparedness is not a costless activity. National security requires that some portion of the economic resources of the nation be allocated to military purposes in peacetime, and some provision be made to mobilise additional resources in times of war. Thus, in the form of either actual expenditure or as opportunity costs, military preparedness requires that economic resources be diverted from civilian consumption and investment and be allocated instead for the provision of military goods and services.

A second, related, aspect of military preparedness is that there exists a positive relationship between economic complexity and technological sophistication on the one hand, and the magnitude of the preparedness burden on the other. Broadly, as weapons become more technologically sophisticated, and as the defence production base itself becomes more complex and capital intensive, the cost of military preparedness tends to increase dramatically.(5) In this connexion, Norman R. Augustine, an industrialist and former chairman of the Defense Science Board, has noted that,

> the unit cost of military equipment, as with much other high technology equipment, is increasing at an exponential rate... From the days of the Wright brothers airplane to the days of modern high performance fighter aircraft, the cost of an individual aircraft has invariably grown by a factor of four every 10 years.(6)

This tendency (known as Augustine's Eighth Law) is

significant in that, within the context of a limited economic resource base, states are only able to allocate relatively limited resources to the military sector. Thus, if defence inflation outstrips economic growth (ie. weapons prices rise faster than defence budgets) the state will tend to enjoy diminishing returns on its preparedness investment, with fewer and fewer goods procured for a given expenditure. In this respect, Augustine's observations are again both insightful and suggestive.

> When the trend curves for the national budget for defense and the unit costs of tactical aircraft are, in fact, extended forward in time... a rather significant event can be predicted for the not too distant future. Namely, the curves intersect... In the year 2054, the entire [US] defense budget will purchase just one tactical aircraft.(7)

The inevitable result of the steadily increasing complexity of the defence industrial base, then, has quite clearly been that the "expense of preparing military forces in time of peace, and employing them in time of war"8 has become significantly greater. Even as late as the dawn of the industrial age, small duchies and principalities could independently bear the expense of sustaining some credible level of military preparedness. In the latter half of the twentieth century, however, only the superpowers can even approximate defence industrial autarky-- and even their independence is being eroded by skyrocketing costs and profound changes in the structure of the international economic system.(9)

This, of course, raises some interesting political questions; for if politics is indeed (in some measure at least) the art of resource allocation, one is moved to inquire precisely how states will go about furnishing increasingly expensive military forces in the context of low levels of economic growth and increasing demands for civilian investment and consumption. Moreover, for many nations this basic question is complicated by the fact that not only must an internal or domestic balance be struck, but external factors such as alliance relations must also be considered. In connexion with the NATO alliance in particular, it seems that the profusion of competing national and factional interests may well prove irreconcilable within present structures-- suggesting that perhaps defence inflation and the threat of structural disarmament will act as a trigger for a re-organisation or dissolution of the European-American defence connexion.

Traditional Approaches

As a result of the tendency to price preparedness beyond the easy reach of most states, governments are increasingly being forced to take steps to minimise the costs of furnishing adequate and sufficient military forces. Because the cost growth in the military

preparedness sector is essentially related to the "procurement of small numbers of highly-customized traditional weapons, produced domestically, and operated by volunteer forces",(10) there are three particular areas in which economies might be achieved. First, in principle the state can reduce its preparedness expenditures by reducing manpower costs through contraction. Because of the obvious expenses associated with feeding, training, and equipping service personnel, governments have traditionally viewed the reduction of manpower levels as a sort of "royal road" to preparedness cost reduction. In this connexion, savings are supposed to obtain as a result of reduced expenditures on pay, housing, and the countless other support services associated with large standing armed forces.(11) The actual savings realised as a result of contraction, however, are not always as significant as its proponents would like to believe, and there is some evidence (both theoretical and historical) to suggest that manpower reductions actually result in increased defence costs. For example, although the British government reduced the size of the armed forces by more than half between 1957 and 1979,(12) defence spending rose by over 221m pounds (constant 1970 value) during the same period. In this connexion, it seems that the capital improvements, higher training costs, and increased use of civilian personnel associated with contraction all tend to offset whatever savings may be obtained as a result of reductions in the

size of the military payroll.

A second means by which governments have traditionally attempted to reduce the cost of military preparedness is through curtailing capital expenditures on weapons systems and other military equipment. Basically, this approach can take two forms. On the one hand, a government may opt to alter its strategic or tactical requirements, and so completely eliminate the necessity for a particular family of weapons (for example, a category of tank, combat aircraft, or warship). This approach is intended to reduce preparedness costs in that it relieves the state of the need to develop or procure certain types of expensive, high-technology defence equipment.(13) On the other hand, the state can cut capital costs by adopting "cheap-and-cheerful" weapons-- that is, by meeting mission-specific requirements with relatively simple, mass-produced military equipment.(14) In this connexion, savings are expected to obtain as a result of reduced development costs, lower procurement costs, and a substantially cheaper life-cycle (ie. fewer and less expensive maintenance costs).(15) In different historical circumstances, both of these approaches have resulted in a reduction of the preparedness burden, and both continue to enjoy considerable support in certain political circles within the Atlantic Alliance.

Historically, reducing capital requirements seems to have been an effective and preferred approach to bridging

the growing gap between military commitment and economic capability. In the context of the contemporary Atlantic Alliance, however, this strategy has its rather obvious and unavoidable limitations. Many Western European nations, for example, have already reduced their strategic commitments and capabilities to the point where further reductions can be made only at the expense of national and collective security. This being the case, it seems that at some point in the near future (if indeed this point has not already been reached) Allied governments will be unable to initiate further large-scale capital cuts within their respective armed forces. Nor does it seem likely that NATO will be able to realise significant savings as a result of adopting relatively unsophisticated, "cheap-and-cheerful" military equipment. The Warsaw Pact has long enjoyed a substantial (and, many would argue, growing) quantitative advantage over the Atlantic Alliance in terms of conventional military forces (infantry units, tanks, artillery, etc.).(16) Under these conditions, the credibility of NATO's conventional deterrent has come to depend quite heavily on the qualitative superiority of Western military technology, making it decidedly difficult to imagine the Western Allies abandoning their high-technology arsenals in favour of cheaper, but less "effective", military hardware. All told, it would seem that few additional savings can be expected to accrue to the Alliance as a result of either reductions in manpower

levels, or cuts in capital requirements.

A third approach to meeting the rising costs of military preparedness involves making more effective use of available defence-industrial resources. In this connexion, savings are supposed to obtain as a result of a more "rational" allocation of scarce development and production resources, resulting in the reduction and eventual elimination of waste and overlap throughout the weapons-production cycle. Within the context of the Atlantic Alliance, rationalisation offers perhaps the greatest potential for cost-cutting and budgetary savings; for, as many critics have observed, NATO-- at least in strictly economic terms-- is grossly inefficient when it comes to developing and manufacturing military equipment. In the words of one observer,

> In the early 1970s, the United States was spending about $5 billion a year on weapons research and development, and the European nations were spending just over half that much. Since most European programs duplicated work already being done in the United States, some argued that around $2 billion of the alliance's R&D spending was wasted. In addition there is a significant amount of duplication of R&D programs among the European nations because of the lack of coordination among them. This has the additional effect of placing the European aerospace industry at a disadvantage in its competition with the United States because [US] Department of Defense policy largely eliminates duplication of R&D effort by US companies, thereby reducing their overall development costs.(17)

Inefficiency on this scale, of course, has important implications in terms of performance and productivity

within the various defence industries. For example, in the context of a limited defence market, the development and production of a wide variety of weapons of the same type (say tanks or missiles) reduces the number of each line that can be manufactured and sold. This in turn forces the producers of military goods into sub-optimal production arrangements, and substantially raises the unit costs of weapons and other defence-related equipment. Within the context of the NATO alliance, there is ample evidence to suggest that this has typically resulted in overpriced military goods, and a significant reduction in the amount of "protection" that NATO can afford to purchase. In fact, Thomas Callaghan assessed the total cost premium associated with redundant research and development efforts and over-lapping procurement schedules at an astounding 25 per cent for European firms, and a lower, but all the same troubling, 10 per cent for American arms manufacturers. In monetary terms, Callaghan estimated that this duplication and inefficiency was costing the NATO allies somewhere in the region of $US 10 billion (in 1975 dollars).(18) While this estimate may have been somewhat exaggerated (19) the order of magnitude of Callaghan's figure nevertheless suggests that there is substantial room within the Alliance for improvement in the efficiency of military development and production.

Rationalisation and re-organisation of the NATO defence industrial base has traditionally taken place from two

directions.(20) On the one hand, member governments have attempted to co-ordinate *demand* for military goods and equipment through intra-alliance agreements establishing common equipment requirements, performance specifications, and replacement schedules. As one observer has noted, this type of co-operation offers two possible benefits.

> First, it may be thought that substantial military advantages may accrue from different armed forces being equipped with the same weapon type in the event of war. Second, it may appear that, by providing for a multi-state market for a weapon, the individual forces in that market can hope to be able to buy it more cheaply.(21)

With respect to the latter, savings obtain primarily as a result of the more efficient use of labour and capital. Under ideal conditions, the greater the order, the more scope for economies of scale and learning derived from long and/or fast production runs.(22) On the other hand, Allied governments have sometimes attempted to co-operate with respect to the *supply* of military hardware. Typically, this type of arrangement involves agreement on matters related to project organisation and management, industrial property rights, and the international allotment of development and production work. The co-operative supply of weapons reduces unit costs in that,

> average fixed costs can be reduced by eliminating redundant research-and-development efforts, doing away with duplicated production facilities, and spreading the remaining fixed costs over higher production runs for an expanded market.(23)

In principle, of course, there is no necessary correlation between the co-ordination of military demand, and the co-operative production of weapons and other defence-related goods. History suggests that it is entirely possible for the increased demand created by a unified market to be met by a single producer, either through regular sales or military aid.(24) Within the context of the Atlantic Alliance, however, standardisation-- at least as it refers to equipment commonality-- has served as an important link between co-ordination of demand and rationalisation of supply. In short, the adoption of common or standardised equipment types within NATO has tended to produce international co-operation with respect to development and/or production. In fact, in recent years, standardisation has emerged as something of a *sine qua non* for arms co-operation and defence-industrial rationalisation within the North Atlantic Treaty Organisation.

In pursuit of standardisation and the associated military and industrial benefits, the Alliance is presented with a number of broad policy alternatives, ranging between the extremes of politically negotiated work-sharing agreements on the hand and the natural operations of the market system on the other. Briefly, the alternatives are as follows:

(a) *Licensed manufacture and co-production.* This type of arrangement involves the "domestic manufacture of another nation's weapons, either wholly or in

part". The distinction between licensed manufacture and co-production lies primarily in the extent of the co-operation. Typically, licensed manufacture refers to a co-operative arrangement under which the licensee builds for its own order only. Co-production, on the other hand, involves production-sharing not only on the licensee's order, but also on the main manufacturer's order, and any third party or export orders. This policy option is believed to confer several important benefits on both the main manufacturer and the licensed producer. With respect to the former, licensing allows firms to generate additional revenue through greater sales volume, license fees (up to 10 per cent of sales), and the provision of technical advice, support, and training services. Moreover, when a firm sells technology that is approaching the end of its product-cycle (as is often the case) it significantly extends the profitability of that technology.(26) For the licensee, the benefits are more numerous and in many ways more substantial. Specifically, the purchase of licensed technology results in substantial R&D savings compared with an independent national venture. In the case of the European purchase of the General Dynamics F-16, for example, the licensees were required to pay only US$164 million (1975 prices) toward research and development costs-- a fraction of what the Americans spent to develop and produce the aircraft.(27) In addition, nations involved in the licensed manufacture of weapons benefit in terms of their balance-of-payments situation (defence monies are spent in the home market as opposed to foreign markets), employment levels (a guaranteed 43,000 man-years of work in Britain as a result of the AWACS purchase), and technological capability (European production technology advanced 5-8 years because of the information transfer associated with the F-16 purchase).(28)

Licensed manufacture and co-production, however, are not costless policy options. It has been demonstrated, for instance, that shorter production runs, the loss of learning economies, and expensive licensing fees all result in unit costs higher than if the product been purchased "off the shelf" directly from the main manufacturer.(29) Moreover, additional cost penalties can be incurred as a result of national modifications to co-produced equipment (higher R&D costs, lower production runs), the "equitable" distribution of work (resulting in duplicate tooling), and the time required to transfer product and production technology. All told, the evidence suggests that the typical cost premium associated with licensed manufacture and co-production is somewhere in the region of 10-50 per cent,(30) depending on factors

such as the technological sophistication of the licensee, and differences in labour rates between main the manufacturer and the licensed producer.

(b) *Joint development and production.* This option involves industrial collaboration not only with respect to component production and final assembly, but also during the design and development stages. In its simplest form, the rationale underpinning joint ventures suggests that major savings will result if a group of nations pools its research and development resources, and combines its order to purchase a single product. To use a hypothetical example,

> A typical case might be two nations each producing an aircraft with R&D costs of 1000 million pounds (duplication), each with a domestic requirement for 200 units. *Ceteris paribus*, a joint venture with equal sharing would save 1000 million pounds on R&D (ie. 500 million pounds per nation) and result in learning economies which would reduce unit costs by 10 per cent as output is doubled from 200 to 400 units.(31)

These savings are supposed to enable participating nations to produce military equipment that they would otherwise be unwilling or unable to afford. Moreover, there are significant non-budgetary advantages to joint projects. For example, each partner retains some form of domestic defence industry; each partner continues to benefit from military high-technology and commercial spin-offs; and, each partner maintains employment levels and avoids the social dislocation associated with industrial contraction and collapse.

As was the case with licensed production, however, the decision to collaborate on weapons development and production is not a costless option. Typically, joint ventures incur cost premia as a result of two factors. First, on any given project some or all participating nations might require modifications or national inputs. This increases research and development expenditures and reduces the savings associated with long production runs of a single type (economies of scale). Second, because nations generally wish to share in the benefits of an advanced development and production venture, joint projects almost invariably involve work allocations based on equity rather than efficiency.(32) This being the case, costs tend to rise as specialisation is inhibited and design and production efforts are duplicated.

Hypothetically, then, joint projects offer participating nations the potential for substantial savings over independent national ventures. Indeed,

under ideal conditions a joint effort can reduce development costs by up to 50 per cent (assuming a two-nation effort) and production costs by as much as 10 per cent. Collaborative ventures of this nature, however, are more likely than not to depart from ideal conditions. Experience suggests that, overall, joint projects typically incur cost premia in the region of 30-60 per cent--although equal sharing on a two-nation project means that each partner can still realise savings of about 35 per cent on R&D and 10 per cent on production.(33)

(c) *Managed Specialisation.* Essentially, managed specialisation involves "the benefits of collaboration in the context of current production patterns--integration without tears".(34) This form of rationalisation means that Europe and America would each specialise in the development and/or production of goods according to a politically negotiated division of labour. Ideally, this type of arrangement would significantly reduce needless and wasteful duplication, presumably resulting in substantial improvements in Allied standardisation and equally substantial budgetary savings for participating nations. Moreover, as specialisation would be politically regulated, re-allocation of production capital need not be carried to its (economically) logical extreme -- thus addressing political and economic concerns on both sides of the Atlantic and softening the more painful social adjustments associated with free trade (see below).

