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## International Codevelopment and Coproduction of Weapons: Some Conclusions and Future Prospects

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*In recent years the rapidly rising cost and complexity of modern weapon systems have made their development and production prohibitively expensive for individual states of medium economic power. International cooperation in weapons development and production offers not only the advantage of economy, but also the general reduction of international economic and technological barriers. In this article Capt. Alexander H. Cornell summarizes an extensive investigation of the methods and effectiveness of international codevelopment and coproduction of weapons. This investigation included three case studies in coproduction: the Atlantic maritime patrol aircraft, the Hawk antiaircraft missile, and the F104G Starfighter.*

## **INTERNATIONAL CODEVELOPMENT AND COPRODUCTION OF WEAPONS**

### **Some Conclusions and Future Prospects**

An article prepared

by

**Captain Alexander H. Cornell, SC, U.S. Navy**

The increasing sophistication of modern weapons has increased the cost of developing them to the point where it is economically impossible for any industrial state of less than continental dimensions to develop and produce for itself an entire arsenal of modern weapons. This trend of events at first seems to present smaller states with the unpleasant choice of remaining in a state of technological inferiority or of contracting major arms purchases with the superpowers. Today, however, multinational codevelopment and coproduction of weapons offer to smaller states a third option. Recent years have seen a large and little known number of successful projects of this type, including the Atlantic maritime patrol aircraft, the F-104G Starfighter, and the

Hawk antiaircraft missile. While most of the codevelopment projects initially undertaken included the United States, the European states of NATO are now beginning to organize independently many projects which fulfill their own specific needs.

International production and development of weapons offer several advantages to the participants. The cost of development is shared by a number of states, thus avoiding duplication of effort and decreasing the cost for each state. The quality of the product usually benefits from the wider experience and knowledge that result from crossing national boundaries. Such projects also usually have the effect of increasing the technological capabilities of each state's industry. This was especially true in the

early projects, in which the United States was a prominent participant. Finally, such projects aid in lowering international trade barriers and in promoting international harmony and understanding.

As might be expected, such projects require sound management practices in order to coordinate the efforts of a multinational and multi-industrial organization. Two different types of management have emerged from these endeavors. One is the so-called institutional type where the project is organized and administered through the organizational framework of NATO. The second is the "permissive" type or a less formal organization which may include any number of states and which usually develops its own *ad hoc* administrative apparatus through an agreement by the participating governments. In this latter type the NATO structure serves more as a sounding board in which the members can air their military requirements and exchange ideas on the subject.

**An Overall Assessment.** The charge is heard today that technology has outgrown institutions. If so, it is high time to concentrate more effort on bringing the level of organization and institutional achievement up to the level of technology. Science and technology have long been recognized as being international by nature, therefore any progress that can be made in the field of international logistics institutions should be considered a contribution toward the solution of the problem of technology versus institutions.

A group of relatively successful attempts have been made to disperse the skyrocketing costs and complexity of modern weapons technology among a group of nations and industries. A series of collaborative programs in perhaps the most difficult and complex of all organizational areas—that of an international/interindustrial scope—now stand as suc-

cessful production accomplishments. It is rather ironical that the collaboration had to first take place in the production of weapons for warfare rather than "peaceful" hardware, but at least it has taken place and is continuing to take place. Peaceful hardware collaboration appears to be following on. In March 1969 the commercial supersonic aircraft *Concorde*, developed and produced jointly by France and the United Kingdom, flew successfully.

International military logistics, the larger field of which the subject of this paper is a part, has mushroomed in importance. International logistics has become a positive, ongoing program which has experienced an extraordinary growth in the form of multiple organizational bodies, both national and international. Because of the large number of institutions and the measures taken to manage the programs, most observers agree that it has not been a well-knit, cohesive operation. There have been a multiplicity of organs, programs, and overlapping assignments of responsibilities, particularly in the United States, that may or may not have contributed to the common objectives of the program. The situation is such in the United States that observers have felt there is no one point below the President, or perhaps the Secretary of Defense for most programs, which is capable of bringing about a clear direction of the joint weapons production program as a whole. As compared to American multiplicity of organs, programs, and procedures, the relative simplicity and fewer number of European and NATO organs stand out in sharp contrast.

