A CASE STUDY OF THE NATO IDENTIFICATION SYSTEM (NIS) CODEVELOPMENT PROGRAM

THESIS

John J. Hepner
Captain, USAF

AFIT/GLM/LSM/88S-34

DEPARTMENT OF THE AIR FORCE
AIR UNIVERSITY
AIR FORCE INSTITUTE OF TECHNOLOGY

Wright-Patterson Air Force Base, Ohio

2

AFIT/GLM/LSM/88S-34

A CASE STUDY OF THE NATO IDENTIFICATION SYSTEM (NIS) CODEVELOPMENT PROGRAM

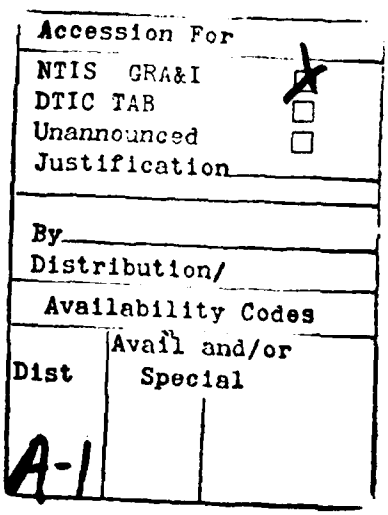
THESIS

John J. Hepner
Captain, USAF

AFIT/GLM/LSM/88S-34

Approved for public release; distribution unlimited

The contents of the document are technically accurate, and no sensitive items, detrimental ideas, or deleterious information is contained therein. Furthermore, the views expressed in the document are those of the author and do not necessarily reflect the views of the School of Systems and Logistics, the Air University, the United States Air Force, or the Department of Defense.



AFIT/GLM/LSM/88S-34

A CASE STUDY OF THE NATO IDENTIFICATION SYSTEM (NIS) CODEVELOPMENT PROGRAM

THESIS

Presented to the Faculty of the School of Systems and Logistics

of the Air Force Institute of Technology

Air University

In Partial Fulfillment of the

Requirements for the Degree of

Master of Science in Logistics Management

John J. Hepner, B.S.

Captain, USAF

September 1988

Preface

The purpose of this research effort was to determine if the NATO Identification System (NIS) Codevelopment Program would increase NATO Rationalization, Standardization, and Interoperability (RSI).

Interviews were conducted with government, military, industry, and foreign officials. In addition, an extensive literature review on the NIS program was conducted to determine if NATO RSI would be increased as a result of the NIS program. The result of this research was inconclusive due to the lack of documentation to determine how many allied nations, excluding the participants, plan to procure the Mark 15 identification system or foreign equivalent.

I wish to express my thanks to my thesis advisor, Dr. Craig Brandt, not only for his help and support in my research effort, but also for introducing me to an exciting and interesting subject. Also, I would like to thank all those who graciously participated in this research. A special thanks to Colonel Bohler, Director of the Combat Identification Systems Program Office, ASD/AEI, for his unit's support and cooperation in this research effort. Finally, I wish to thank my wife [redacted] for her support and encouragement throughout the year.

John J. Hepner

Table of Contents

Abstract

The purpose of this study was to determine if the NATO Identification System (NIS) Codevelopment Program would increase NATO Rationalization, Standardization, and Interoperability (RSI). The study had three basic objectives: First, to identify what benefits do the participating countries plan to realize from the program; secondly, to determine if the NIS program will realize any cost savings; and third, to determine if NIS will increase NATO RSI.

The study found that participants plan to realize the military benefits associated with the development and deployment of interoperable identification systems, and also economic benefits, in both the production and scientific sectors, as a result of the program. The also found that the program will not result in any cost savings due to the development of several interoperable identification systems. The research effort was inconclusive in determining if the NIS program would increase NATO RSI. This was due to the lack of documentation as to whether or not other allied nations, excluding the participants, are going to procure the Mark 15 system or foreign equivalent.

A CASE STUDY OF THE NATO IDENTIFICATION SYSTEM (NIS) CODEVELOPMENT PROGRAM

I. Introduction

General Issue

Armaments cooperation programs are not new; however, they have become more prevalent within the last ten years. Of 163 programs identified in the past forty years, sixty percent are since 1977 (2:1).

Since the formation of the North Atlantic Treaty Organization (NATO) in 1949, the alliance has promoted armaments cooperation as a means to standardize equipment and reduce the duplication of effort in the development of weapon systems (12:1-1). Early cooperative programs primarily dealt with license agreements to produce U.S. developed weapon systems. These programs resulted in the deployment of major weapon systems to include the Sidewinder missile and the F-104 aircraft (20:29). Despite recognizing and promoting the benefits associated with armaments cooperation, the alliance has yet to realize them to any degree of significance.