Managed specialisation, however, while generating some rather significant savings, also necessarily involves certain economic and political penalties. First, there are cost premia related to the production and assembly duplication associated with the politically derived objectives of equity and autonomy. Thus, as often appears to be the case, one of the more important political benefits attached to managed specialisation is also a liability with respect to economic efficiency. Second, there are also concerns that managed specialisation will undermine the technological elan of the West, over time resulting in higher prices and lower quality military equipment.(35) The Americans in particular have evinced concern in this regard, and have suggested (and to some extent pursued) an alternative form of managed specialisation that emphasises industrial teaming and the allocation of sub-contracts through politically negotiated agreements. And third, there are problems related to the actual allocation of development and production work. In both Europe and the US there is a fear that firms and nations that handle one type of technology will fall behind in

others-- creating or perpetuating a technology gap. Perhaps more importantly, however, it appears that a crucial pre-condition for managed specialisation is the politically difficult task of harmonising equipment requirements. As Lawrence Hagen argues,

> ...requirements must be roughly simultaneous, to allow precise tradeoffs within projects. It is unlikely that one state would agree to transfer the technology from an earlier project, or promise to purchase weapons from a completed production process, without contemporaneous activity in the other direction.(36)

(d) *Sectoral free-trade.* Essentially, this method of achieving standardisation involves "the creation of a competitive NATO free-trade area, with no restrictions on the entry of new firms into national markets."(37) According to classical economic theory, substantial economic benefits would accrue to the Alliance under such an international trade regime. Put simply, free-trade means that each of the European and American allies would specialise in the development and/or production of those goods in which it had a comparative advantage. The natural operation of market forces would then produce a significant rationalisation of NATO's defence industrial base (ie. reduce or eliminate duplication and waste), and a substantially enhanced level of standardisation within Alliance armed forces. Under such conditions, NATO could expect direct budgetary savings of somewhere in the region of 20-30 per cent per annum.(38)

Sectoral free-trade, however, as is the case with most policy options, involves certain economic and non-economic penalties. In the context of the Atlantic Alliance, for example, the international re-allocation of defence industrial resources associated with competition and free-trade could be particularly damaging to Western European economic prospects. As the United States enjoys a pronounced comparative advantage in the development and production of high-technology weaponry (longer production runs, more efficient plant, greater R&D budgets, etc.) any free-trade regime would threaten to relegate the European allies to the status of "industrial helots" or "metal-bashers." Should this occur, the Europeans would suffer in three respects. First, countries such as France, West Germany, and the United Kingdom would suffer a substantial loss of employment as non-competitive firms were forced to close down or re-locate.(39) In the UK, then, where the defence industry employs over 700,000 people,(40)

the short-term effects of free-trade in defence goods. (apart from the obvious political fallout) could be expected to range from increased social welfare payments to foregone tax revenues. Over the longer term, there is the very real danger that a substantial loss of high-technology jobs could produce increased emigration of skilled labour and an accelerated "brain drain"-- neither of which would particularly improve Britain's future international competitiveness. There is little evidence to suggest that the other main European arms manufacturers would not suffer a similar fate. Second, the loss of technologically advanced defence industries would drastically reduce the competitiveness of European industry as a whole. As the changing international division of labour has forced Western European countries to abandon the more labour-intensive manufacturing sectors, the future economic health of the region has come to depend more and more on the "commanding heights" technologies associated with the aerospace, information processing, and electronics industries.(41) Third, any large-scale re-allocation of defence research and development capacity to the US would render Western Europe dependent on American goodwill for military equipment and spare parts. This, of course, would leave the European allies politically vulnerable and severly disadvantaged in future economic and political dealings with the United States. Moreover, while competition and free-trade might result in lower procurement costs, there is a concern in Europe that life-cycle and maintenance costs would rise dramatically under a sectoral free-trade regime.(42)

It would seem, then, that while in principle states facing the prospect of impending structural disarmament have a number of policy options open to them, in the context of contemporary NATO the Allies are required to focus their attention more narrowly on rationalising their defence industries and making more effective use of their collective industrial resources. This necessity, of course, immediately raises the question of how to best achieve these ends-- or, more precisely, how to achieve these ends

within the context of a stable and healthy alliance. As several studies have suggested,(43) the only options that offer the possibility of significant cost savings are specialisation through free trade and managed specialisation. The real questions, then, are which of these two approaches the Alliance should adopt and what are the consequences of each. It is to these issues we must now turn our attention.

Endnotes

1 The United States General Accounting Office (GAO) offers one of the better definitions of "defence industrial base".

> The term "defense industrial base" refers to the business firms and government facilities that produce the weapons and allied services purchased by the Department of Defense. The business firms that make up this base include large corporations and small family owned companies. Some manufacture both defense and non-defense products. Their activities range from assembling major weapons (such as tanks, aircraft, and missiles) to supplying small parts (such as washers, screws, and fittings) and to machining already manufactured parts.
>
> Companies that supply the armed services directly are called prime contractors. They are at the top, or first tier, of the many layered defense industrial base. Below them are other firms called subcontractors, or second tier contractors. A third tier is made up of companies that supply items directly to the second tier. Currently the defense industrial base is made up of 25,000 to 30,000 prime contractors and about 50,000 firms in the lower tiers.

See, US General Accounting Office, "Report to the Honorable Sam Nunn, United States Senate, Overview of the Status of the Defense Industrial base and DoD's Industrial Preparedness Planning", GAO/NSIAD-85-69, May 23, 1985, p. 1.

2 For a more detailed discussion of this concept see K. Waltz, Theory of International Relations; H. Morgenthau, Politics Among Nations; and, B. Buzan, People, States, and Fear.

3 Adam Smith, "Of the Expense of Defence," in The Wealth of Nations vol. 5, part 1. Chicago Encyclopedia Britannica, 1952.

4 C. Hitch and R. McKean, The Economics of Defense in the Nuclear Age, (Cambridge, Mass: Harvard University Press,

1967), p.3

5 "The argument in this section is that defence inflation is not an inexorable alien force, but merely the economic manifestation of a tendency by defence planners to choose expensive solutions to a large variety of distinct military and technical problems." See, R.P. Smith, "Defence Costs," The Future of British Defence Policy, (Aldershot, UK: Gower Publishing, 1985), p. 148.

6 Norman R. Augustine. Augustine's Laws and Major Systems Development Programs. A compilation of reprints from Defense Systems Management Review, Defense Electronics, Astronautics and Aeronautics, and the Washington Post. Privately printed, 1981. pp 21-22.
For further information on defence equipment cost increases see Statement of Defence Estimates 1981, Cmnd 8212-1, London: HMSO, April 1981. p.45; R.L. Sivard. World Military and Social Expenditures 1980, (Leesburg, Va.: World Priorities, 1980), p.11.; R. Facer. "The Alliance and Europe: Part III. Weapons Procurement in Europe--Capabilities and Choices." Adelphi Paper No. 108. (London: IISS, 1975.); and, J.S. Gansler. The Defense Industry, (Cambridge, Mass.: MIT Press, 1980) pp. 15-17 and 83.

7 ibid.

8 Adam Smith, *op cit.*

9 For a more detailed development of the argument that rising defence costs are eroding the capability of states to provide adequately for national defence and security see Thomas A. Callaghan, "The Structural Disarmament of the West: Our most Critical Defense Industrial Challenge." in Industrial Capacity and Defense Planning, Final Report, US Military Academy 1981 Senior Conference (West Point, NY: AG Printing Office).

10 R.P. Smith, "Defence Costs." in The Future of British Defence Policy, (Cambridge: University Press, 1985), p.156.

11 Thus, for example, one of the first measures adopted by the UK government as a result of Britain's post-war economic decline was the reduction of the manpower component of the British armed forces from over 840,00 in 1948 to approximately 315,000 by the late 1970s. See K. Hartley, "Defence: A Case Study of Spending Cuts." in Big Government in Hard Times, C. Hood and M. Wright (eds.) (Oxford: Matin Robertson & Company, 1981), pp. 128-129.

12 ibid., p.127.

13 This was the approach adopted by the United Kingdom

during the 1960s and 1970s. By abandoning Britain's "world-wide" military role, and consolidating the commitment to European defence the British government was able to phase-out the Royal Navy's major capital ship-- the aircraft carrier-- and the RAF's family of strategic bombers. See K. Hartley, "Defence: A Case Study of Spending Cuts." in Big Government in Hard Times, (Oxford: Martin Robertson & Company, 1981), pp 132-135.

14 "Defence Costs." op cit., p. 149.

15 An example of this is the USAF's "hi-lo" weapons mix. The advanced high-technology F-15 fighter aircraft is far too expensive to procure in quantities sufficient to meet American strategic requirements. Accordingly, the relatively low-technology and much cheaper F-16 has been procured to bridge the gap. For an account of this approach in the US context, see C. Myers, "Hi/Lo What?" Military Science and Technology 1 (Spring 1981): pp. 48-52.

16 The Military Balance 1986-1987. (London: The IISS, 1987)

17 R. Saunders, "NATO Standardization and Military Effectiveness." in Conventional Deterrence, p. 194.

18 Thomas Callaghan, US-European Co-operation in Military and Civil Technology (Washington, D.C.: Center for Strategic and International Studies, Georgetown University, 1975), p. 37

19 Contrast Callaghan's figures with those of the US Department of Defense. In this connexion see, Report to Congress on the Standardization of Military Equipment in NATO and Other Related Actions, 1975, and Methodology to Quantify the Potential Net Economic Consequences of Increased NATO Commonality, Standardization, and Specialisation, vol. II of the Report by C&L Associates for the Vertex Corporation, 13 Oct. 1978.

20 T. Taylor, Defence Technology and International Integration (New York: St. Martin's Press, 1982): p.3.

21 ibid.

22 For a rather exhaustive discussion of the logic surrounding economies of scale see, K. Hartley, NATO Arms Co-operation, pp. 41-68; for a discussion of learning curves see, Methodology to Quantify.., op cit.

23 J.R. Golden, "NATO Industrial Preparedness," in Conventional Deterrence, p.46.

24 Thus, throughout the later 1940s and the 1950s the

United States produced most of the military equipment used in Western Europe. With the recovery of European industry, however, European weapons began to proliferate within the Alliance, and standardisation suffered accordingly. See, J. Feldman, "Collaborative Production of Defense Equipment within NATO." Journal of Strategic Studies, vol. 7, #1 (March 1984), p. 284.

25 Hartley, NATO Arms Co-operation, p. 78.

26 If a firm is, say, 10 years ahead of its competitors, it can profitably sell technology which is 5-9 years old. As this technology would soon be widely available in any case, it is prudent to sell it while it can still command a good price. See K. Hartley, NATO Arms Co-operation, op cit., pp. 132-133.

27 ibid., p.135.

28 ibid., pp. 124-139.

29 ibid.

30 K. Hartley, The Structure of European Industry, p.239. The UK F-4 Phantom fighter aircraft, for example, cost 23%-43% more than off-the-shelf American units, largely because of national modifications including British avionics and Rolls-Royce engines

31 K. Hartley, NATO Arms Co-operation, p. 78.

32 ibid., p.148.

33 Hartley, NATO Arms Co-operation, p. 161.

34 Lawrence Hagen, Twisting Arms: Political, Military, and Economic aspects of Arms Co-operation in the Atlantic Alliance (Kingston: QCIR, 1980): p. 99

35 Defense Science Board, Achieving Improved NATO Effectiveness Through Armaments Collaboration report of the 1978 Summer Study, December, 1978, p. 30. Cited in Hagen, Twisting Arms, p. 101.

36 Hagen, p. 101.

37 K. Hartley, "Defence Procurement and Industrial Policy", in The Future of British Defence Policy, p. 168.

38 ibid.

39 It is important to note that not all European industries are unable to compete internationally. The UK, for example, is highly competitive in aircraft subsystems such

as avionics and ejector seats.

40 K. Hartley, "Defence Procurement and Industrial Policy", p. 169.

41 R. Nobbs, "Air Industry Policy Report", The European Alternatives, ed. G. Ionescu (The Hague: Sijthoff and Noordhohh, 1979), p. 162.

42 K. Hartley, NATO Arms Co-operation, pp. 116-118.

43 See Hagen, Twisting Arms; and Taylor, Defence, Technology and International Integration.

ALLIANCE OPTIONS:
SECTORAL FREE TRADE

Introduction

Classical liberal economic theory suggests that whenever one country has a comparative advantage over another in producing some good, specialisation can increase national and international output and result in a more efficient use of each country's resources. Not surprisingly, many Western economists and politicians have advocated this type of approach as a solution to the defence-industrial malaise currently plaguing the Atlantic Alliance. According to proponents, while various collaborative production schemes might contribute in some small measure to rationalisation, only unrestricted competition and free trade can produce the Alliance-wide specialisation necessary if the West is to avoid the slide into structural disarmament and military vulnerability. Essentially, the argument for sectoral free trade suggests that NATO's capacity for conventional deterrence and

defence is seriously undermined by a marked lack of equipment compatibility among Alliance armed forces, and inter-generational order-of-magnitude increases in the cost of military hardware. Free-trade is intended to ameliorate this situation in two ways. First, free trade based on competitive bidding for contracts and no entry barriers to foreign firms would inevitably result in a very high degree of equipment commonality within NATO. Broadly, a liberalised trade regime in defence goods would mean that member governments would procure military equipment on a cost-effectiveness basis and without reference to other political or social objectives. Under these conditions a single producer could be expected to supply a particular equipment type (say a combat boot or fighter aircraft) to all Alliance armed forces-- resulting in both enhanced tactical inter-operability and improved logistical efficiency. Second, a NATO-wide free-trade area in military equipment would produce a more rational and efficient allocation of defence-industrial resources within the Alliance. As one observer notes,

> The greatest savings would come from a system of completely unrestricted trade and specialization in weapons production among NATO allies because each country would tend to make those items that it could produce with the greatest relative efficiency and could sell enough of those items to allow its industries to operate at a very efficient rate.(1)

In this connexion, free trade in arms would maximise the military capability NATO could expect to obtain for a given

input of resources-- affording the Alliance considerably more "bang for the buck" than it currently enjoys.

In the structure of the argument as a whole, the role of this chapter is to develop a fairly comprehensive picture of the benefits attached to greater specialisation and free trade in Alliance defence production. It should be noted, however, that this scenario quite consciously reflects the benefits associated with free trade under *ideal* circumstances-- that is, free trade as it might develop within a "politics-free" Alliance. The objective here is to detail the economic logic underpinning the intra-alliance trade liberalisation argument, with the intent of later contrasting this to the political logic opposing such an arrangement.

Military Benefits Of Sectoral Free-Trade

Historically, Alliance-wide standardisation and free trade have been presented as important means of addressing the growing conventional force imbalance in the European theater. Since the 1970s, a period in which the various Warsaw Pact armed forces underwent intensive modernisation, this imbalance has grown to the point where many observers feel that the West is currently unable to resist a Soviet attack in Central Europe. To quote a US Congressional Budget Office report,

> With respect to one full-scale war, as NATO forces are now configured, the alliance could successfully defend itself against an attack by 90 Warsaw Pact divisions. But there is little likelihood [that this would be the case].... the Soviets would likely mobilize at least 30 more divisions, raising the threat to NATO's central region to 120 divisions.
>
> At present, however, NATO'S forces have too few divisions to defend against a 120 division threat. Even resorting to theater nuclear weapons would give NATO only a temporary respite before it would begin to feel the debilitating effects of Pact nuclear counterstrikes. Current US plans for hastening the movement of reinforcements to Europe would not materially correct this balance.(2)

One of the more important reasons why NATO cannot field the greater numbers of ground force formations, fighter aircraft, and warships that would redress this imbalance is that presently there is far too much duplication of effort within the Alliance. For example, NATO currently employs over two dozen anti-tank weapons, a variety of tanks, more than 50 types of ammunition, and numerous models of combat aircraft.3 As each of these weapons types has its own distinct production line, training facilities, maintenance requirements, and logistical infrastructure, this is not particularly cost-efficient either in terms of development and production or life-cycle expenses. Moreover, as equipment is seldom inter-operable between national armed forces, it has been argued that lack of standardisation has resulted in a significant reduction in the combat potential of NATO-- put simply, Allied forces are less effecitve because they are unable to fight alongside each other

effectivley or reinforce each other as needed.

Historically, then, standardisation and specialisation through free trade have been presented as means of at least partly redressing these shortcomings and improving both the quantity and quality of the various Allied armies. In this connexion, former NATO commander Andrew Goodpaster estimated as long ago as 1974 that rationalisation and standardisation would increase NATO force effectiveness by about 30 per cent over then-current operational levels.(4) More recently, US DoD computer simulations arrived at similar conclusions, suggesting that the Alliance could expect to realise considerably improved performance as a result of basic levels of inter-operability and standardisation (for example, common fuel and ammunition types).(5) While it is important not to overestimate the military benefits associated with standardisation, the available evidence suggests that-- under ideal conditions-- free trade and equipment commonality could conceivably result in substantial improvements in the military efficiency of NATO forces.

Standardisation and free trade in defence goods can improve NATO military preparedness and efficiency levels in two ways. First, Alliance-wide equipment commonality (particularly, but not exclusively, in fuel and ordnance) would greatly facilitate the co-ordination of adjacent Allied armies in joint operations. Second, standardised

military equipment would reduce logistical problems so that a nation's combat formations would not be restricted to a fixed national sector.

There is a significant body of evidence that suggests that flexibility in the form of potential for joint combat operations is becoming an increasingly important aspect of NATO's central front defences. Historically, Alliance armies have been organised for relatively static "area defence" within discrete national sectors. More and more, however, Allied forces (particularly those of the US, UK, and the FRG) are moving toward mobile and aggressive operational doctrines-- that is, doctrines that emphasise concentration, maneuver, and deep counter-thrusts against the enemy rear.(6) As might be expected, under these conditions the European battlefield threatens to become very confused and disorganised in times of war; inter-allied boundaries are expected to all but disappear in the heat and noise of the first few days of battle, resulting in units of all nations being forced to fight alongside one another. If one also considers that Soviet forces could reasonably be expected to concentrate their offensive operations against corps or national sector boundaries, then it would appear that the ability of Allied forces to integrate their defences is indeed becoming an important element of NATO's conventional deterrent.