In fairness to the problem, however, it must be borne in mind that international logistics affairs have been harder to manage because they are fast moving, worldwide, and extremely complicated. Many factors bear upon the problem to a degree not usually experienced by purely national or single industrial

problems. Despite these, it is safe to say that international logistics as a whole, and coproduction in particular, has produced some tangible, successful results since World War II. While expectations have fallen short in cooperative research, there is something to be learned from the codevelopment and coproduction efforts of the past 20 years. The record shows that industrial groups were created and operated of a size comparable to any national giants of industry. For both the governmental side and industrial side of the coproduction organizations, there were new coordinating groups created which managed the industrial combines as well as any unilateral enterprise. Unprecedented accomplishments using multinational and multi-industrial consortia took place with a speed, economy of resources, and production performance that equaled or surpassed many purely national or single industry programs.

Faced with the costly and almost impossible problem of procuring modern weapon systems by unilateral means, the NATO Allies developed a method and process of multilateral production. The method resulted in their being able to jointly participate in and contribute to common production and thereby obtain weapons for themselves they might not otherwise have been able to procure.

In practice the coproduction problems proved that many national, legal, customary, and self-interest barriers between and among participating nations can be eliminated or reduced. The consortia members furthered the cause of strengthening their economic and industrial capabilities and helped reduce the technological gap between them. They also helped reduce or eliminate trade, tariff, tax, and proprietary rights barriers which had been obstacles to production and procurement.

The weapons produced have been publicly acknowledged as being as good, if not superior, to any produced

unilaterally. The quality has been excellent and the quantity exactly that which was programmed. They kept remarkably within their original budgets. They produced well the standardized weapons suitable for international operation and provided common maintenance and logistics support by any of the user nations.

To direct successfully vast transnational coproduction programs required an unusual kind of flexible organization and managerial talent. These qualities were apparent not only on the part of top-level coordinators and management within NATO and the international/interindustrial agencies created, but also on the part of the governments themselves and the thousands of workers at the grass roots level.

Integrity and loyalty to the project as a whole were especially noteworthy. The policy of designating one man on policy boards and executive agencies for each nation and the high caliber and intellectual discipline of the designees were keystones of managerial effectiveness. As cohesive groups, they overcame or reduced the day-to-day problems and barriers of different national and business customs to make the programs work. They learned to schedule highly complicated production requirements and cross deliveries that had to be coordinated to meet the total program involving hundreds of industries, and they learned to depend upon each other for such coordinated deliveries.

They surmounted differences in language; differences in engineering standards and procedures; differences in distance and industrial locations; differences in the level of their technological and production capabilities; differences in business practices, measurement systems, and accounting and contracting procedures; differences in patent and proprietary rights laws; differences in financial and credit philosophies and practices; and differences in managerial techniques and

organizational habits, to recount but a few that were brought out in the case studies.

The entire management aggregate found that an organized approach, based on sound and imperative reasons for cooperating, coupled with a willingness to be flexible and to compromise, could make possible the benefits of mutually produced, expensive modern weapons, which they might not otherwise have gained.

Their managerial techniques and organizational elements, while differing in degree of authority, became more patterned and now can be generalized upon in several useful ways. The record of the programs alone shows a broadening but relatively standardized pattern as time and experimentation went on. In each case there was the familiar pattern of a top policymaking board of international members. Beneath it there was in each case a governmental executive agency and usually a parallel industrial executive agency. Similar functional divisions were created beneath these. In addition, other divisions were created as necessary to meet the peculiar demands of the particular production enterprise such as language, liaison, and technical documentation control centers. Even the manufacturing consortia, whether for aircraft or missile production, fall into subgroups organized along major component lines. The use of groups of experts was common practice in all three cases to make initial investigation and to recommend plans and organizational structures. It was generally a matter of degree of authority granted or taken by each of the above levels in which the programs differed.