It is widely recognized that duplication, rather than cooperation, has been common throughout the alliance. Ambassador David M. Abshire, U.S. Permanent Representative

to the North Atlantic Council (NAC), indicated the following examples:

1. Eleven firms in seven alliance countries are building anti-tank weapons.

2. Eighteen firms in seven countries are designing and producing ground-to-air weapons.

3. Sixteen companies in seven countries are working on air-to-ground weapons [12:1-1].

Duplication is a waste of valuable resources, increases nonstandard equipment, and complicates logistics support and tactics, thereby decreasing military capability.

The lack of standardization is evident when one considers the combat forces that will be deployed on NATO's central front. Allied combat forces are estimated to deploy twenty-three different combat aircraft, seven main battle tanks, eight types of armored personnel carriers, and twenty-two different anti-tank weapons (36:34).

It has been estimated that over $10 billion per year could be saved through NATO standardization of arms. In addition, standardization would increase effectiveness forty percent without an increase in defense budgets (36:34). General Andrew Goodpaster, former commander of NATO forces, estimated that the ability of tactical air units to refuel and rearm at bases throughout the alliance would increase their combat effectiveness by 300 percent (29:15).

Recognizing NATO's decreasing military capability due to a lack of standardization, Congress passed legislation in 1977 aimed to promote standardization through armaments

cooperation programs. Their commitment to NATO Rationalization, Standardization, and Interoperability (RSI) is denoted by the 'Culver-Nunn' Amendment which states:

> It is the policy of the United States that equipment for the use of personnel of the Armed Forces of the United States stationed in Europe under the terms of the North Atlantic Treaty should be standardized or at least interoperable with equipment of other members of the North Atlantic Treaty Organization. Accordingly the Department of Defense shall initiate and carry out methods of cooperation with its allies in defense equipment acquisition to improve NATO's military effectiveness and to provide equitable economic and industrial opportunities for all participants. The Department of Defense will also seek greater compatibility of doctrine and tactics to provide a better basis for arriving at common NATO requirements. The goal is to achieve standardization of entire systems were feasible, and to gain the maximum degree of interoperability throughout the alliance military forces [14:5-6].

In addition, the Secretary of Defense was directed to acquire equipment that is standardized or at least interoperable, and report to Congress when the procurement of a new system is not standard or interoperable with equipment of other NATO members (49:13).

The congressional legislation permitted the Secretary of Defense to waive the Buy American Act which required the Department of Defense (DOD) to procure only U.S. developed systems. The Buy American Act was a major contributor to the duplication of effort among the alliance, because of the trade barrier it established between the U.S. and its allies.

Despite the U.S. committment to NATO RSI, little was achieved in the ensuing years. Congressional findings

contend that this diminishing military capability is a result of the lack of cooperation among the alliance. These findings were reflected in the Nunn Amendment to the 1986 Defense Authorization Bill which was sponsored by Senator Samuel Nunn, and co-sponsored by Senators John Glenn, William Roth, and John Warner. The amendment stated:

> (1) that for more than a decade the member nations of the North Atlantic Treaty Organization (NATO) have provided in the aggregate significantly larger resources for defense purposes than have the member nations of the Warsaw Treaty Organization;
>
> (2) that, despite this fact, the Warsaw Treaty Organization member nations have produced and deployed many more major combat items such as tanks, armored personnel carriers, artillery pieces and rocket launchers, armed helicopters, and tactical combat aircraft than have the member nations of NATO; and,
>
> (3) that a major reason for this discouraging performance by NATO is inadequate cooperation among NATO nations in research, development, and production of military end-items of equipment and munitions [35:23].

In addition to these findings, the Nunn Amendment also directed the services to consider at every step of the acquisition process, cooperative developments or existing allied systems as alternatives to developing weapon systems independently (7:4). Lt Gen Bernard P. Randolph, former DCS Research, Development, and Acquisition, in his letter to all major commands stated:

> The Congress, in the FY86 Authorization Acts, has sent us a strong and clear message of support for NATO cooperative armaments projects [38:1].

Today with the increasing costs associated with the acquisition of a major weapon system, the budgetary

constraints upon military spending, and congressional support for armaments cooperation, cooperative programs have begun to focus on the research and development (R&D) efforts of designing and developing weapon systems. Due to the recent passage of the Quayle and Nunn Amendments to FY86 Defense Authorization Act, codevelopment programs are becoming the trend in weapon system acquisition. One such program, and the topic of this research effort is the NATO Identification System (NIS).