At its simplest, Alliance-wide standardisation will give commanders more flexibility in the

> deployment of combat formations while making interallied co-ordination at the tactical level easier. Standardization allows commanders to deploy national forces without consideration of differences in the capabilities of their weapons. At the tactical level, units ordered to fight alongside forces from other nations will find it much easier to co-ordinate their actions if both employ similar weapons and battlefield procedures.(7)

Free-trade and standardisation, then, can be expected to significantly enhance the compatability of NATO military equipment and so directly improve the operational effectiveness of the Allied armed forces. The military efficiency of the Alliance, however, depends on far more than simply the capacity for joint combat operations. Perhaps even more importantly, the combat effectiveness of the various NATO armed forces depends on their ability to provide logistical support to one another. As one observer suggests,

> In the admittedly special case of the Allied Central Europe Mobile Force, whose seven national contingents have seven separate logistics chains, it has been suggested that its fighting capabilities could be increased by 50 per cent if it used common equipment; it would need fewer men for support and less transport, and it would be able to move more quickly.(8)

Assuming that this logic is valid, and that a standardised logistical infrastructure actually would enhance Allied military performance, what are the sources of this potential increase in combat efficiency? The answer, it seems, is two-fold. First, NATO-wide standardisation would allow the Alliance to substantially

improve its so-called "tooth-to-tail" ratio-- that is, the number of men tasked for front-line combat versus those in miscellaneous support roles.(9) It is interesting to note in this connexion that at least one observer has suggested that the principal reason why the Warsaw Pact has a much higher tooth-to-tail ratio than NATO is almost exclusively related to the greater degree of equipment commonality in evidence among the various Pact armed forces.(10) While NATO might not be able to match the extremely high ratio of the Soviet bloc armies, it seems reasonable that standardisation would nevertheless permit a significant redeployment of support personnel to combat roles. Second, standardised equipment types would allow various national armed forces to draw on allied logistics and support services. In this respect, the ability to use common fuels and ordnance, for example, would greatly improve the supply situation in a combat environment.

> Fuel and ammunition would be consumed in great quantities in war and, being bulky, they are difficult to move. For commanders to be able to take them from the most convenient source, regardless of its national origin, would be of real value and provide some basis for flexibility in force deployment. *Inter alia*, it would mean that aircraft unable to return to their home base could land elsewhere, refuel, rearm their guns and perhaps return to combat.(11)

In the search for some final specific assessment of the military value of standardisation, it would seem that unrestricted competition and free trade in defence goods could be expected to produce several substantial and rather

mouth-watering pay offs for the West. Under ideal conditions, standardisation would tend to improve Alliance flexibility, put more troops into combat roles, and generally enhance the overall military effectiveness of NATO forces-- at a lower cost than is currently required to maintain forces using non-standardised equipment. The advantages of an Alliance-wide free trade area in defence goods, however, are not exclusively limited to increases in combat and logistical efficiency. Considering the economic aspects of standardisation suggests that rationalisation of the Alliance defence industrial base could produce substantial savings in the area of defence-related production and procurement. As at least some of these savings would probably be kept within the defence sector to acquire additional military resources, free trade offers NATO the possibility of fielding more and better military forces at less cost to member governments.

Economic Benefits of Sectoral Free-Trade.

At its simplest, the argument in favour of a comprehensive NATO free-trade regime in defence goods suggests that the Alliance's defence industrial base, as it is presently configured, is extremely wasteful and inefficient. Essentially, at least according to the precepts of liberal economic theory, Western defence

industries are unable to maximise production efficiencies because of political interference in the natural operations of the market-place. Lawrence Hagen, although himself not necessarily a supporter of free trade, puts it thus:

> The tensions between demand and supply have not been allowed to work themselves out because of government procurement practices; inefficiency, often poor quality, and limited choice have been the result.(12)

Free-trade is intended to remedy the the West's current defence-industrial malaise in that under such a regime the forces of production within the Alliance would be brought into line with market structures. Put another way, free trade in military equipment would improve productivity and reduce development and production costs because heightened competition and the effects of comparative advantage would result in a more cost-efficient allocation of productive resources within NATO.

The above comments suggest in broad terms the potential economic benefits associated with a more liberalised NATO defence-industrial sector. They do not, however, detail the substance of such an approach. In other words: they do not demonstrate how free trade would alter the existing Alliance defence-industrial base, how such changes would improve efficiency, and to what degree this strategy would generate savings. While general aspects of these questions have been raised elsewhere, the central task here is to explore the scope and nature of any proposed re-allocation

of Alliance productive forces and to outline some of the savings expected to result therefrom.

The theoretical and historical evidence suggests that the adoption of Alliance-wide free trade in defence goods would probably result in a radical re-allocation of defence-industrial resources from Western Europe to the United States. The reason for this is essentially quite simple. Under a comprehensive free-trade regime in defence goods most of the European defence-related industries would be unable to successfully compete with their American rivals. Put bluntly, without the subsidisation and protection they currently enjoy, many European firms simply could not develop and/or produce military equipment as efficiently as US manufacturers. Under these conditions, unrestricted competition among NATO arms producers would inevitably result in many, if not most, European defence firms being forced out of the market by their American competitors.

If we assume, for example, that the aerospace sector is indicative of NATO defence industries in general,(13) then it is possible to outline six reasons for a large-scale transatlantic shift in production capacity.

> (a) *Size hypothesis.* European aerospace firms are clearly much smaller than their American rivals. While no definite causal connexion has been established between size and success in the aerospace industry, many observers suggest that there is at the very least an historical correlation.
>
> > [F]irms which are absolutely large are required to undertake complex R&D in a

> competitive time-scale, to achieve economies from large outputs and to spread the inevitable risks over military and civil products. In other words, the size hypothesis predicts that successful performance is positively associated with size....(14)

In this connexion, the Americans are at a distinct advantage. At the top end of the US market (ie. among Boeing, McDonnell-Douglas, Lockheed, Northrop, and General Dynamics), the average American firm is more than twice as large as the most successful European manufacturers (eg. British Aerospace or Aerospatiale), both in terms of work-force size and production. In fact, the European industry taken as a whole is less than *half* that of the United States.(15) Given the magnitude of this differential, the size hypothesis suggests that American firms enjoy a significant comparative advantage in the aerospace sector.

(b) *Differential in product and production technology.* Keith Hartley suggests that with respect to both R&D and manufacturing/management techniques American industry enjoys a considerable advantage over its European counterparts. In fact, by some estimates, US firms are between seven and twenty years ahead of their trans-Atlantic rivals in development and production technology.(16) If one also considers that, as a rule, European industry operates at a lower level of capital intensity than does the US (that is, less production capital per worker) one is afforded some insight into the greater productivity and superior cost-efficiency of American firms.

(c) *Scale economies.* There are major differences in the typical size of American and European production runs -- creating important differences in the potential for savings associated with scale. For example, a representative US order for combat aircraft is somewhere in the region of 1000 units, produced at a rate of 12-30 per month. On the other hand, a typical European order is only about 200-300 units, with a monthly delivery rate of 2-4 units.(17) This being the case, American firms are able to employ labour and capital more efficiently, and spread the costs of R&D, plant, and machinery over greater numbers of units (thereby reducing unit cost). While European firms can begin to approach the scale of US production runs through collaborative ventures (typically around 800 units per order), they do so only by incurring substantial cost-premia. In short, relatively short production runs inhibit the efficient operation of European aerospace firms.

(d) *Differences in labour elasticity.* European competitiveness is significantly compromised by the relative strength of organised labour in Europe. Typically, the productivity of European firms is reduced by

> lower labour productivity for a given output, greater labour hoarding, union opposition to hiring and firing, immobility, a concern with job preservation rather than production, and a general absence of shift working in Europe.(18)

(e) *Learning curve differentials.* In aircraft production, as in most industrial enterprise, productivity improves as management and labour learn by experience. Put simply, as a firm's employees become more familiar with their respective tasks, the average number of man-hours required per unit tends to drop. On average, US learning curves are significantly steeper than is the case in Europe--usually in the order of 70-80 per cent as opposed to 80-100 per cent in Europe.(19) Moreover, the US firms have an even larger advantage over longer production runs: In this connexion, studies suggest that although unit man-hours are slightly higher for American firms during the early stages of production, after about the fiftieth aircraft steeper learning curves give the US industry an advantage. This advantage is further compounded by the fact that European learning curves tend to "flatten out" over longer production runs, while US curves seem to be continuously falling.

(f) *Competitiveness.* American firms would benefit from the introduction of Alliance-wide free trade largely because they are already accustomed to operating in a highly competitive environment and as a result are generally more innovative, aggressive, and responsive to consumer demand. The European aerospace market, for example, is largely dominated by a few national and private firms, many of whom are single producers enjoying monopoly or near-monopoly status.(20) In marked contrast to this stands the American market, which is comprised of at least five major firms competing in design and development. Under free-trade conditions, European industry would be unable to meet the American challenge without a substantial adjustment period.

Under an Alliance-wide free-trade regime in defence

goods, then, market forces would probably generate a considerable re-allocation of productive resources. As one observer notes,

> [T]he creation of free trade in weapons... would mean major shifts in the existing distribution of production between countries, with large potential gains to the USA. The standard prediction is that the USA, with a comparative advantage in advanced technology goods, would become the main producer and exporter of weapons embodying reasearch and development and Europe would be left only with "metal-bashing".(21)

From a liberal economic perspective, however, such a development would not necessarily be disastrous or even terribly unhealthy. In fact, quite the opposite; under a comprehensive weapons free-trade arrangement, comparative advantage and exchange effects would result in less expensive weapons for Allied forces, while forcing Western European countries to shift capital and labour into sectors were they could be more profitably employed. Moreover, it is not possible to argue that Europe would invariably be reduced to some form of industrial helotry (which in any case can be quite profitable). High-technology firms such as Rolls Royce, Marconi, and Martin Baker currently enjoy a significant competitive edge over their US rivals and could reasonably be expected to prosper under free trade. While it is true that, over the short-run, adjustment to rationalisation might prove to be somewhat difficult for the European

allies, two conditions attach to any sweeping prophecy of doom and gloom. First, however drastic the changes associated with free trade, it seems highly unlikely that Europe would be reduced to mere metal-bashing. Given the relatively healthy condition of some sectors of the European defence industry, it seems probable that a significant level of military industrial capacity would remain located in Western Europe. Second, free trade would probably generate vast improvement in the efficiency of the NATO defence industrial base. Competitive markets and comparative advantage, in addition to the scale and learning economies associated with rationalisation, could substantially improve productivity-- resulting in lower unit costs and significant increases in the purchasing power of NATO member governments.

Turning now to specifics, exactly how would the re-allocation of productive resources associated with sectoral free trade improve the efficiency of defence-related production in the Alliance, and what would be the extent of the associated savings? To start, if sectoral free trade meant that NATO demand for a particular good could be met by a single high-speed production line, then the Alliance could expect to obtain savings as a result of improved economies of scale. As Lawrence Hagen concludes,

> The extension of data from civilian to military products suggests that scale economies of five to 15 per cent are possible when production is doubled from 50 per cent MES (minimum efficient scale of production) to MES, with 10 per cent being the most likely figure.(22)

Indeed, some observers suggests that there are even greater potential savings. In this connexion, for instance, Trevor Taylor argues that, with respect to the aircraft industry, doubling production typically results in unit price reductions of up to 20 per cent!(23) Since in 1980 total NATO spending on defence equipment was approximately US$43 billion,(24) savings of this magnitude could reduce the Alliance's equipment costs by between US$2 billion and US$8 billion per annum.

Second, additional savings could be realised through free trade as duplication and overlap in research and development were reduced and ultimately eliminated. While there is almost universal recognition that avoiding needless duplication in R&D would significantly reduce Alliance defence costs, there are a variety of opinions with respect to the exact degree of savings that could be expected from this type of rationalisation. On the one hand, for example, there are those who suggest that the total European research and development budget can be taken as an approximate theoretical measure of intra-Alliance overlap and waste. According to this argument, NATO could and should eliminate the equivalent of 100 per cent of European R&D expenditure, thus generating budgetary savings

of somewhere in the vicinity of US$2.6 billion per annum (in 1975 dollars).(25) On the other hand, there are those who argue that at least some transatlantic overlap is necessary or desirable, and that in any case not all European R&D duplicates American efforts. From this perspective, rationalisation and co-ordination of research and development would produce more modest savings of about US$1 billion per annum.(26) Whether one accepts the upper or lower bounds, however, it is obvious that Alliance-wide free trade would result in a more rational (ie. less wasteful) allocation of research and development resources, and a substantial annual reduction in NATO defence costs.

Third, rationalisation and free trade would lower NATO defence expenditures as a result of increased learning economies. In this connexion,

> Learning curves, also called experience or progress functions, show the extent to which unit costs decline with increases in cumulative output. The basic idea is that the more frequently labour and management perform a specific task, the more efficient they will become at that task (ie. they learn by doing). For example, an 80 per cent labour learning curve is typical for the UK aircraft industry. This means that man-hours per aircraft or per unit of weight (pound, kilogram) will decline by 20 per cent for each doubling in cumulative output. Thus the second unit requires 80 per cent of the man-hours for the first unit and the 400th takes 80 per cent of the man-hours for the 200th unit.(27)

Within the context of the Atlantic Alliance, if free trade meant that manufacturers could typically double their output on each production line then savings in the order of

10-15 per cent would be within reach.(28)

Fourth and finally, comprehensive free trade in defence goods would generate savings as a result of comparative advantage and international exchange. Although it is difficult to measure comparative advantage, Hagen and Hartley have established the approximate level of savings that NATO could expect to realise under free-trade regime in defence goods. Specifically, the direct gains from free trade (those resulting from the operation of comparative advantage and exchange) would probably be of the same magnitude as those associated with scale economies-- that is, somewhere in the region of 10 per cent. In addition, substantial cost reductions would result from the abolition of tariff and non-tariff barriers; potential Alliance-wide savings of 10-20 per cent are not unreasonable given current levels of protection among NATO members.

In sum, then, it seems reasonable to suggest that the adoption of a NATO free-trade area in defence goods would reduce overall equipment procurement costs by approximately 20-50 per cent.(29)

Endnotes

1 Richard M. Saunders, "NATO Standardization and Military Effectiveness", in Conventional Deterrence, eds. James Golden, Asa Clark, and Bruce Arlinghaus (Lexington, Mass: DC Heath & Co.,1984), p. 194.

2 CBO, US Ground Forces: Design and Cost Alternatives for NATO and non-NATO Contingencies, (Washington, DC, Dec. 1980), p. xiii. See also Defense Science Board, Achieving Improved NATO Effectiveness Through Armaments Collaboration, Report of the 1978 Summer Study, Newport, Rhode Island, Dec. 1978.

3 J. Feldman, "Collaborative Production of Defense Equipment Within NATO", Journal of Strategic Studies, vol. 7, no. 1 (March 1984), p. 284.

4 Richard M. Saunders, "NATO Standardisation and Military Effectiveness," in Conventional Deterrence, p. 192.

5 US, Department of Defense, Office of the Secretary of Defense, A Report to the Congress on the Standardization of Military Equipment in NATO, (Seventh Report to the Congress by the Secretary of Defence), 1981, pp. 80-81.

6 See James Blackwell, Jr., "Conventional Doctrine: Integrating Alliance Forces", in Conventional Deterrence.

7 Saunders, "NATO Standardization and Military Effectiveness." in Conventional Deterrence

8 Trevor Taylor, Defence Technology and International Integration. pp. 38-39. Citing Gardiner L. Tucker, in "Standardisation and the Joint Defence", Nato Review No. 1, Jan. 1975, p. 11.

9 Standardisation within the Alliance's logistics infrastructure would allow for substantial advantages in terms of scale economies in the number of support personnel and the size of stocks required.

10 Thomas Callaghan, US/European Economic Co-operation in Military and Civil Technology (Washington, DC: CSIS, Georgetown University, 1975), p. 29.

11 Trevor Taylor, Defence, Technology and International Integration. p. 41.

12 Lawrence Hagen, Twisting Arms, p. 45.

13 The US comparative advantage in aerospace development and production is actually greater than in other industries. See Dosser et al. Collaboration of Nations, (Oxford: Martin Robertson and Co., 1982), p. 155. However, this is merely a difference of degree-- the American defence industry as a whole, with a few notable exceptions, does enjoy a comparative advantage over its European counterparts.