Early joint production of weapons had as its publicly avowed purpose that of getting defense-related industries started in Europe. The purpose was to build up and broaden the technological base among European members in the belief that broader strength meant

greater security. Since then, however, the emphasis has changed to viewing joint production as a method of helping European industries survive in the face of overwhelming American competition. The large and increasing number of smaller programs underway since the first ones of the late 1950's and early 1960's are evidence of this trend. The literature is replete with statements by European nationals and industrialists confirming these new trends and emphases.

While the trend away from broader, multiple-member programs toward more specific bilateral and trilateral projects with more limited objectives is a matter of record, there is one significant exception. That is the NATO Air Defense Ground Environment (NADGE) organization in which all the NATO nations are members. It is submitted that the large, but relatively unknown, number of coproduction agreements taking place in the 1960's testify to the continuing acceptance, interest, and desire on the part of most Alliance members, and especially their developing industries, to participate in joint programs. "Transnational business" seems to have become interested in the practicability of the new way of joint manufacturing and most of the impetus for the new programs now comes from outside NATO as a formal organization.

Actually, as for the inception of most joint projects, nearly all important ones have been started by one or two members since the beginning. Thus, whether the programs have evolved into multilateral ones or have remained mostly bilateral as they are today, their beginnings were usually found in the requirements or interests of one or two members. One answer as to why the programs have gone down to smaller, lower levels has been due to the difficulties inherent in getting multimember agreement on the requirement and participation. However, there are undoubtedly other practical reasons such as

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national pride in product, resurgent self-interests, both nationally and industrially speaking, and even selfishness, in view of the economic gain and sales advantages that can be gained by being a limited producer of a needed weapon.

The programs proved in actual practice that many national, political, legal, customary, and self-interest barriers between and among the participating nations and industries can be eliminated or greatly reduced. They furthered the cause of strengthening the industrial and economic capabilities of the partners and helped reduce the technological gap between them. They also helped reduce or eliminate trade, tariff, tax, and proprietary rights barriers. They were good examples of two significant elements necessary to any international or inter-industrial effort—the *will* to participate and the *goodwill* to see it through.

**The Role of NATO.** It is in the vital function of getting everyone interested and informed who may have a similar requirement that NATO has been of real assistance. The present NATO organization provides the place and opportunity for its members to hear each other's needs and to make the contacts which are necessary to reach an agreement. The very fact that each is made *aware* of the other's intentions and needs is a significant step toward cooperation. Above all, increased mutual respect and trust are fostered by the proof that they have been able to work together.

The present system of management which is in vogue, the permissive type, by no means shuts out the NATO bodies from active participation. All the sections of the International Staff and the military organs that influence production have important functions to perform. Not only do they provide a formal framework for negotiation, but they have facilitated many decisions as the result of informal, behind-the-scenes bargaining. Even Vandevanter, who did

not see the staff or NATO playing too important a role in production matters, admitted that the official network was "ideally constituted to act as a continuous channel of communications."<sup>1</sup> He visualized the correct role of the NATO organs as intermediaries rather than arbiters and concluded that the role of arbiter would only serve to curtail NATO efforts to establish criteria and select weapons.

By the late 1950's the Production and Logistics Division and its successors increasingly became the parliament for ideas within NATO rather than the vehicle of their execution. The military organs have not succeeded as well as might have been expected in having their carefully worked out requirements become realities. In fact, with the exception of Atlantic, not a single NATO Basic Military Requirement (NBMR) drawn up by the Military Committee has ever been carried out. On the other hand, a large number of requirements that have come up from the members or their industries have been accomplished.

The NATO International Staffs, in responding to the need to provide some sort of structure in which to fit the growing number and kinds of cooperative programs, drew up general guidelines for them in their "NATO Production and Logistics Organizations" (NPLO's). These structural guidelines were necessary to bring the many current and prospective programs into as routine or standard grouping as possible to avoid political problems arising in the absence of such guidelines. There already had been sufficient patterns set in all three categories of programs to insure that the guidelines were reasonable and would be acceptable. They in no way straitjacketed any desirable deviations or impeded unique organization innovations. No instance was found wherein the International Staff/Secretariat overstepped its bounds as a clearing house or as a coordinating agency and catalyst. Not once did it

overstep its limited operational powers or impede progress by "forcing" any particular organizational arrangement. Its key position and value were recognized, for example, by the United States when it insisted that the staff be the focal point for negotiations between the European members and the United States or its industries for matters concerned with weapons production of U.S. origin.