14 Hartley, NATO Arms Co-operation, p. 107.

15 Hartley, NATO Arms Co-operation, p. 107.

16 Hartley, NATO Arms Co-operation, p. 111.

17 Hartley, NATO Arms Co-operation, p. 111

18 Hartley, NATO Arms Co-operation, p. 111.

19 Hartley, NATO Arms Co-operation, p. 113.

20 Single-firm concentration ratios within Europe are typically 30 per cent or more (reaching 100 per cent for the Netherlands!), as opposed to less than 8.9 per cent in the US. See, Hartley, NATO Arms Co-operation, p. 106.

21 Hartley, NATO Arms Co-operation, p. 38.

22 Lawrence Hagen, Twisting Arms, pp. 114-115. Minimum Efficient Scale (MES) refers to the point on a unit cost curve at which further increases in output cease generating cost reductions. See Hartley, NATO Arms Co-operation, pp. 53-61.

23 Trevor Taylor, Defence, Technology, and International Integration, p.52.

24 Hartley, Nato Arms Co-operation, p.32.

25 Taylor, Defence Technology and International Integration, p. 50.

26 Department of Defense, Office of the Secretary of Defense, A Report to the Congress on the Standardization of Military Equipment in NATO, (First Report to the Congress by the Secretary of Defense), 1975.

27 Hartley, NATO Arms Co-operation, p. 51.

28 Hagen, Twisting Arms, p. 115.

29 This final figure is derived from the estimates of K. Hartley (20-30 per cent) and L. Hagen (25-50 per cent).

See, Keith Hartley, NATO Arms Co-operation, p. 67.; and, Lawrence Hagen, Twisting Arms, p. 115.

ALLIANCE OPTIONS: MANAGED SPECIALISATION

Introduction

As outlined in some detail in the previous chapter, the military and economic consequences of a NATO-wide free-trade area in defence goods would be highly advantageous to member states faced with rapidly rising defence costs and fixed or declining budgetary resources. At its simplest, this argument suggests that, under ideal conditions, specialisation based on comparative advantage could be expected to enhance equipment commonality and compatibility, and reduce the costs and uncertainties typically associated with large defence-related development projects. In short, Alliance-wide free trade in defence goods would allow NATO to field more and better military forces (ground formations, tanks, warships, etc.) without increasing the budgetary resources allocated to military preparedness.

As far as NATO is concerned, however, it would seem that there is decidedly little possibility of achieving anything even remotely approximating such a free-trade arrangement. While Allied governments generally acknowledge that specialisation and international exchange are mutually advantageous, they continue to argue that the close relationship between military power and sovereignty

puts defence-related trade in a unique and separate category. Moreover, especially in the case of the *high-technology* defence industries, there are substantial European reservations regarding the broader economic implications of unrestricted competition in the defence market-place. It is part of the conventional wisdom, for example, that in an unregulated trade environment whole sectors of the European industrial base would fall victim to the competition of larger, more productive, American firms. As Europe is counting on many of these threatened industries (particularly aerospace, electronics, and informatics) to assure its future international competitiveness, it is not surprising that European political leaders evince little in the way of concrete support for more liberalised trade arrangements within the Atlantic Alliance. Indeed, together with US congressional opposition (based on fears of regional economic dislocation) and the more or less natural predisposition to defence industrial autarky, European economic concerns constitute something of an insuperable barrier to specialisation through free trade.

The improbability of pure and unfettered free trade, however, does not mean that NATO members have been entirely unwilling or unable to undertake significant initiatives aimed at enhancing specialisation and rationalisation within the Alliance. What it does mean is that NATO has been forced to promote specialisation through politically

negotiated industrial co-ordination rather than simply relying on market forces. In this connexion, the various bilateral Memoranda of Understanding (MOUs) and the "family-of-weapons" initiative (undertaken pursuant to DoD Directive 2010.6) are but two examples of negotiated arrangements that are intended to enhance the overall rationalisation and specialisation of the Alliance's defence industrial base without violating the political or economic parameters established by governments on both sides of the Atlantic. It is important to realise, however, that while managed specialisation of this sort promises to greatly enhance the military preparedness of the NATO allies, it also contains the seeds of disharmony and conflict. All told, managed specialisation is not a risk-free remedy for the Alliance's defence industrial ailments. In fact, quite the opposite: While in principle managed specialisation promises to substantially reduce waste and duplication within NATO's defence industrial base, in reality the pre-conditions for such an arrangement threaten to drive a potentially disastrous economic wedge between the European and American allies, thus undermining Alliance cohesion and weakening the West's defences. In other words, managed specialisation is not the panacea proponents would have us believe-- indeed, as a cure for the Alliance's defence industrial malaise it may prove to be considerably worse than the ailment itself.

In the politically charged context of the NATO

alliance, a steady and equitable two-way flow of military equipment is a necessary prerequisite for managed specialisation and the more efficient use of defence-industrial resources. In short, the European allies are unlikely to negotiate any specialisation agreement that fails to seriously address the current imbalance in transtlantic defence trade. As Lawrence Hagen argues,

> Europe will not consciously sanction the continuation of a foreign sales pattern which saw approxmately $13 billion in foreign sales go to America in return for less than 10 per cent in the opposite direction.(1)

In other words, unless the Europeans are able to sell more of their military equipment to the United States, the political entrails suggest that there will be decidedly little movement toward managed specialisation and greater defence industrial rationalisation within the NATO alliance.

In order to realise a more equitable transatlantic exchange pattern, however, simple economic logic dictates that the various European defence industries must become competitive (in terms of both price and quality) with their American counterparts; as no one has seriously suggested that the Alliance should pay a cost premium, over an indeterminate period, on goods that are qualitatively inferior, and that cannot be delivered in adequate numbers or on schedule. Clearly this is something of a consensus

on both sides of the Atlantic. A US DoD report, for example, summarised the American position as follows,

> No country in Europe can produce to an intercontinental scale. Thus the economies of scale the Alliance needs-- and the benefits the Europeans seek-- cannot be fully realized until...the European nations organize their defense procurement on "a united and collective basis". Europe's fragmented defense industrial base also makes it difficult for its industries to develop and produce weapons competitive in quality, quantity and price with those produced in the US.(2)

And, it would seem, the sentiments and concerns underpinning American thinking in this respect are also reflected in the European defence community. In this connexion:

> It has become commonplace to argue that Europe must "get itself together" before a better balance can be struck across the Atlantic cooperation in military development, production and procurement. This theme runs through meetings of the WEU and Eurogroup and was a major reason for the creation of the IEPG....(3)

This, of course, has important implications for the future structure of NATO's defence industrial base; for as things stand, European competitiveness is undermined by an American defence industry that (with a few notable exceptions) can produce qualitatively superior defence goods less expensively than is possible in Europe. If European industries are to have any chance of competing with US firms it is essential that the European development and production effort be re-organised in order to match

American capitalisation rates and scale economies-- that is, along continental rather than national lines.

Therein, however, lies the rub. The transformation of the European defence industrial base from a collection of competing national firms to a truly competitive continental effort necessarily involves a significant degree of state intervention in the military development and production sphere-- including, *inter alia*, various tariff and non-tariff barriers to American penetration of the European defence market. As the loss of the lucrative European market would almost assuredly result in substantial American economic resentment and retaliation-- and as this would just as surely undermine Alliance cohesion-- it seems that there is an argument to be made that efforts aimed at instituting managed specialisation within the Alliance are, paradoxically, more likely to weaken NATO than strengthen it.

The intent of this chapter, then, is to demonstrate that NATO efforts to improve Alliance military effectiveness through standardisation and industrial co-ordination are in many ways inherently contradictory and largely self-defeating. Broadly, while on the one hand significant movement toward Alliance-wide rationalisation requires extensive restructuring of the European defence industrial base; on the other, such a restructuring necessarily involves forms of state intervention that the Americans are likely to find most intolerable-- precisely,

the exclusion of US defence firms from particicpation in European defence projects. Moreover, it seems likely that should US manufacturers indeed find themselves shut out of the lucrative European market, American political reaction will be swift and telling. In the final analysis, although one can only speculate as to the outcome of such a train of events, one cannot dismiss the possibility that conflict and competition over the Alliance's defence industrial base will ultimately result in a significant weakening-- if not a partial dissolution-- of the Atlantic Alliance.(4)

Political and Economic Limits to Free Trade

According to the precepts of liberal economic theory, whenever one country has a comparative advantage over another in producing some good, unrestricted free trade is the most effective means of encouraging international specialisation and the efficient use of each country's productive resources. Basically, provided there are no impediments to international exchange (ie. tariff and non-tariff barriers), nations will tend to specialise in those goods which they can produce at a comparatively low opportunity cost, and then trade for goods they produce less efficiently. In theory at least, this is supposed to result in generalised mutual advantage as all trading parties can maximise the efficient use of their productive

resources and increase their overall consumption of goods.

In connexion with the Atlantic Alliance, liberal economics have been used (implicitly or explicitly) to demonstrate that the adoption of Alliance-wide free trade and specialisation based on comparative advantage could be expected to significantly enhance the economic and military efficiency of member nations. More specifically, it has been argued that if NATO were to allow market forces to determine the distribution of productive resources within the Alliance, costs would be reduced as a result comparative advantage and exchange, and the economies associated with servicing a large integrated market (economies of scale, etc.). Moreover, if a free-trade regime in defence goods were to emerge, NATO could anticipate significant alliance-wide standardisation (with all the associated benefits) as all consumers purchased their goods from the (same) most cost-efficient producer. In short, the implementation of Alliance-wide free trade in defence goods could be expected to produce a number of rather mouth-watering military and economic payoffs for the Atlantic Alliance.

As the arguments in favour of NATO-wide free trade and specialisation are so decidely appealing, one is moved to inquire precisely why such a regime has never been adopted by the Alliance. In an age of rapidly rising equipment costs and limited budgetary resources, one might expect Western governments to move rapidly and enthusiastically

toward free trade in defence goods if such a move promised to substantially reduce the cost of military preparedness. Such an expectation, however, would be largely unrealistic; for, though governments are properly concerned with cost-efficiency, enthusiasm for free trade is typically moderated by consideration of the broader political and economic objectives of the state. Put another way, states have other-- often more important-- goals than simply minimizing the costs of preparedness; and free trade threatens to undermine these objectives just as surely as it promises to promote the efficient use of the Alliance's defence industrial resources.

The specific, if complex, question that seems worth addressing in this connexion relates to the often-heard argument that NATO *could* achieve greater efficency in resource use if only member nations exercised greater political will. To pose the question directly, do the "higher-level" political and economic concerns of the state constitute surmountable "obstacles" that may be overcome through negotiation and compromise; or are they unavoidable and insuperable "constraints" that cannot be wished away and must therefore be considered legitimate limitations on policy choice? The answer, it seems, is that within the Alliance many of the impediments to specialisation through sectoral free trade are indeed quite substantial, and cannot be expected to yield to the logic of the greater-efficiency-in-resource-use argument. Consider, for

example, the *political* reservations of the NATO allies regarding free trade. To start, on both sides of the Atlantic there is a deeply-rooted reluctance to institutionalise the interdependence inherent in specialisation. On one level this likely stems from the fact that all states naturally place a premium on independence and autonomy: according to more traditional notions at least, this is virtually the definition of the state. On a more immediate level, however, concerns regarding specialisation are more particularly related to European fears of abandonment and the traditional American preference for defence industrial autarky.

At its simplest, the political argument against free trade suggests that such an arrangement would threaten core political interests in both Europe and America. For the Europeans, the most obvious threat posed in this connexion is the political leverage that would accrue to the United States as a result of specialisation and rationalisation. Assuming--and this is not unreasonable-- that the untrammelled operation of market forces effected a large-scale shift of productive resources to the US, Europe would become highly dependent on Washington's goodwill for the continuing supply of essential weapons and spare-parts-- leaving Western Europe vulnerable to American political pressure and probably resulting in a certain loss of independence in foreign policy. Understandably, given the often profound differences between US and European

global interests, the possibility of this sort of dependence and vulnerability is decidedly unappealing to the majority of Western European political leaders. Moreover, quite apart from the singularly European fears of dependence, there are a number of political concerns-- shared by both the US and Europe-- regarding the implications of greater interdependence. For example, full specialisation would necessarily involve the complete integration of the various Allied defence industries into a single combined effort; with the US producing, say, military airframes while Europe produced avionics, engines or ordnance. Under these conditions, should the European-American connexion be severed at some future date neither Europe nor America would be capable of independently producing the full range of military equipment required for national defence. Not surprisingly, in a world of pervasive competition and conflict (not to mention the real or imagined Soviet military threat) both the Europeans and the Americans perceive this as an unwarranted and unacceptable risk to their sovereignty and security.

Clearly, then, there are political impediments to sectoral free trade that are deeply-rooted in the nature of the international state system, and that are probably not amenable to political negotiation or compromise.

In addition to the political reservations attached to specialisation, there are a number of deep-seated economic

concerns-- evident in both Washington and the European capitals-- that militate against Alliance-wide sectoral free trade. For example, while it is undoubtably true that the United States as a whole would would be an economic winner under a sectoral free-trade regime, certain regional and sectoral interests (particularly elements of the American labour force, and a limited-- but not insignificant-- number of first- and second-tier industrial firms) could conceivably incur substantial losses as a result of increased European competition. In this connexion, the US legislative branch, reflecting both traditional mercantilist desires to protect the domestic arms industry and the more immediate political concerns of its membership, has become the focus of a generalised and pervasive American resistance to greater foreign participation in the US defence procurement process. Thus, in recent years Congress has evinced an intense-- and to many Europeans, growing-- concern regarding the economic implications of greater American dependence on European military equipment, and has put into place a number of legislative instruments designed to protect the US industrial base. Moreover, individual Congressmen, sensitive to the partisan political implications of the social and economic adjustments associated with sectoral free trade, have responded energetically to growing pressure from threatened US defence contractors and labour organisations-- particularly in those regions enjoying a

large concentration of defence development and production capacity. In the words of Trevor Taylor,

> Congressmen for whom a foreign order would mean a loss of jobs [and corporate profit] in their constituency inevitably oppose the order, almost regardless of the military merits of the case. Maine Congressmen fought a bitter battle on behalf of the Mary Mount Company when the Mag-58 was chosen despite the inferiority of the Mary Mount's product; the latter is reputed to have had a much greater tendency to jam when firing and had a lower rate of fire, among other weaknessess.(5)

Given the representative nature of the American political system, of course, and the fact that according to some estimates every $1 billion in lost export sales costs US industry approximately 70,000 jobs, this reaction to the threat of increased European competition is perhaps not too surprising.(6)

In response to the perceived economic threat (however limited) posed to the US defence industrial base by European competition, Congress has erected a substantial number of legislative barriers to European participation in the American defence market. While it is true that a number of these Congressional hurdles have been overcome by means of executive waiver and various Memoranda of Understanding, the historical record shows that the operation of many of these provisions (particularly as they relate to competition and small business set-asides) has remained an integral part of the US procurement process;(7) as a rule, US legislation has consistently discouraged or

precluded European firms from gaining access to the American defence market-- despite the declarations of many apologists for US government policy.(8) Listed below are three procurement-related acts typical of US legislative restrictions on the import of foreign defence goods. These acts-- irrespective of whether or not they have been waived in certain instances-- are in some measure indicative of the depth of American concern over the economic implications of greater foreign participation in the American defence market.

(a) Buy America Act: Originally introduced in 1933, this legislation requires the United States government to procure domestically all goods intended for public use, except where such a policy would involve unreasonable costs or be otherwise contrary to the public interest. This act can be waived under the terms of the Culver-Nunn amendment to the Defense Appropriation Authorization Act (1976), but in the words of one observer, remains "one of the largest obstacles to overseas procurements... because it has tremendous internal political and economic strength.(9)

(b) The Berry Amendment to the Appropriations Act: Under this legislation, the US government is prohibited from undertaking substantial puchases of food or clothing grown or produced outside the United States. Although this amendment was first introduced in 1942, it remains in operation today; and has, in fact, been greatly expanded over the years. With the exception of chemical warfare clothing, the provisions of this act apply to all NATO European goods-- irrespective of any Memoranda of Understanding.(10)

(c) The Industrial Preparedness Production Planning Program: This legislation prohibits the acquisition of non-American defence goods where such an action can be demonstrated to undermine the mobilisation capacity of the US defence industrial base. Under the provisions of this

> programme, FY 1974 saw forty-six per cent of US defence procurement protected from foreign competition.(11)

It would seem, then, that while Alliance-wide free trade in defence goods would be militarily and economically beneficial to the United States, there are sufficient obstacles inherent in the American political system to preclude any significant move toward that end. Essentially, free trade is doomed by the fact that, outside of the Carter administration and some quarters of the civilian hierarchy of the DoD (and then only in highly abstract terms), few in the US support greater foreign participation in the American defence procurement process. Indeed, Congress, business, and organised labour are all vehemently opposed to greater European access. Nor should this be particularly surprising; for, while the US and Europe share a number of security-related objectives and concerns, in connexion with the defence industry transatlantic interests tend to be mutually exclusive. One US House Armed Services Committee report underscored this point in the following terms:

> It is difficult to fault the Europeans' desire to increase their defence markets-- as a goal for Europeans. However... there is no evidence to support the thesis that buying European is in the best interests of the United States *which is, after all, an economic competitor of Europe* as well as a military partner (italics mine).(12)

The Europeans, too, have historically evinced a certain degree of apprehension with respect to the potential economic implications of Alliance-wide free trade in defence goods. While this uneasiness has been discussed to some degree above (see chapter 1), it is perhaps useful at this point to restate the various arguments in somewhat more depth and detail.

At its simplest, the principal European objection to sectoral free trade is concerned with the adjustment problems that each state would have to face as production capital was re-allocated throughout the Alliance. The conventional wisdom, of course, suggests that the various European defence industries would be rendered largely redundant if rationalisation were to be carried out according to the dictates of untrammelled comparative advantage: exceptional products such as the Harrier jump-jet and the Roland missile notwithstanding, European industry as a whole is deemed to be inefficient and costly in comparison with many larger and more productive US firms, and would presumably "wither away" in the face of unrestricted American competition. Given that the liberal democratic state is naturally concerned with public and corporate reaction to the major indicators of national economic health, it is perhaps understandable that sectoral free trade, with its promises of greater unemployment, a worsening balance of payments picture, and increased social

unrest, is not a particularly popular policy option among the Western European allies.

In more specific terms, European opposition to freer transatlantic defence trade is largely based on perceptions that such an arrangement would inevitably result in large scale economic and social dislocation within the various European countries. On the one hand, this probably reflects a general concern over the potential loss of tax revenue and increased social security payments naturally associated with capital flight. Perhaps at a more basic level, however, it also reflects a recognition that European labour and production capital is relatively inflexible; and that such rigidity necessarily renders any attempt at industrial re-organisation and rationalisation both economically difficult and politically risky.

In principle, if defence production within the Alliance were to be re-organised in accordance with the operation of comparative advantage, European industrial resources would necessarily be re-allocated out of domestic defence industries and into other sectors of the economy. In other words, European workers and plant would be transferred out of those sectors forced into decline by American competition, and into areas in which Europe enjoyed something of a comparative advantage. In practice, however, the situation is far from being that cut-and-dried. Fixed and variable capital-- in any economy, but particularly in the European context-- is not

easily taken out of, say, the aerospace sector, and applied to textile or automobile production. Plant requires re-tooling, and people must be re-trained and often re-located-- usually at great expense to the state. Moreover, there is no guarantee that "released" labour can be profitably re-employed in other industries: despite the best efforts of the state, the historical record suggests that increased unemployment is almost certain to attach to even limted industrial contraction and decline. Thus, if the European allies were forced to wind down a even a limited portion of their defence industrial effort as a result of sectoral free trade, European governments would be faced with a number of social and economic problems-- precisely, substantially higher levels of unemployment and the potentially exorbitant cost of converting idle plant to profitable production. In short, unless it proved possible to quickly and efficiently move capital and labour out of defence production and into the civilian sector, the adoption of a NATO-wide sectoral free-trade regime would severely tax the financial resources of many European governments while at the same time undermining the social and political stability of the region.

An additional source of European concern over NATO-wide free trade in defence goods is the possible impact of such an arrangement on the European balance of payments position-- that is, on the difference of value between payments into and out of the respective Western European

economies. In this connexion, it is generally asserted that a healthy and extensive defence industry can contribute to the balance of payments through both import savings and export earnings. Broadly, the domestic production of military equipment can be immensely beneficial to a nation's overall economic position in that it allows the state to import fewer expensive defence goods from abroad, while generating income as a result of export sales, production licensing agreements, and patent rights. In the European context, the various domestic defence industries do in fact seem to contribute quite significantly to the balance of payments of the respective Allied states. This is particularly true of major arms producing countries like Britain and France, for whom the sale abroad of military equipment is an important source of foreign exchange. In this connexion, for example, consider that according to SIPRI estimates, 1980 witnessed French arms sales abroad reach an astounding 8 per cent of all French exports; similarly, the British figure for that year, while representing a somewhat less stellar 2.5 per cent of total exports, amounted almost exactly to the annual visible trade surplus for 1980-- or approximately 1.2 billion pounds.(13) If these arms sales were to be lost due to capital flight, and if one also calculates in home purchases that would have to be sourced elsewhere if domestic development and production were to wind down, it becomes obvious indeed that the re-allocation of defence

industrial resources associated with sectoral free trade would generate a substantial disequilibrium in the European balance of payments position-- in the process seriously threatening the economic health of precisely those states that enjoy the greatest political influence among the European NATO allies.

These problems, while they would doubtless prove troublesome and disruptive to European governments concerned with national economic performance and political legitimacy, do not in themselves necessarily constitute insurmountable obstacles to defence free trade. Taken individually, the fiscal and payments difficulties attached to large scale industrial re-structuring would probably prove manageable in the face of a concerted and focused effort on the part of national and regional government. When considered in the context of the broader economic picture, however, these problems seem to acquire gargantuan proportions. As Trevor Taylor argues:

> In isolation, none of these difficulties is insuperable and the disarmament community, including some trade unionists, has already done substantial work showing how all defence industries could be run down without too much economic dislocation....The final complication, however, is that adjustments to defence production do not stand alone. Governments in the West already face an abundance of adjustment problems with which they cannot easily deal. The rising price of oil, competition in manufactured goods from newly industrialised countries and the increasing automation of production have all helped to establish high rates of inflation and unemployment in many NATO states.(14)

Clearly, then, given conditions of general economic malaise and the attendant need for extensive social adjustment, the European allies are not in a position to "negotiate away" their defence industries-- not even in the pursuit of a more rational Alliance defence industrial base or dramatically lower preparedness costs. Put simply, to enter into a sectoral free-trade agreement with the Americans at this juncture would be to place a potentially intolerable burden on an already somewhat shaky economic foundation. Moreover, in a world in which the traditional European "smoke-stack" industries are increasingly unable to compete with low-wage foreign rivals, the loss of high-technology defence industries to US competition would probably be disastrous for Europe's future international competitiveness and economic health. Consequently, European governments have tended to shy away from the creation of a competitive NATO free-trade area, opting instead for a variety of economically sub-optimal development and production arrangements (see Chapter 1 above).

In summary, and despite protestations to the contrary, there is decidely little chance of achieving substantial intra-Alliance specialisation and rationalisation by way of freer transatlantic trade in defence goods. European, and ultimately American, resistance to such an arrangement is firmly rooted in the core economic and political interests of the various Allied states; and is not, therefore, an

obstacle that can somehow be surmounted or overcome by means of negotiation or political horse-trading. Clearly, then, the search for more cost-effective means of developing and producing military equipment within NATO must start with a realisation that opposition to free trade is an integral part of the political landscape-- that is, a legitimate and immutable constraint on policy choice. If the Alliance defence industrial base is to be rationalised, it will not-- essentially, cannot-- be via the free-trade route so popular in certain technocratic and Congressional circles. Rather, rationalisation will have to be achieved by other means. At its simplest, if NATO is serious about reducing defence costs it will have to devise an armaments policy that is more congruent with the "higher level" political, social, and economic goals of its member states.

Managed Specialisation: A Viable Alternative?

Beginning in the 1970s, a consensus began to emerge within the Alliance that specialisation based on free trade was essentially a political "non-starter," and that alternative approaches to rationalisation and standardisation would have to be found if NATO were to remain militarily effective in the face of rapidly rising defence costs. The approach that ultimately came to

underpin Allied efforts in this direction-- as first introduced by US President Ford at the 1976 NATO summit-- suggested that, in order to be politically acceptable, specialisation would have to be based on a co-operative US-European partnership in which both "pillars" would be encouraged to develop and produce military equipment for sale within an integrated Alliance defence market. On the surface at least, this innovative "two-way street" approach seemed (and in many circles, still seems) to be obviously superior to free trade based on comparative advantage in that managed specialisation poses less of a threat to core economic and political interests within NATO: the efficient institutionalisation of the two-way street neither threatens the Europeans with the loss of their high-technology defence industrial base, nor subjects the United States to significant regional and sectoral economic dislocation of the sort most feared by Congress. Moreover, under managed specialisation there appears to be far less risk of economic competition within the defence sphere escalating into a full-blown trade war.

Below the surface, however, the inner logic of politically directed rationalisation belies these appearances: over the long run, managed specialisation threatens to generate tensions that are every bit as deleterious to the long-term workability of the NATO alliance as those associated with free trade. In short, the two-pillar approach is not practicable because the

immediate pre-condition for managed specialisation-- precisely, a reasonably competitive European defence industry-- is impossible to establish without the use of protectionist economic measures-- measures that are likely to result in the exclusion of US firms from the European military equipment market, and so cause substantial American resentment toward NATO Europe. Under these conditions, and contrary to the original intent, attempts to push the rationalisation of the European defence industrial base are likely to result in a deterioration in Alliance cohesion, and ultimately a reduction in the West's military preparedness.

Despite its institutional genesis during the Ford years, managed specialisation as an Alliance policy experienced its most active period during the Administration of US President Jimmy Carter. While the initial Allied responses to Ford's two-way street initiative had often been disconnected and un-methodical, within a relatively short period of time the Carter Administration had managed to focus these rather disparate efforts and to bring some degree of cohesion and purpose to Alliance policy. Carter initiated his campaign for a more equitable and efficient two-way street during the 1977 NATO summit in London. There, before the assembled NATO ministers, the President suggested that rationalisation and standardisation within NATO could only be really effective

if Alliance defence industrial policy were to be based on a solid foundation of negotiated co-operation between the US and Europe. Implicit in this, of course, was the recognition that the chief historical obstacles to rationalisation were related to insufficient political negotiation, and not, as was the previous orthodoxy, to a surfeit of state intervention in the procurement process. In this connexion, Carter re-emphasised the need for a more open US defence market, and suggested that the United States and Europe seek new ways to bring about a "genuinely two-way street" in transatlantic defence trade.(15)

President Carter's formal declaration of intent was first given operational substance in the form of DoD Directive 2010.6, "Standardization and Interoperability of Weapons Systems and Equipment Within NATO." Under the terms of this directive, the United States government was commited to three broad policies designed to enhance transatlantic defence trade and greater rationalisation in the development and production of military equipment. First, the so-called "Dual Production" initiative attempted to encourage member nations to enter into licensed production or co-production agreements with respect to systems already designed by another member. This rationalisation scheme relied on competitive and independent research and development; transatlantic industrial co-operation being strictly limited to the production and assembly phases of any given project.

Second, the doors to greater transatlantic trade were to be opened via the medium of general and reciprocal Memoranda of Understanding (MOUs). These instruments, negotiated on a bi-lateral basis between the United States and European NATO governments were intended to override the application of a number of protectionist trade policies, and to admit greater Allied participation in the various national defence procurement processes. In the words of Dr. William Perry, US Under Secretary of Defense during the Carter years and a strong supporter of rationalisation and standardisation:

> The purpose of the general MOUs is to open up the defense markets of each country to fair competition by NATO's defense industry. These MOUs waive various "Buy National" restrictions on a reciprocal basis.(16)

In this respect it is important to note that, although one of the intended functions of the MOU was to enhance the operation of the market system, broadly speaking that was not their primary purpose-- at least not as envisaged by the Carter Administration. Rather, as demonstrated below, the reciprocal reduction of entry barriers to national defence markets was considered an integral component of a more radical and far-reaching managed specialisation effort.

The third policy initiative articulated in DoD 2010.6 recommended complementary development of defence systems within the context of a politically negotiated division of

labour (the so-called "family-of-weapons" concept). Put another way:

> By inter-governmental agreement(s) (a series of Memoranda of Understanding), a particular class of technologies would be sub-divided such that each state has a responsibility for a given weapon system....Each state would then be responsible for the production of its assigned system, and would promise not to compete with the production of other systems under the purview of the other state(s) involved. Each state would also agree, at the appropriate time early on in the process, to acquire a given number of weapons of each type from the family pool. Data packages involved in each project would then be transferred to the participants, and the appropriate arrangements arrived at for third country sales. The end result would be a managed specialisation of functions: the benefits of collaboration in the context of current production patterns-- integration without tears.(17)

In many ways this third leg of the triad represented the most politically sophisticated-- and by far the most promising-- approach yet adopted by the NATO alliance with respect to defence industrial rationalisation. At its simplest, the family-of-weapons initiative represented an attempt on the part of the US and its European allies to reconcile the pressing goal of achieving budgetary savings within the defence sphere with higher national objectives related to employment, military and industrial prestige, and balance of payments considerations; that is to say, it was essentially a political arrangement, the potential success of which rested on its ability to balance the military, social, and broader economic needs of states on both sides of the Atlantic.

Managed specialisation in the guise of the family-of-weapons approach, however, while being far more attractive than free trade, was (and is) by no means a panacea for the structural disarmament presently threatening NATO. In fact, quite apart from the more obvious and immediate difficulties associated with the concept,(18) managed specialisation is faced with a number of obstacles related to the implicit requirement that European military equipment be competitive with that produced in America-- obstacles that are not only insurmountable within the context of the Alliance as it is presently configured, but that threaten over the long term to seriously weaken-- possibly even rupture-- the European-American military connexion.

Endnotes

1 Hagen, Twisting Arms, p. 55.

2 US Department of Defense, Office of the Secretary of Defense, A Report to the Congress on the Standardization of Military Equipment in NATO, (Seventh Report to the Congress by the Secretary of Defense). 1981, pp. 13-I4.

3 Public Law 94-361, Sec. 803 (c). As cited by Trevor Taylor, Defence, Technology and International Integration, p. 87.

4 While not suggesting that competition over the defence industrial base will in itself lead to a dissolution of the Alliance, within the context of a broader malaise such conflict may contribute to a long-term fracturing. At the very least defence industrial competition threatens to make transatlantic arms co-operation decidedly more difficult than is presently the case. For a discussion of the concept of the "widening Atlantic" see Ralf Dahrendorf, "The Europeanization of Europe", in A Widening Atlantic: Domestic Change and Foreign Policy, ed. Andrew J. Pierre (New York: Council on Foreign Relations, 1986).

5 Taylor, Defence, Technology, and International Integration, p. 166.

6 Jan Feldman, "Collaborative Production of Defense Equipment Within NATO", Journal of Strategic Studies, vol. 7 no. 1 (march 1984): p. 289.

7 Up to 95 per cent of US Defence contracts are awarded to US firms. Giles Gherson, "Pentagon Review Worries Canada's Defence Firms", Financial Post, Nov. 16, 1987.

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12 Hagen, Twisting Arms, p. 27.

13 World Armaments and Disarmament: SIPRI Yearbook, 1980, (London: Taylor and Francis, 1980), p. 75. As cited in

Taylor, Defence, Technology and Integration, p. 201.

14 Taylor, Defence, Technology, and International Integration, p. 57.

15 "Remarks by President Jimmy Carter addressing the NATO Ministerial Meeting, Lancaster House, London, 10 May 1977", USIS Official Text, May 11, 1977, p. 6. As cited in Stephen Kirby, "The Failure of Low-Profile High-Politics", Journal of Common Market Studies, vol. xviii, no. 2 (Dec. 1979), p. 188.

16 See statement by William Perry, US Under-Secretary of Defense for Research and Engineering, in "NATO Standardization, Interoperability, and Readiness", Hearings, Special Subcommittee on NATO Standardization, Interoperability and Readiness of the House Armed Services Committee, 95 Congress, 2nd Session, pp. 1362-6. As cited in Hagen, Twisting Arms, p. 92.

17 Hagen, Twisting Arms, p. 98-99.

18 These include the formulation of common military requirements, replacement schedule harmonisation, problems related to technology transfer, and the need for political will. See Trevor Taylor, Defence, Technology and International Integration, pp. 68-104.

THE EUROPEAN AEROSPACE INDUSTRY AND THE EFAP

As demonstrated in the preceding chapters, an essential pre-condition for the successful rationalisation of the NATO defence industrial base is a significant increase in the level of European participation in the US defence procurement process. To date, of course, American legal and procedural barriers have tended to discriminate against European military goods-- effectively excluding all but a handful of exceptional products from access to the US defence market. However, as there is little indication that the Europeans are prepared to tolerate this situation indefinitely, it would seem that if Alliance-wide industrial re-organisation is to become a reality American trade legislation and procurement practices will have to be reformed to encourage a greater flow of traffic on the westbound carriageway of the transatlantic two-way street. This, however, has proven to be an exceptionally elusive goal; for a variety of reasons the US government has remained implacably hostile to greater European participation in the US procurement process, particularly in the form of politically negotiated "affirmative action" programmes. While it is true that both Congress and the Administration have articulated a well-massaged declaratory policy in favour greater Allied access, in practice this has been superseded by an insistence that foreign goods be

commercially competitive with those produced by US firms. Put simply, then, to the degree that European goods are more expensive and of lower quality than their US counterparts, the American predeliction for formal competitive procurement has effectively shut them out of the US market.