**The Ad Hoc Approach and Other Conclusions.** An additional conclusion of this study is that when supranational authority does not exist, as in a coalition such as NATO, a tendency toward *ad hoc* arrangements for joint projects takes place. The necessary centralized authority and responsibility are provided by newly created international bodies or by the use of certain existing national bodies specifically endowed with supranational powers. Moreover, in the absence of real authority in its own right, there is a greater need to rely upon personalities.

The *ad hoc* approach to initial program organization and agreement is still the general method of arrangement between nations in the absence of any supranational authority. However, the nature of joint weapons production has changed from being primarily security mission-oriented and NATO-sanctioned programs, which reflected early U.S. domination of development and production, to programs which reflect broader national, economic, and technological interests.

The size, nature, and specific partners of today's combines have experienced changes. The earlier position of the United States, that of being generally the only one with a ready-to-produce weapon, is undergoing change. The current list of national combinations and weapons shows that all the members are substituting *their* components or *their* weapons more and more in place of components or weapons of

U.S. origin. Or, if a U.S.-developed weapon is selected, they are obtaining a larger share of production.

A trend that also may be observed is that the overall programs have moved from one of building up the industrial and technological potential of weaker member countries to one of international cooperation to meet specific needs. European countries have moved away from the initial security basis for cooperation to one based on greater technological improvement for national or economic reasons.

As a result of this change, the European members are demanding and arranging an increasing share of recent programs. As *quid pro quo* has become a keynote in the outright sale of weapons, it is becoming the practice in codevelopment and coproduction.

Still another conclusion regarding organization is that the present so-called "permissive" system of organization of combinations has fostered a greater number of joint programs than the early one of organizational and operational sanction under the so-called "institutional" method. The International Staff and its principal division responsible for coordinating cooperative weapons development and production can be credited with taking the initiative in seeking a better way, a more acceptable way, of facilitating international weapons planning and production efforts.

Regardless of the organizational "method" used to stimulate pooled productions by NATO, whether "institutional" or "permissive," they were designed to foster as much cooperation as possible. The "institutional" type structure was so short-lived that it certainly cannot be criticized for too much adverse influence on the programs. In fact, it only obtained completely for the Atlantic aircraft, one of the better structured and managed programs. The remainder of the programs have been organized by "permissive" type approaches of one degree or another. The

system, or perhaps better called "process," produced sufficient successful structures to show that it is capable of adaptation to any degree of interest and competition between nations and their industries. However, it has not been either a detriment or a significant means of facilitating joint research and development efforts.

The "permissive" structure is really no prescribed structure at all, but a means of making every conceivable avenue and opportunity for joint efforts available to the members. Buyers and sellers are urged to negotiate in an unrestricted, logical market process. The product itself may be determined by the participants. The door is open even to latecomers who wish to join. When it comes to such crucial steps as the selection of a product, influence is left to exert itself in rough proportion to the amount of risk, production, and sales each member sees fit to pledge. It is not necessarily a one-vote situation. By such realistic apportionment, the system faces up to the facts of business life. The field is open to hard but open negotiation, until a group is found willing to take on the manufacturing task. A competitor whose product is not chosen cannot prevent the others from combining. There is no veto so long as at least two wish to proceed.

Existing international structures were used to assist in the organization of all cooperative projects. The NATO Standing Group, the Military Committee, the Armaments Committee, and particularly the International Staff were not specifically established for these functions but were given responsibilities to play an active part in the cooperative process. The staff was restructured no less than five times to fit the changing patterns of joint endeavor. The same observation is valid as applied to individual programs and organizations. National organs, both government and industrial, were used wherever feasible to operate or to assist in operation of

the programs. By using such existing bodies, duplication of organization was avoided, as were the creation of new jobs, the training of new units, and industrial reorganization.

**Adherence to Principles and Objectives of International Logistics.** The question of how well the case programs met or conformed with the principles of international military logistics can now be answered in summary. Certain basic principles are restated below followed by comment on each:

1. To promote the defensive strength of the allies by developing a coordinated production base in Europe for modern weapons systems.

This objective was enhanced by the three case programs to the extent that they, and many others, have been among the chief reasons for European countries being in the position they are today of initiating their own joint development and production programs.

2. To promote the concept and practice of standardization among the allies.

This principle also was adhered to. Weapons were produced that were identical in performance, support, maintenance, and use in all countries. It is obvious that an even greater amount of standardization among allies can be achieved by multilateral programs than can be by bilateral ones. However, in either case, progress is made toward a common family of weapon systems in use by the partners.

3. The principle that countries are still responsible for equipping their own forces but that cooperative means are indispensable for countries with limited resources.

The first part of this principle is still adhered to and is not likely to change in the foreseeable future. The second part has been the keynote of the case programs and has carried over into present-day cooperative projects.

4. To transfer the factors of production where needed in the alliance



and increase the technological and industrial base.

Proved by the programs.

5. To maximize the exchange and effectiveness of scientific and technical information and resources through elimination of unnecessary duplication of effort and facilities.

This, in fact, took place in the case programs and is continuing under present programs.

6. A NATO principle, that it is politically desirable that cooperative programs take place in NATO or under the NATO aegis.

This principle appears to have been drawn away from on the part of the members. None take place within NATO today, but most seek the NATO aegis. Again, the exception is NADGE.

7. A NATO principle that a system should be evolved whereby cooperation would be both efficient and attractive. Permissiveness, flexibility, an open door to members, and subsequent action taken by interested nations should be on a case-by-case basis in as free a manner as possible.

This principle appears to have taken hold and is the current basis for individual national and industrial cooperative programs. In fact, it has become a more common way of doing transnational business in weapons development and production with or without NATO sanction or initiative.

**Some Managerial Conclusions.** The touchstone of management problems in multilateral organizations is an understanding of coalitions. A coalition cannot enforce compliance by any sovereign member, simply because there is no supranational authority. Therefore, management is faced with an even greater challenge than is normally found in a typical organization.

One of the management successes was the practice of each government designating one man, and one man only, to represent it on the policymaking

organ. This resulted in a small, able group which did well at representing their governments, were very good at clearing problems at their own national levels, and, most of all, worked exceedingly well together. They were given general and flexible direction, real responsibilities, and, above all, trust—a combination that proved itself in the operational results.

The success of what might be described broadly as military/government/industrial endeavors in the joint application of development and production organization in order to produce modern weapons may well serve as an example to other international institutional effort. There are those who even view the successes as presaging a trend whereby the methods used to achieve weapons cooperation may be a useful way of conducting certain other international affairs. Whether one agrees with this or not, the avoidance of duplication of national effort that could be achieved by cooperative efforts in other fields than weapons is certainly an objective well worth considering.

**Future Prospects for Cooperative Development and Production of Weapons.** Although the problems of effective standardization and common production of weapons by the alliance members are complex and manifold, they are not insuperable. There are basic problem areas which challenge the success of all programs, areas which cut across every known attitude and national interest. There are problems of a more immediate but less fundamental nature, however, that might be resolved more readily if the proper study was attempted. For example, the problems of cost sharing and funding sources or methods are two whose resolution would greatly facilitate future programs. They too will be found by the student of organization to have their roots in the national sovereignty issue.

There is clearly need for some kind of central funding arrangements, particularly for feasibility and design studies and for research and development, if they are to be communal affairs. Central funding would be ideal for production, too, but perhaps more difficult to obtain agreement for in view of the larger sums of money involved. Unfortunately, it is not possible for NATO to commission even general "paper" studies at its own expense. The alliance is dependent upon individual firms or national governments to undertake even these at their own expense and risk. It would appear that if the recently reorganized NATO Conference of National Armaments Directors (CNAD) and newly created NATO National Industrial Advisory Group Conference (NIAG's) are to perform any kind of real planning for weapons development, they must have some kind of funding resources. They should be able to commission innumerable studies to determine the economic feasibility or technical viability of projects they may propose in the future. NATO should continue to initiate projects which might interest any two or more members. It must continue to make its requirements known to members and encourage them to join together in projects where requirements of both the coalition and the individual nations parallel each other. Only in this way can the recent trend toward numerous bipartite and tripartite *ad hoc* arrangements be taken advantage of for the benefit of NATO as a whole.