This being the case, it has become painfully clear to the European allies that if they are to have any chance whatsoever of improving their military balance of trade with the United States they must first of all reorganise their defence industries along more commercially competitive lines-- that is, they must consolidate their regional defence market and increase their export sales. Such a move, of course, would allow European industry to achieve production economies and capitalisation rates similar to those enjoyed by American manufacturers-- presumably resulting in lower priced and higher quality European defence goods and greater participation in the US procurement process. In order to realise this goal, however-- and this is the crux of the problem-- it seems that the European allies will have to take measures that are likely to result in the effective exclusion of American defence firms from the European market. As this is likely to generate substantial American resentment toward Europe, it seems that, contrary to the original intent, attempts to rationalise the European defence industry and perhaps move toward some form of managed specialisation within NATO may

well result in a further fracturing of the Alliance defence industrial infrastructure, and indeed generate a net decline in the industrial preparedness of the West.

The purpose of this chapter, then, is to demonstrate the dynamics of this process in connexion with the European military aerospace industry, and particularly in connexion with European Fighter Aircraft programme. Aerospace and the EFA were chosen for several reasons:

> (a) They illustrate the basic conflict between the short-term requirements of a healthy European defence industrial base and the long-term requirements of a healthy Alliance defence industrial base.
>
> (b) They demonstrate the importance of protectionism and expanded sales markets to European competitiveness.
>
> (c) They illustrate the potentially divisive tensions that exist between Europe and the United States.
>
> (d) They demonstrate the political limits to even strictly European industrial collaboration. The *ad hoc* nature of the EFA programme suggests that European nations have other, more important, goals than simple economic efficiency, and that structural re-organisation of the sort advocated by several EC studies is not politically feasible at the present time.(1)

Thus, a study of the European Fighter Aircraft programme provides evidence regarding the central assertion of this paper-- precisely, that the rationalisation (even on an *ad hoc* basis) of the European defence industrial base is simultaneously pre-requisite to and incompatible with the broader goal of Alliance-wide specialisation and rationalisation. As we have seen in the preceding

chapters, managed specialisation (or, indeed, specialisation through free trade) requires that Europe begin producing defence goods that are commercially competitive with those of their American rivals. What remains to be demonstrated in a concrete way is that policies and programmes aimed at achieving that goal are more likely than not to undermine transatlantic industrial rationalisation and contribute materially to the centrifugal forces already operating within the Alliance. A starting point in this connexion is a model of the European aerospace industry that outlines both the importance of market consolidation and expansion, and the role of American aircraft firms in impeding this.

The Structure of the European Aerospace Market

The demand for competitive aerospace equipment, of course, suggests the need for substantial restructuring and re-organisation within the European defence industrial base; for as things stand, Europe's disparate national aerospace industries enjoy neither the market scale nor the capitalisation rates required to make them truly competitive with the American giants. Stripped of its details, this line of reasoning suggests that if European firms are to have any chance of competing with US manufacturers it is essential that European development and

production be organised along continental, rather than strictly national, lines. As many observers-- on both sides of the Atlantic-- have noted, Europe must effectively "get itself together" (ie. co-ordinate demand and co-operate on supply) before there is any genuine possibility of realising a more equitable balance of traffic on the two-way street.

Essentially, the realisation of a more competitive European aerospace industry requires two fundamental changes in the structure of the European market. First, if European firms are to produce aircraft and component systems that are qualitatively competitive with those of their American rivals, it is absolutely essential that NATO Europe reform its highly under-capitalised and unnecessarily duplicative research and development infrastructure along American lines. As one team of experts put it:

> The need for a considerably greater effort in research and development (R&D)... is self-evident... [N]ot only are the European members devoting considerably fewer resources to it than the United States-- European publicly funded R&D is only 31% that of its transatlantic partner-- but it is fragmented, duplicated and thus highly wasteful.(2)

In short, the compartmentalisation and disaggregation of the European military aerospace industry (particularly in comparison to that of the US) has tended to undermine the technological verve and vitality of the NATO European allies. Combined with consistently low levels of capital

funding,(3) over time this has resulted in generally inferior European product and production technology-- and an inability on the part of European firms to compete qualitatively with their American counterparts. Clearly, this requires not only higher levels of funding, but also a basic restructuring of the European R&D effort.

Second, if the Europeans are to manufacture aerospace goods that are commercially competitive with respect to price, it is necessary to re-arrange production so as to secure the benefits commonly associated with servicing a large consolidated market. At present, of course, such a market does not exist; the NATO European defence industry consists in a collection of discrete and disparate national production efforts operating within a largely unco-ordinated and dis-aggregated market environment. As a result, European prices are high while productivity tends to relatively low. In sum, the limited nature of the national (and even the regional) market in Europe effectively undermines Europe's ability to compete with American firms.

The key variable in this equation, of course, is the relative inadequacy of a European defence market that lacks both the scope and capital intensity required to sustain a truly efficient and competitive aerospace industry. This being the case, the most obvious solution to Europe's current defence industrial malaise would seem to consist largely in a two-pronged policy of (a) systematically

consolidating and expanding demand for European aerospace goods (through the harmonisation of national procurement schedules and a more aggressive extra-regional export strategy); and (b) rationalising the European research and development effort (thus reducing duplication and overlap and allowing a greater aggregation of capital in support of a dangerously underfunded industrial sector). Put another way, a larger and less fragmented European defence market would provide European industry with many of the advantages currently enjoyed exclusively by American manufacturers--including, most importantly, a virile and efficient R&D sector, and the production economies associated with large orders and long production runs.

More precisely, this two-pronged approach would improve European competitiveness in three ways. First, joint research and development would provide an effective means of overcoming the limitations imposed by relatively small national R&D budgets. Broadly, joint ventures allow firms and governments to pool their resources, resulting in the elimination of purely duplicative research (and the diversion of saved resources to additional research), economies of scale (the realisation of a critical mass of researchers and equipment), and diversity (several approaches to the same problem).(4) Second, a less fractured regional market would substantially increase the size of the average domestic order placed with European firms. For example, whereas under the present structure a

large European aircraft order tends to be somewhere in the neighbourhood of 400 units, in an integrated aerospace market the average would more typically be in the region of 800 plus. For a sophisticated combat aircraft (say the American F-18 or the European Tornado) the scale and learning economies associated with a production increase of this magnitude translate into significant price reductions. Indeed, given an 85 per cent learning curve (not unresonable in the aerospace sector), doubling output from 400 to 800 units would lower unit costs by as much as 15 per cent.(5) Third, an increase in extra-European sales could also be expected to result in significant cost reductions. Assuming the same learning curve as above, for example, if an 800 unit European effort were to be expanded through export sales to 1200 units, individual aircraft costs would drop by a further 13 per cent. In short, under ideal conditions, a larger and less fractured European defence market promises to generate significant production economies; resulting in substantially lower prices, and over the long run producing technologically superior and more competitive goods.(6)

This, of course, is not to argue that the NATO European allies would ever be able to realise all the economies associated with large orders and capital-intensive production arrangements; clearly the often substantial cost-premia attached to *ad hoc* collaborative efforts threaten to preclude this (see chapter 1 above). It is,

however, to suggest that European defence firms-- if they are to become more competitive with their American rivals-- require access to a far broader market than they presently enjoy. In connexion with the aerospace industry (although the logic applies to other sectors as well), Trevor Taylor offers perhaps the most succinct expression of this type of economic logic when he argues:

> ...there is little hope of aircraft manufacturers in Europe competing successfully against an American firm backed by a large US government order unless they too enjoy a large base order.(7)

In the final analysis, it seems, Europe's future competitiveness in the aerospace sector hinges largely on its ability to begin producing to a continental (even intercontinental) scale.

The Role of US Aerospace Firms

Historically, there appear to have been two major reasons for the collective inability of the various European aerospace industries to consolidate and expand their markets and so realise the scale economies required for commercially competitive production. On the one hand, rationalisation was (and is) impeded by European concerns regarding the potential political and economic implications of regional industrial re-organisation. In this connexion, the conventional wisdom suggests that there are three

barriers to a full-scale integration of the European aerospace sector. First, assuming-- and this is not unreasonable-- that rationalisation would result in a large-scale re-allocation of production capital within Europe, all nations would be faced with staggering, possibly overwhelming, adjustment problems. Given the relative immobility of European labour and capital, this would mean greater unemployment, substantial loss of tax revenue, and a worsening balance of payments picture. Second, as the aerospace industry is characterised by advanced technologies (electronics, informatics, engines, etc.), there is a generalised fear that the loss of national aerospace capacity would undermine future economic competitiveness. In a world in which Europe can no longer compete in certain labour-intensive industrial sectors "commanding heights" industries such as aerospace have assumed a heightened significance, and European governments have become particularly loathe to abandon them-- even in pursuit of long-term regional development. And third, national governments are naturally concerned that the loss of a national aerospace capacity would leave them at the mercy of foreign suppliers, possibly leading leading to reduced political independence, higher life-cycle costs, and inappropriate weapons systems.

While it is true that these considerations will probably continue to act as constraints on any movement toward comprehensive structural integration in the

aerospace industry, suffice it to say at this point that the Europeans have been able to at least partly overcome these impediments by means of *ad hoc* collaborative projects and joint ventures. On the other hand, and perhaps more importantly, efforts to enhance the competitiveness of the European aerospace industry have been undermined by the active presence of the American aerospace giants in Western Europe. For a variety of reasons this problem has proven less amenable to political negotiation than intra-European concerns, and continues to constitute the chief barrier to the realisation of a commercially healthy European aerospace sector.

Essentially, the active presence of US defence firms in Western Europe undermines European competitiveness in two respects. First, the availability of American military systems and sub-systems in Europe (often of superior quality and at relatively low prices) effectively "steals" market share from European firms, preventing them from realising the economies typically associated with large orders and long production runs. In connexion with the aerospace sector, for example, US designed and/or manufactured aircraft account for approximately 35 per cent of the value of the combined NATO military fleets.(8) While in itself the loss of nearly one third of the potential European regional market constitutes a serious handicap for the European military aircraft industry, American market penetration further aggravates Europe's

competitive weakness in that it tends to reinforce the already highly fractured and disaggrated structure of the European aerospace market, resulting in additional dis-economies and even higher prices. Thus, to cite one of the more obvious examples offered by recent history, the American sale of F-16s to Belgium, Denmark, Norway, and the Netherlands (the so-called EPG nations) effectively shut European-designed aircraft (ie. the collaboratively produced Tornado and the French Mirage) out of almost 20 per cent of the European aerospace market-- almost certainly resulting in unrealised scale economies and higher unit prices.(9) Under these conditions, it would seem that even when the European allies enter into collaborative development and production projects, American competition means that European firms are often faced with the prospect of a regional sales market that is too small to financially sustain either advanced R&D or efficient, capital-intensive production arrangements.

Second, the participation of US firms in the European aerospace market tends to undermine European efforts to realise greater scale economies through increased foreign sales. Exports, of course, are often an important variable in determining the viability of any given industrial project-- indeed, in the words of one European defence industry executive, they are "the 'swing factor' between a profitable and an unprofitable arrangement".(10) American participation in European aerospace projects, however,

almost invariably results in a failure to exploit potential export markets. Broadly, to the degree that European firms produce or utilise American designed systems or sub-systems, European export sales are subject to the extra-territorial application of US trade and export-control legislation-- that is, to political regulation by the American government. While this is clearly offensive to the European allies on political grounds (it is often perceived as an unwarranted violation of national and regional prerogatives to control and regulate domestic economic affairs), European governments also find it loathesome in that, to the extent that it can be used to undermine European export initiatives, American trade and technology control legislation clearly has a purely commercial application.(11) As Joseph Rallo argues, US export control legislation can be used to limit the Western European share of the global market, in the process severely undermining Europe's "ability to maintain an efficient domestic industrial base," and ultimately compromising the capacity of European firms to "compete on equal terms with American MNEs in global commercial competition."(12)

The active presence of US defence firms in Europe, then, can be seen to constitute a serious impediment to the development of a truly efficent and competitive European aerospace industry. At this point it is perhaps useful to examine a particular European aerospace project, with the

objective of identifying some of the more salient features of the European response to this threat.

The EFAP

To view the issue in terms of European co-operation to meet a US economic and technological challenge, rather than simply as a military matter, the European Fighter Aircraft programme would appear to have two principal objectives. On the one hand, the programme is quite clearly intended to support a more technologically robust and cost-efficient European aerospace sector, enhancing the international competitiveness of the various aerospace-related industries (including, inter alia, avionics, informatics, airframes, and engines), and helping to minimise the European military preparedness burden. To this end, the project is aimed at co-ordinating demand and rationalising supply in order that R&D costs can be shared and scale economies realised. On the other hand, and equally importantly, the programme appears to be intended to promote a number of national European political and economic goals, including support for domestic high-technology industries and job preservation. In this connexion, equity often seems to take precedence over efficiency as each participating nation attempts to maximise the benefits associated with collaboration while minimising the costs. Thus, in any

study of the EFAP (or indeed any other collaborative aircraft venture) it is important to recognise that there are significant limits to the scope for rationalisation and integration within the European aerospace industry--limits that should not be viewed as surmountable obstacles but rather as legitimate and unavoidable constraints on policy.

At this juncture, of course, these limits would appear to preclude the pursuit of structural reform(13) as an approach to European defence industrial rationalisation, primarily because no European government is willing to sacrifice jobs and high-technology industrial capacity for the seemingly rather distant benefits associated with regional economic development (from which they may derive little immediate benefit). Far more likely is the type of *ad hoc* co-operative approach employed in connexion with the Tornado project; for this approach promises a reasonably satisfactory trade-off between the commercial objectives related to cost and quality and other national objectives related to jobs, technology, and industrial prestige. *Ad hoc* collaboration, however, is far from being a perfect solution to the Alliance's defence industrial problems. To be sure, it allows competing and conflicting European interests to be managed satisfactorily, reducing costs through relatively painless co-operation and work-sharing. The problem is that American economic interests cannot be introduced into the equation without rendering it

unworkable. In short, even within the context of *ad hoc* collaboration, it seems to be impossible to accomodate both European and American interests. This, of course, suggests that perhaps these interests are in some sense mutually exclusive-- that is, perhaps European and American objectives are irreconcilable within the Alliance as it is currently configured. If this is so, NATO would seem to be approaching a point in its history at which a decision will have to be made regarding the structure and direction of the Alliance-- particularly as these relate to transatlantic armaments co-operation and defence industrial rationalisation.

Physically, the EFA can be described as a

> ...canard delta, twin-engined fighter optimised for the air-to-air combat role with a secondary mission of air-to-ground and air defence. The design parameters-- also called cornes values-- agreed to by the National Armaments Directors in August 1985, call for a basic mass empty of 9.75 tonnes, thrust (re-heat) of 90 Kn per engine and a gross wing area of 50 square metres.(14)

Despite the disarming simplicity of this description, the EFA is unquestionably the most sophisticated and technologically advanced aircraft yet to be attempted by European industry, nationally or collaboratively. Essentially, the EFA is what is known as an active control technology or fly-by-wire (FBW) aircraft-- that is, it is an aerodynamically "unstable" design requiring a

computerised flight control system in order to fly. Put simply, the EFA is dependent on sensors that monitor internal and external conditions and relay this information to an onboard computer, which then adjusts the control surfaces so that the aircraft remains in stable flight. The chief advantage of the FBW system is that it can achieve higher levels of manoeuverability than is possible for conventional aircraft-- presumably resulting in superior combat performance.

At the heart of the EFA is an avionics system that necessarily stretches the current state of the art to its limits. The Eurofighter has been conceived as a fully FBW system with no mechnical back-up--that is, the aircraft is entirely dependent on its hardware and software packages not only to enable it to fly, but to ensure that no matter how the control column is manipulated the aircraft never exceeds its cleared flight envelope boundaries. Also included in the avionics system are a revolutionary new "intelligent" fuel management system, an advanced three-dimensional tactical display, and possibly an integrated multi-purpose aircraft and weapons management processing unit built directly into the aircraft's structure to maximise the efficient use of space and cooling resources.(15) Similarly, the new power plant for the Eurofighter will also be at the cutting edge of aerospace high-technology. While the new engine will not be ready in time for the first prototype aircraft (to be

powered by either a Rolls Royce RB199 or a General Electric F404) upon completion it will incorporate some of the latest developments in aero engine technology including, inter alia, single crystal turbine blades, powder metallurgy, and full authority digital engine control.(16). Overall, the new engine design, advanced avionics, innovative construction materials, and sophisticated fly-by-wire techniques incorporated into the European Fighter Aircraft represent a quantum leap forward in aerospace and related technologies.