The second more immediate problem, that of costing out each project to let each member know the total risk and his own share of the risk, is one that demands early study and resolution. Each project should be carefully costed out and sensibly phased, with agreed points fixed at which deliberate decisions must be taken on the future of the project. It will require common resources to carry out such a study for

each proposal, whether it be an *ab initio* one such as Atlantic or a purely production program of a weapon in being such as Hawk; whether it be an *ad hoc* project resulting from the usual unsystematic individual approach by one or two members or the hoped for result one day of controlled, advanced planning and direction of a total collaborative effort.

The "unknown risk" must be made the "known fact" to the greatest extent possible to attract nations to join. "It is," as James concluded, "only fair to national parliaments, so that governments do not find themselves inextricably involved in projects that might grossly exceed the estimate."<sup>2</sup> In isolating the costing and phasing problems as being of significant importance, he was urging their resolution to satisfy, in turn, the political problem of nations which he too saw as being "in the last resort... a problem of political will, rather than the mechanics of organization."<sup>3</sup>

The problem of planning sensible R&D programs in a coalition is an enormously difficult one. Answers to such questions as the comparative usefulness of weapons available a decade or more from the present or how to gauge the probabilities of technical success or how to hedge against failure by a series of technological enterprises that by hindsight will look like "wasteful" duplication—these are tough enough for one group of political or military administrators in a single nation. The problem of agreement is compounded in a coalition many times over. However, if limited funds to integrate NATO R&D efforts could be made available, little would be lost and much may be gained. The added ingredient to a pooled, integrated R&D agreement could be the free exchange of scientific information, with even greater possibilities of gain

**Possible Weapons Fields for Future Cooperation.** Returning to more factual

possibilities, many feel that the most promising approach would be to combine resources to develop and produce "families" of weapons or equipments. This approach would secure the advantages of cooperation without a great dispersal of effort. It would preclude the tendency of each nation to spread itself too thin into almost every conceivable type of weapon, as is generally the case today. By agreeing to engage in a whole field or family of weapons, each country could benefit and still remain comparatively self-sufficient, and certainly competitive, by being a participating producing member of a family of weapons required by all the others. Such a plan would go a lot further toward the common objectives of standardization and cost reduction than the present practice of securing cooperation on one weapon at a time.

Some say that there are only two basic choices facing Europeans in the problem of meeting the rising costs of modern weapons. One is the deliberate buildup of a European economic and technological system wherein each country attempts to find partners, especially in the United States, for specific projects in which it is interested. The second is the pursuit of a real "NATO Common Market" in arms, a major part of which would be a series of American/European industrial consortia, tied to families of weapons. In this respect the NADGE is pointed to already as an arrangement that goes beyond a single equipment, into a family of communications and warning devices. Such a proposal for the family approach is not without a great deal of interest. So much so, that Hunt, in summing up a forward-looking study of the requirements of military technology in the 1970's, concluded that there are clearly several areas where the member countries, particularly in Europe, could develop and produce their own weapon systems or families of weapons.<sup>4</sup> First, he drew up five categories of weapon

systems likely to be continued or to be newly required in the 1970's. Then he carefully estimated whether each weapon family and weapon were susceptible to either single effort or collaborative effort. Next, he forecast those weapons which would be susceptible to NATO collaborative programs and those which the members would be most likely to buy from the United States. There were some he foresaw as being almost certain to be left up to the United States alone to develop.

Many observers feel it is time to raise the sights in real cooperative efforts. If NATO fails in the field of arms coordination and standardization, one which now has proved its practicability, they see the possibility of that failure going far beyond the confines of NATO itself. Other observers feel it is time to abolish NATO and revert to bilateral or other multilateral agreements and treaties. What would be gained by such a change is hard to imagine, especially when there is in existence a good international structure and a history of cooperative effort to build on. An academician from Canada answered the abolitionists in a sensible manner when he wrote:

NATO is the first peace-time attempt at constructing sophisticated international apparatus for uninterrupted military planning and for the continuous exchange of political information analysis and consultation. Even if the present military *raison d'être* of NATO should disappear, the volume and complexity of contacts and transactions at the international level of a group of industrially advanced countries on the verge of forming a "security community" will require the continued operation of some international brokerage apparatus whose features would largely resemble the present NATO model. It would therefore seem prefer-

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able to maintain the organization sufficiently flexible... than to follow the counsel of abolitionists, only to discover the immediate need for a laborious restoration of something very similar.<sup>5</sup>

There are some organizational and procedural bright lights pointing toward the future as this paper is written. For one thing, there is the complete rearrangement of the NATO armaments structure and the elevation of the revamped organization to a higher level within NATO. The phrase, "SHAPE requirement" has been discarded as evidence that there need not necessarily be a 100 percent militarily agreed upon endorsement to start a development program by two or more members. As a result of NATO's initiative, the former NATO Basic Material Requirement (NBMR) system has been abandoned. Where there was difficulty before in achieving a unanimity among the nations to start a program, today the flexible policy is that, "if any two countries see fit to enter in a cooperative R&D or production program, they are free to do so, as long as they are willing to pay the price." Moreover, the others are free to participate if they so desire and are willing to share the cost.

There is one improvement that many knowledgeable observers would like to see and that is that more emphasis and coordination power should be given to the most active and interested monitor-organ within NATO, the International Staff/Secretariat. That organization, and especially its Defence Support Division, has demonstrated a dedication that has risen above national interests, the intelligence to foresee the benefits of cooperative efforts from the very beginning, and the flexibility to include industry's assistance when it became a key element. They have earned the trust, confidence, and cooperation of industry. The Staff/Secretariat and its Defence

Support Division could be the keystones for achieving greater cooperation in the future.

One thing is clear. The scientific revolution has made the pursuit of special interests in weapons by the separate powers a dangerous, unrewarding, and costly game. This is especially true for the lesser powers, but apparently even for a nation as wealthy and powerful as the United States. Technological progress has placed common challenges before the nations and created common interests far more significant than their separate and often conflicting desires. It has given them the chance to pursue those common problems in international combinations for their own benefit and for the benefit of all other members.

The challenge is clear. The record stands as proof that cooperative institutions and programs can succeed in meeting it. The possibilities are almost limitless. The focus must be more and more on concrete, attainable inter-

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### BIOGRAPHIC SUMMARY



Capt. Alexander H. Cornell, SC, U.S. Navy, has had extensive experience in the field of business administration. His degrees include a B.A. from Union College, an M.A. in history from Connecticut University, an M.S. in administration from Ohio State University, and a Ph.D. degree from American University, also in administration. As a supply officer he has served in a variety of administrative positions, including a tour of duty as Director of Warehouse Operations with the Naval Supply Systems Command in Washington, D.C. Captain Cornell served as Plans Officer for the School of Naval Warfare during the last academic year and is presently occupying the James V. Forrestal Chair of Military Management at the Naval War College.

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national efforts such as have been examined in this study if real progress is to be made toward a safe, prosperous,

and united community of the free world nations of Europe and America and the Far East.

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### FOOTNOTES

1. E. Vandevanter, Jr., *Coordinated Weapons Production in NATO: a Study of Alliance Processes* (Santa Monica, Calif.: Rand, 1964), p. 94.

2. Robert R. James, *Standardization and Common Production of Weapons in NATO* (London: Institute for Strategic Studies, 1967), p. 22.

3. *Ibid.* (Underlining added.)

4. Kenneth Hunt, *The Requirements of Military Technology in the 1970's* (London: Institute for Strategic Studies, 1967), p. 35-36.

5. Harald von Rikhoff, "The Changing Function of NATO," *International Journal*, Spring 1966, p. 167.

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Decisions which determine the success or failure of the strategic direction of global war have to be determined by the meeting of a number of minds, each of which contributes its own specialized knowledge, while also serving as a balance and a check on the others.

James Forrestal: Testimony,  
Senate Naval Affairs Committee,  
1 May 1946