Organisationally, the EFAP is very similar to the collaborative MRCA project, the intent being to draw on the Tornado experience for guidance and direction, and so avoi some of the shortcomings associated with the Panavia/NAMMA management structure.(17) The government steering organisation for the Eurofighter, for example, has been modelled on NAMMA (the Tornado state management agency). Called simply the International Programme Office (IPO), this agency represents the governments involved in the EFA and is charged with the task of overall project management and supervision, particularly in connexion with the allocation of development and production responsibilities. The IPO has a multi-national staff (including a manager, deputy, technical director, and commerical director) which is responsible to a Board of Directors comprised of senior officials from each of the participating countries' defence ministries (roughly equivalent to NAMMO). The Office is

headquartered in Munich and will share existing facilities with NAMMA.

Parallelling the government organisation, the four participating aerospace firms-- AIT, CASA, BAe, and MBB/Dornier-- have formed a joint company known as Eurofighter-Jagdflugzeug GmbH (limited liability company) to act as the prime contractor for airframe, ground and avionics equipment. Work-sharing and development costs for the initial production of 800 units are to be shared 33 per cent each for the UK and FRG, 21 per cent for Italy, and 13 per cent for Spain, reflecting the proportion of initial output each country will take. Engines are to be produced on a similar basis by another international firm known as Turbo Eurojet Engines GmbH (Eurojet). This company-- formed by Rolls Royce of the UK, Motoren-und Turbinen Union (MTU) of Germany, Fiat Aviazione of Italy, and Sener of Spain-- has been established specifically to develop and produce the power plant for the EFA. The allocation of development and production work will correspond to that on the airframe side; with each industrial partner responsible for research, design and production of specific engine sub-systems.

In establishing the industrial organisation for Eurofighter, the participating firms attempted to integrate the best features of MRCA management while avoiding some of the more serious errors. In this connexion, elements of continuity are apparent not only in the organisational

structure of the EFA programme, but also in the management and research personnel associated with Eurofighter GmbH and Eurojet. For example, many of the project managers (including-- among others-- the managing director of Eurofighter GmbH, Gerrie Willox of BAe, and departmental directors Piero Scarafiotti of AIT, and Martin Friemer of MBB), have had a long professional association with the Tornado project, and presumably will bring to the EFA some of their experience regarding the vagaries and caprices peculiar to international collaborative ventures. Thus in some sense, Eurofighter can be said to be exploiting the advantages associated with institutional learning. To be sure, the Tornado and EFA programmes have been kept institutionally distinct (although at one point there was talk of merging the two). However, the continuity in personnel (amongst other things), means that the organisational experience gained on the Tornado project has been largely transferred to the Eurofighter, sparing the latter the need to "re-invent the wheel" in connexion with collaborative aerospace development and production. Ceteris paribus, this can be expected to reduce the number of delays typically associated with joint ventures, resulting in fewer collaboration premia, lower unit costs, and ultimately a more price-competitive final product.

Building on the Tornado experience, the Eurofighter programme also involves a number of practices that diverge sharply from the MRCA model--particularly in connexion with

(a) the level of concern regarding product support and maintenance, and (b) the level of American participation in the programme. Unlike the MRCA, Eurofighter GmbH has a product support director responsible for the maximisation of the aircraft's maintainability during the design and development phases, and for product support at the time of introduction into service. The product support group is functionally similar to FFV Maintenance in the Swedish Gripen programme, and is intended not only to enhance the combat effectiveness of the Eurofighter (the aircraft can be serviced, refuelled, and re-armed in 30-minutes), but also to improve export prospects by lowering life-cycle and maintenance costs (resulting in fewer aircraft being required for a particular task). Perhaps more importantly, the EFA also differs from Tornado in that, whereas Tornado involved significant American participation at the sub-systems level,(18) efforts are being made to exclude American firms from any participation in the Eurofighter programme. While not mentioning the United States explicitly, the EFA consortium wants firm guarantees from sub-contractors that the aircraft can be sold to any buyer, and has established bidding rules that insist on freedom to export all component systems and parts. As US government export and technology controls often prohibit American firms from making such a commitment, there is little European enthusiasm for US involvement-- and the likelihood of American firms participating in the Eurofighter

programme is near nil.

Having described both the physical characteristics of the EFA and the management and organisational structure of the Eurofighter programme, it is necessary at this point to show how, and to what extent, the project will enhance the international competitiveness of the European aerospace industry. First, as demonstrated above, collaborative ventures of this type have an important and positive impact on the technological competitiveness of participating firms. While it is true that international collaboration tends to result in higher overall research and development costs, so-called "collaboration premia" are often substantially less than 20 per cent and have been falling as Europeans have become more experienced at joint ventures.(19) In return for this extra expenditure, joint projects allow European firms to aggregate "scarce" investment capital in support of the historically underfunded aerospace sector, improving both productivity and technological quality. Moreover, this aggregation is likely to produce more research than would several discrete projects totalling the same expenditure, simply because duplication and overlap are reduced and a critical mass of researchers can be assembled.

A charge commonly made by those opposed to joint ventures is that full specialisation of R&D is never realised (there are invariably duplicate testing facilities

and too many expensive prototypes), and that this necessarily results in higher costs and less bang for the research buck. As was the case with the Tornado, the Eurofighter programme is particularly open to such charges in that it does indeed involve several flight test centres and a number of expensive developmental prototypes. However, it should be noted in this respect that whereas the Tornado project involved fifteen development aircraft,(20) the EFA will require only eight-- presumably resulting in less cost inflation.(21) Moreover, it would appear that the Eurofighter programme, building on the experience gained during the MRCA project, will in fact involve little if any duplication of R&D work. From the initial stages of the programme, both Eurofighter and Eurojet have assigned each participating firm responsibility for a particular set of technological problems and for the development, design, and production of specific sections of the airframe and engine (The Spanish firm CASA, for example, is exclusively responsible for the EFA's twin tail segment(22)). This means that during testing there will be little in the way of duplicate rigs or tooling, and that both consortia can expect to exploit the gains associated with specialisation. Nor should it be forgotten that-- as is often the case-- in the aerospace industry, time equals money. Thus duplicate test centres, to the extent that they facilitate the rapid evaluation of new product technology, may actually reduce overall R&D

costs. In the final analysis, then, it would seem that duplicate test facilities would appear to be a natural and beneficial function of specialisation, and not-- as some have argued-- simply an "unnecessary" financial burden imposed by politicians and bureaucrats in pursuit of their own parochial interests.

Overall, collaborative R&D work can be said to result in a technologically superior final product at marginally higher total costs. Contrasting a comparable independent national aerospace effort to the EFA, the empirical validity of this assertion is at least partially substantiated. In short, it seems that because of the expense of advanced R&D a national European aerospace venture simply cannot even begin to approach the overall technological vitality of the Eurofighter. Thus for example, the best that can be hoped for in connexion with the BAe P.120, Britain's nationally developed active control technology aircraft, is a design the incorporates off-the-shelf radar and Rolls Royce RB199 engines (the same engines that are in the Tornado). RAF officials have expressed some concern that, because Britain cannot independently afford R&D of the scale required to develop an advanced, state-of-the-art aircraft, in the P.120 they would be getting an product with substantially inferior performance to the Eurofighter at about the same price.(23) It seems clear that only through the sharing of the R&D burden can the Europeans begin to consistently challenge

America's technological dominance in the military aerospace market.

Supporters of collaboration also claim that joint ventures improve competitiveness in that they reduce production costs by exploiting the scale and learning economies associated with large orders. In this connexion, the Eurofighter programme has two objectives. On the one hand, the programme is designed to consolidate regional demand by generating a base order approaching the scale commonly enjoyed by US firms. On the EFA, as on the Tornado, each firm specialises in the manufacture of specific parts for all 800 aircraft,(24) allowing companies to employ labour and capital more efficiently, and to spread the costs of R&D, physical plant and administration over more units than if they were building to a national scale. Usually, this allows firms to move further down their learning and unit cost curves and to achieve cheaper production. Moreover, large base orders mean that the most efficient and capital-intensive plant and machinery can be installed, reducing unit costs even further. Drawing on evidence provided by the Tornado experience, this suggests that a base order of 800 aircraft could result in unit savings of 10 per cent for the UK, 15 per cent for the FRG, and as much as 30 percent for Italy and Spain.(25) According to this logic, of course, savings would be increased substantially if the Eurofighter consortium managed to further co-ordinate demand with other European

nations, largely explaining recent European efforts to persuade Belgium and other EPG nations to join the venture.

Collaborative production, of course, is not without its cost penalties; all four participating nations plan to establish their own final assembly lines, and this will necessarily tend to reduce the benefits derived from specialisation. However, as final assembly typically accounts for only about 10 per cent of European production costs,(26) the collaboration premia associated with duplication can be as little as 1-2 per cent of final production expenditures.(27) Considering both the benefits derived from scale and learning economies and the penalties associated with duplication, it would seem that a base order of 800 units for the EFA programme could be expected to reduce unit costs by as much as 30 percent of the cost of a national programme (although 15-20 per cent is perhaps a more reasonable estimate).(28)

A second objective of the Eurofighter programme is to reduce production costs even further by securing stable export markets. Assuming the same learning curve as above, if an 800 unit European effort were to be expanded through export sales to 1200 units, individual aircraft costs could be expected to drop by a further 13 per cent.(29) This clearly indicates the significance of foreign sales; in fact, it suggests that, at least in connexion with Europe, extensive and sustained export sales are centrally important to the competitiveness and profitability of any

collaborative venture.

The importance of exportability to the Europeans, of course, means that they have tended to resist American efforts to participate in the EFA programme, insisting that the incorporation of US technology could potentially impose strict constraints on future foreign sales.(30) Although to date no firm decisions have been made, it appears likely that this will result in at least two important instances of US firms being denied sub-contracts on the Eurofighter. First, it is unlikely that Hughes Aircraft Co. will be successful in its bid for work on the new radar for the EFA. Hughes has teamed with AEG of Germany and GEC of Britain to produce an upgraded version of the US-designed AN/APG 65 radar (known as Multi Mode Silent Digital radar, or MSD) for inclusion in the Eurofighter. The other competitor for the contract is an all-European consortium led by Ferranti of the UK (and including Inicel of Spain and FIAR of Italy). The Ferranti team is proposing a derivative of the Marconi Blue Vixen radar (the ECR-90) which, it is argued, would bring greater technological and commercial advantage to Europe. While it is true that the FRG and Spain are thought to prefer the existing AN/APG 65 in order to control costs, maintain interoperability within their respective airforces, and (in the German case), because AEG is to be the prime contractor on the Hughes' project,(31) Eurofighter's strict bidding rules are likely to mean the all-European radar will be chosen-- simply

because of its greater potential for export sales.(32)

Second, the American designed F404 engine is likely to be excluded from the EFA programme on similar grounds. The long-term plan of the Eurofighter consortium is that later prototypes and production aircraft will be powered by a jointly developed engine based on the Rolls Royce XG40. Until this power plant is available, however, Eurofighter has to rely on an existing interim design-- either the RB199 or the General Dynamics F404. European fears that, once included, the F404 would be retained in later production models (and that this would impede export sales) has inclined the consortium members to favour the Rolls Royce RB199 until the XG40 is ready.(33)

As Trevor Taylor has argued, the Eurofighter has placed the Europeans in a position of "giving either contracts or offence to the US".(34) Considering the importance of exports to the European aerospace industry, it is difficult to imagine that contracts will be offered to the Americans as long as US government export restrictions remain in place. Considering further the importance of the European market to the US industry, and in particular the fact that the Eurofighter radar and engine contracts are worth a total of $US 1.5 billion,(35) the offence offered will be serious indeed. It remains to be assessed precisely how this will affect future European access to the American market, and how it will affect the future development of the Atlantic Alliance.

The American Response

Initially, efforts to rationalise the various European defence industries were conceived with the intent of improving Europe's international competitiveness and so generating a more equitable flow of traffic on the two-way street. As a regional goal, of course, rationalisation was important to the Europeans as a means of redressing the increasingly unacceptable transatlantic defence-related trade imbalance and generally strengthening Europe's industrial infrastructure. As an Alliance goal, too, European rationalisation was considered important, primarily because it allowed the European allies to play a larger role in their own defence (thus reducing the US burden) and also because it allowed for greater armaments European co-operation with the United States. Increasingly, however, European efforts to rationalise their collective defence industrial base have become something of an irritant to the Americans. What has changed in this respect is not so much the logic underpinning the European efforts, but rather the effect those efforts are having (or threatening to have) on the American defence industry-- particularly in connexion with the military aerospace sector.

Perhaps the most pressing American concerns regarding the Eurofighter programme are related to the potentially deleterious effect European collaboration and protectionism will have on US aerospace exports-- particularly to Europe, but also to other traditional American customers outside the NATO European market. Foreign military sales (FMS), of course, are important to the US for a variety of reasons. First, while it is true that the US economy as a whole is not appreciably dependent on arms exports, certain key indicators of economic health are indeed influenced by the balance of defence trade. For example, a Congressional Budget Office study tabled in 1976 concluded that for every $US 1 billion in FMS 42,000 US jobs were created.(36) If we apply this rule of thumb to the five top DoD aerospace contractors, we find that in 1978 foreign military sales generated more than 125,000 American jobs.(37) Given that liberal democratic governments are naturally concerned with the political ramifications of such gross economic statistics, some idea of the national (and partisan political)(38) importance of aerospace exports begins to emerge. Second, foreign military sales are important as a means of reducing US DoD budget expenditures. In this regard, it has been estimated that for every $US 8 billion in arms exported by American firms, the US DoD realises $US 560 million in budgetary savings-- primarily as a result of recouped R&D outlays and production economies (resulting in

cheaper weapons being available in the US).(39) Moreover, savings may be even greater in connexion with the aerospace sector. To quote a second CBO report, the most substantial budgetary savings accruing to the DoD can be expected in the area of "recently developed, high technology systems--particularly fighter aircraft and missiles."(40)

And third, foreign military sales are important to the US in that certain security-active firms rely heavily on exports for both revenue, and the large base orders that generate production economies and underpin the international competitiveness of the US industry. In connexion with the aerospace sector, while it true that the export market typically accounts for less than one half of the military sales of American aerospace firms, a number of companies fall into this category-- that is, they are dependent on foreign orders for a substantial proportion of their total military sales. For example, no fewer than five of the top ten US aerospace firms derive 20 per cent or more of their defence-related business from foreign military sales, with some (notably Textron and Northrop) deriving almost 50 per cent of their business from this source.(41) Nor should one underestimate the importance of export sales in maintaining the international comparative advantage enjoyed by US aerospace firms. In this respect, the CBO is again enlightening and instructive, suggesting that foreign military sales are a significant contributing factor to the commercial competitiveness of the American

industry, and citing four sources of potential savings in this connexion (these being: recouped R&D, learning curve effects, economies of scale, and production line stability).(42)

At its simplest, then, it would seem that foreign military sales are of considerable interest to both the US government and the American aerospace industry. Not only do exports improve corporate competitiveness and profitability (by generating production economies), they also improve the cost-effectiveness of the Department of Defense (by reducing procurement costs) and promote national economic stability (by maintaining employment levels and helping with the balance of payments). Given the importance of FMS, then, (an appreciation of which is shared to some extent by Congress, the Administration, the bureacracy, and industry) it is perhaps not too surprising to find the US government vigorously opposing foreign efforts to restrict and regulate US imports. Nor is it particularly surprising that the US is finally waking up to the transatlantic economic implications of sucessful European armaments co-operation; for, Europe, once largely an American dominated market, is increasingly becoming hostile to US defence goods. In the context of an American defence budget that is unlikely to grow substantially in the next few years, the possibility that armaments co-operation among the European allies could significantly reduce US exports to Europe and elsewhere naturally bodes

ill for American interests. Understandably, US policy makers are beginning to react to the perceived threat. In this connexion, the Eurofighter programme-- and the American response-- provide an interesting case in point.

Given the political and economic importance of aerospace exports to the Americans, it is difficult to see how a programme like the Eurofighter (with its promises of greater protectionism and increased international competition) could not generate significant conflict between Washington and the European capitals. All told, the Americans see the EFA project as posing a three-fold threat to US interests. First, the Americans feel that, because of the Eurofighter consortium's bidding rules, US manufacturers will be excluded from participating in the programme itself and will not therefore have a share in a project that should sell well in Europe and beyond. American fears in this respect, of course, have been reinforced by the apparent failure of Hughes Aircraft and General Electric to secure up to $US 1.5 billion worth of engine and [redacted]ionics contracts, and by the European refusal to accept Secretary Weinberger's suggestion that the US contribute to EFA with a share of about 10 per cent. Should the Americans fail to gain access to the Eurofighter programme, they are concerned that they will be permanently shut out of the fighter aircraft market in the four EFA-consortium nations.

Second, the US feels that if the Eurofighter is commercially successful (that is competitive in terms of price and quality with US products) there is a strong possibility that they will eventually be excluded from the broader European military aerospace market. Naturally enough, this concern is partly underpinned by ongoing Eurofighter efforts to persuade the EPG (F-16) nations to enter the EFA-consortium as full partners-- efforts that may prove irresistable to European nations dissatisfied with licensed production under American export controls.(43) If Eurofighter GmbH proves successful in its bid to attract more European participants, then US firms do indeed face "being frozen out of the vital European export market."(44) As some calculations suggest that by the turn of the century as many as 2000 US-designed European aircraft will be approaching the end of their operational life-cycles, and that their replacement value will be around $US 30 billion,(45) such a development would be a substantial blow to US industry.

A third American fear regarding the Eurofighter programme is that a commercially competitive European aircraft might well challenge the US stranglehold on the global (non-Soviet) military aerospace market. Currently, US designs account for about 85 per cent of the aircraft in service outside of NATO, while the European share is closer to 5 per cent.(46) However, if European collaboration and protection succeed in producing a combat aircraft that is

is reasonably priced, of good quality, and not subject to US export controls then there is a good chance that Eurofighter might sell 200 plus aircraft to foreign buyers. To be sure-- given the magnitude of the numbers involved-- the sale abroad of 200 aircraft will not appreciably alter existing European market share (at least not over night). That would require far more exports than are currently projected. However, a successful EFA, incorporating exclusively European technology and know-how, may prove to be the first step toward establishing not only a more balanced two-way transatlantic street, but also a more equitable division of the global aerospace market.

The US political response to the Eurofighter threat has thus far been ambiguous, although there are indications that the Americans are digging in for a protracted battle with the consortium over access to the project for US firms. On the one hand, for example, both the Administration and Congress have reacted to European protectionism by attempting to persuade and entice the European allies to participate in more transatlantic armaments programmes. In this connexion, US Secretary of Defense Weinberger, US Ambassador to NATO William Abshire, and US Deputy Secretary of Defense William Taft have spearheaded American efforts to convince the European allies that NATO needs to make the best use of its available defence resources, and that industrial teaming is

the most effective means to that end. Similarly, the legislative branch has responded to the EFA by pursuing a constructive, non-confrontational, policy designed to bring the Europeans back into the American fold by means of incentive rather than threat. In this respect, for example, Congress amended the 1986 Defense Authorisation Act in oreder to further reduce some of the formal legal barriers to European participation in the US market and to make available $US 125 million for US-European co-development projects (part of a policy known as the Nunn Initiative).(7) Since then Congress has sweetened its offer by appropriating a further $US 3 billion for collaborative transatlantic research and development.(48)

On the other hand, however, the US government has periodically assumed a less congenial posture toward the Europeans and has threatened to respond to the Eurofighter bidding rules with political pressure and retaliatory legislation-- perhaps demonstrating the limits to US tolerance. On March 2, 1987 for example it was reported that DoD had issued a note to the EFA countries declaring that protectionist measures undertaken in connexion with the Eurofighter programme were in violation of the Memoranda of Understanding that existed between the US and NATO Europe. The note further indicated that failure to amend the EFA bidding requirements so that US firms could participate in the project would result in additional restrictions being placed on the transfer of American

military technology to Europe and a loss of European procurement opportunities in the American defence market.(49) The ambiguous nature of the overall American position was underscored by the fact that the note was withdrawn shortly after it was issued.(50)

While it is still too early to predict with any certainty which direction the US will eventually take in this regard, it seems inevitable that the American decision will ultimately be influenced by the European reaction to the so-called Nunn Initiative. Broadly, should the Europeans accept the US offer of greater transatlantic co-development, then Washington will obviously be only too happy to refrain from taking retaliatory or punitive action against Europe. Conversely, however, should the initiative fail, and the Europeans continue to pursue regional defence industrial development at the expense of American industry, then it is clear that the US will feel constrained to begin protecting its own economic interests-- at the very least, undermining the potential for further industrial collaboration between Europe and America. As it appears unlikely that Europe will accommodate the US at the expense of its own economic future, European efforts to strengthen their pillar of the Alliance defence industrial base would seem destined to generate conflict and disharmony within NATO for some time to come.

Endnotes

1 Both the 1978 Klepsch Report (Report on European Armaments Procurement Cooperation) and the 1983 Fergusson Report (Report on Arms Procurement Within a Common Industrial Policy and Arms Sales) recommended the creation of a single EC market in military equipment, and the consolidation and rationalisation of the European development and production effort.

2 Frederick Bonnart, "The Open Market-- The Way Ahead For the European Defence Industry." NATO's Sixteen Nations vol. 32, no. 4 (July 1987). In the mid-1980s the IEPG commissioned a group of experts to identify and analyse shortcomings in the structure of the European defence industry. The final report of this panel (known as the European Defence Industry Study Team) was tabled at the Madrid meeting of the IEPG defence ministers on June 22 1987. In brief, yhe Study Team's investigation demonstrated that the crux of Europe's defence industrial weakness was that (a) European research and development was severely underfunded by American standards, and (b) that Europe lacked a single procurement institution with the authority to act as such. To redress these shortcomings, the Team recommended that a common research and development programme be established, and that the IEPG establish a small permanent secretariat headed by a prominent European.

3 In 1975, for example, American assistance to its aerospace industry totalled about $US 8.8 billion (1975 dollars). For the same period aggregate European aid totalled only about $US 2.9 billion (1975 dollars). See Joseph C. Rallo, Defending Europe in the 1990s-- The New Divide of High Technology (London: Francis Pinter, 1986), 59-60.

4 M.J. Peck, "Microelectronics and Computer Technology Corporation." Research Policy vol. 15, no. 5. (October 1986), p. 222.

5 Trevor Taylor, Defence, Technology and International Integration (London: St. Martin's Press, 1982), p. 89.

6 This is assuming, of course, that at least some of the savings generated by scale economies would be redirected to R&D. Even in connexion with *ad hoc* collaborative production this promises to result in some technological improvement.

7 Taylor, p. 89.

8 See Lawrence Hagen, Twisting Arms: Political, military, and Economic Aspects of Arms Co-operation in the Atlantic Alliance (Kingston: QCIR, 1980), p. 153.; and Keith Hartley, NATO Arms Co-operation (London: Allen & Unwin, 1983), p. 103.

9 The development and production savings that would have resulted from the sale of Tornado to the EPG nation would probably have been in the region of 10-15 per cent. to the EPG nation. Based on hypothetical estimates provided by Trevor Taylor. See Trevor Taylor, Defence, Technology, and International Integration (New York: St. Martin's Press, 1982), pp. 89-90.

10 Count Corrado Agusta, quoted in Meeting Report, International Symposium on NATO Standardization and Interoperability, American Defense Preparedness Association, March 1978, pp. 77-83. as quoted in Hagen, Twisting Arms, p. 83.

11 Existing US policy (particularly the Arms Export and Control Act, and the Export Administration Act) prohibits the unauthorised sale of defence systems or sub-systems designed in the United States. Under the provisions of this legislation the US government has disallowed proposed sales of the Swedish Viggen (containing an American engine) to India, and the co-produced F-16 to Jordan. See Hagen, Twisting Arms, p. 82-85.

12 Rallo, Defending Europe in the 1990s, p. 73.

13 That is, the more or less comprehensive re-allocation and re-organisation of production capital along continental lines, as opposed to *ad hoc* rationalisation which is project specific.

14 "Eurofighter Organisation Takes Shape." NATO's Sixteen Nations vol. 31, no. 4, (July 1986): 90.

15 For a discussion of the enabling technologies and a technical analysis of the EFA see B. Wanstall, "Manufacturers Prepare for Europe's New Fighters," Interavia no. 10, 1985, pp. 1133-1136.; S. Broadbent, "EAP: A Step Up the Ladder of Advanced Technologies," Jane's Defence Weekly vol. 7, no. 11 (21 March 1987): pp. 510-511.; and S. Broadbent, "EFA and Beyond: A Giant Leap for Avionic Software," Jane's Defence Weekly vol. 7, no. 12 (28 March 1987): 560-562.

16 "Eurofighter Organisation Takes Shape." NATO's Sixteen Nations vol. 31, no. 4 (July 1986): p. 90.

17 For a discusion of the organisational aspects of the EFA see, "Eurofighter Organisation Takes Shape." NATO's Sixteen Nations vol. 31, no. 4 (JULY 1986): p. 90.; "Europe's Fighter Prospects." Jane's Defence Weekly vol. 6, no. 8 (August 31, 1986): pp. 379-381.; and Frederick Bonnart, "The European Fighter Aircraft--an update." NATO's Sixteen Nations vol. 31, no. 7 (November 1986): pp. 58-60.

18 W.B. Walker, "The Multi-Role Combat Aircraft (MRCA): A Case Study in European Collaboration," Research Policy 2 (1974), p. 291.

19 Hartley, NATO Arms Co-operation, p. 150.

20 Hartley, NATO Arms Co-operation, p. 150.

21 "Eurofighter Organisation Takes Shape," p. 90.

22 X.I. Taibo, "EFA is a First for Spain," Jane's Defence Weekly vol. 6, no. 8 (30 August 1986): p. 381.

23 Nick Cook, "Stormy Ride for the EFA," Jane's Defence Weekly vol. 7, no. 22 (6 June 1987): p. 1137.

24 Trevor Taylor, "European Armaments Co-operation: Competition for Resources," Defence Yearbook 1987 ed. RUSI (London: Brassey's Defence Publishers, 1987): p. 145.

25 Hartley, NATO Arms Co-operation, p. 152.

26 Trevor Taylor, European Armaments Co-operation; Competition for Resources," p. 145.

27 Hartley, NATO Arms Co-operation, p. 153.

28 Hartley, NATO Arms Co-operation, p. 153.; and Taylor, "European Armaments Co-operation: A Competition for Resources," p. 145.

29 Based on an assumed 85 per cent learning curve. See, Taylor, Defence, Technology and International Integration, pp. 89-90.

30 Thus the Europeans rejected Secretary Weinberger's suggestion (made in the autumn of 1985) that the US be allocated a 10 per cent share in the EFA programme. The Europeans feared that this would contribute to the fracturing of the regional aerospace market, and impede their efforts to sell the Eurofighter on the wider world market.

31 The AN/APG 65 is being retro-fitted into Germany's F-4s and is already in service in Spain's EF-18s.

32 F. Clifton Berry, Jr., "The British are Coming," Airforce Magazine (June 1987): p. 76.

33 For a discussion of the American bids for the radar and engine components of the EFA see, F. Clifton Berry, Jr., "The British are Coming," p. 76.; and Trevor Taylor, "European Armaments Co-operation: Competition for Resources," p. 146-147.

34 Taylor, "European Armaments Co-operation: Competition for Resources," p. 147.

35 Washington Times, 2 March 1987, p. 2.

36 CBO, "The Effect of Foreign Military Sales on the US Economy", Staff Working Paper (23 July 1976), p. 1.

37 Based on the following data (all sales figures in $US millions): General Dynamics, 1476; Litton Industries, 524; Textron, 441; Lockheed, 297; and McDonnell Douglas, 274. See, H. Tuomi and R. Vayrynen, Transnational Corporations, Armaments, and Development, (New York: St. Martin's Press, 1982), p. 29.

38 Congressmen, too, are concerned with employment--particularly as it effects their district. Thus, Congressmen for whom loss of exports means a loss of jobs in their constituency are unlikely to favour foreign protectionism or increased international competition.

39 CBO, "Budgetary Cost Savings to the DoD Resulting From Foreign Military Sales", Staff Working Paper, (24 May 1976), p. ix.

40 ibid.

41 See Tuomi and Vayrynen, p. 30.

42 CBO, "The Effects of Foreign Military Sales on the US Economy", p. 181.; Gansler also supports this assertion. See Gansler, The Defense Industry, p. 214.

43 See, "The Battle for a European Fighter", Jane's Defence Weekly, vol. 7, no. 24 (20 June 1987), p. 1278.

44 ibid.

45 Pierre Condon, Interavia, no. 4 (1986), p.379.

46 Hartley, NATO Arms Co-operation, p. 103.

47 Trevor Taylor, "European Armaments Co-operation: Competition for Resources", p. 151.

48 Ted Hooton, "Europe's Fight For US Contracts", Jane's Defence Weekly (3 Oct. 1987), p. 754.

49 Washington Times, 2 March 1987, p. 2.

50 Wahington Times, 3 March 1987, p. 4.

CONCLUSION

The central argument of this paper is that efforts to rationalise the European defence industrial base are both pre-requisite to and incompatible with the broader goal of Alliance-wide specialisation and rationalisation, at least within NATO as it is presently configured. Broadly, the contention is that rising weapons costs in the context of stable or shrinking defence budgets are moving the NATO alliance inexorably toward structural disarmament-- that is, to the point at which the trend curves for national defence budgets and the cost curves for military equipment intersect. In response to this trend, the Alliance has been forced to consider means of reforming its duplicative and highly wasteful defence industrial effort so that development and production costs can be controlled, and the price of military preparedness can be kept within reasonable limits. From a simple economic perpective, of course, the creation of a NATO-wide free-trade regime in defence goods would seem to be the optimal approach to this problem as it promises the most comprehensive rationalisation and the most effective cost reductions. Free trade, however, is fraught with political hazards that make it largely unacceptable to most Alliance governments.

An apparently attainable alternative to free trade in this connexion is "managed specialisation", or rationalisation according to a politically negotiated division of labour. As demonstrated, in the late 1970s there was considerable enthusiasm within NATO for this type of approach, particularly in the form of the "family-of-weapons" concept so heavily favoured by the Carter Administration. Within Alliance circles managed specialisation was considered more realistic--and therefore more possible-- than free trade because it minimised Allied fears that industrial re-organisation would be painful and traumatic; in short, as Lawrence Hagen pointed out, "it offered the benefits of collaboration in the context of current production patterns-- integration without tears."

Managed specialisation and the family-of-weapons concept, however, proved not to be the panacea many had expected. "Current production patterns", heavily favouring the US, were considered largely unacceptable to a Western Europe that was increasingly inclined to economic competition, as well as military co-operation, with the Americans. Consequently, the European allies made it clear from the start that any specialisation within the Alliance would have to be based on the prior realisation of a more equitable flow of traffic on the transatlantic two-way street. In short, the Europeans established as a pre-condition for NATO-wide defence industrial rationalisation greater access for their goods to the US

domestic defence market.

This pre-condition--unavoidable and perfectly legitimate from a European perspective--has proven in large measure to be at the root of the Alliance's current defence industrial dilemma; for if the Europeans want to enter the American defence market, US trade and procurement legislation requires that they do so on the basis of commercial competitiveness, not political horse-trading. Essentially, then, if Europe desires greater access to the US market, it must first of all "get itself together" and begin producing competitive equipment at competitive prices. In order to achieve this, however, Europe must reform its own domestic market in order to realise US-scale production economies and capitalisation rates. The crux of the problem is that this necessarily requires greater European collaboration and protectionism, and ultimately suggests that Europe will begin to offer the US more global competition. As this is unlikely to sit well with the Americans, it would seem that-- contrary to the original intent-- European rationalisation seems destined to result in more, not less, fracture within the Alliance defence industrial base. Although the verdict is not yet final, the Eurofighter programme would seem to confirm this hypothesis.

In the final analysis, it is perhaps going too far to suggest that conflict and competition over the defence industrial base heralds the ultimate demise of the Atlantic

Alliance; NATO has weathered too many potentially divisive crises in the past to suppose that it will not prove capable of "muddling through" this time as well. It does seem reasonable, however, to suggest that if NATO is to survive into the twenty-first century it must undergo something of an economic and political reconfiguration. As things stand, the Alliance does not permit the US and Europe to pursue the common goal of defence industrial rationalisation simultaneously with their respective-- and increasingly divergent-- regional and national economic goals. This clearly implies that a structure is needed that would in some sense allow the Allies to accommodate one another without sacrificing efficiency in weapons production. While it is unclear at present precisely how NATO should achieve such a goal, it is nevertheless obvious that some movement must be made in this direction; for, in the context of skyrocketing defence costs and limted industrial and budgetary resources, the present conflict over the defence industrial base serves only to further diffuse and fracture the Alliance's collective preparedness effort.

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