NIS Overview

The NIS program is a complex codevelopment program involving five countries; the U.S., France, Germany, Italy (MOU still in negotiation), and the United Kingdom (30). The cooperative effort involves the R&D of common sub-components to be used in the new identification systems being developed among the participants. Dennis Kloske, former special advisor for NATO Armaments to the Deputy Secretary of Defense, denoted the NIS program as a 'flagship' cooperative program in which the U.S. has been working on for at least twenty years (15:25).

It was estimated in November 1987, that the U.S. has already spent approximately $150 million on the program (28:11). From FY 1988-92, an additional $345.4 million is projected for the NIS program (15:27).

The need for a new identification system is manifested by the technological advancements with respect to speed,

lethality, and range of modern military equipment fielded since 1959, when the Mark 12 system was developed (34:104). Gabriel Frenczy, NATO's director of command, control, and communications noted that:

> The current identification systems within the Alliance are no longer completely able to fulfill the exacting demands imposed by commanders given a highly mobile battle and the dense airborne environment...[18:49].

Specific Problem

Codevelopment programs are becoming more prevalent as a means to meet the requirements of NATO RSI. Due to the large capital investment and manpower requirements necessary to develop a weapon system, it is imperative that such endeavors are successfully completed and anticipated rewards realized. The question that needs to be answered is, how effective will the NIS program be in improving NATO RSI. This research effort will attempt to answer that question.

Research Objectives

The objectives of this research are:

1. Identify what benefits do the participating countries plan to realize from the program.
2. Determine if the NIS program will realize any cost savings.
3. Determine if NIS will increase NATO RSI.

Scope/Limitations

Although there are many agencies involved in the NIS program, the research was limited to the Combat Identifi-

cation System Program Office (CISPO) which is tasked with implementing the NIS program. Also, the research is limited to the foreign officials in the U.S.. The research effort will not cover any classified information; therefore the research effort will not elaborate in-depth on component or performance characteristics. The final results of this research effort are limited to the degree in which conclusions can be drawn based on the analysis of the data collected and the author's interpretation of that data.

Methodology

The research effort was divided into three phases. The first phase consisted of a cursory review of literature on armaments cooperation and the NIS program, and exploratory interviews with DOD officials at Wright-Patterson Air Force Base (WPAFB) who are knowledgeable of the NIS program. Exploratory interviews were conducted with Col Jack Morris, ASD/XR, Mr. Tom Fowler and Major Sal Reza, ASD/AEI. The purpose of this phase was to provide the researcher with a working knowledge of the program, limit the scope of the research effort, and to obtain additional data sources.

The second phase involved a thorough review of literature on NATO armaments cooperation. In addition, a review of U.S. laws, and applicable military documents and regulations pertaining to armaments cooperation and weapon system acquisition was conducted. This phase provided the background information on the development of NATO armaments

cooperation, identified additional sources of data, and constituted the initial data collection aspect of the research effort. The purpose of this phase was to supply the researcher with the necessary expertise to facilitate analysis of the data collected.

The third phase constituted the primary data collection aspect of the research effort. This phase consisted of interviews with government, military, industry, and foreign officials. Interviews covered general questions on armaments cooperation, and specific questions concerning the NIS program. Interview questions are grouped in that manner and are attached in the Appendix. Also, military documents dealing with the NIS program were obtained and reviewed. The outcome of this effort was to answer the research objectives outlined earlier in this chapter.

Interviews were primarily conducted in person; however, telephone interviews were also conducted to facilitate data collection due to interviewer/interviewee availability, and time constraints. Interviews were conducted with the following individuals:

1.	Tom Fowler,	Deputy Director of Combat Identification Systems, ASD/AEI, WPAFB.
2.	Maj Sal Reza,	Program Manager, Requirements and Analysis, ASD/AEI, WPAFB.
3.	David Longinotti,	U.S. IFF Project Director for the Assistant Secretary of Defense for Command, Control, Communications and Intelligence, Pentagon.

4.	Albert Spies,	Technical Attache, West German Embassy, Wash DC.
5.	Tran Thi Thu Van,	Armament Attache, French Embassy, Wash DC.
6.	Frank Cevasco,	International Program Director, Office of the Under Secretary of Defense for Research and Engineering, Pentagon.
7.	Maj John McDevitt	Program Element Monitor, USAF, SAF/AQRZ, Pentagon.
8.	Carlos Aquino	Advisor to the Special Advisor for NATO Armaments to the Deputy Secretary of Defense, Pentagon.
9.	Terry W. Harley	Program Manager, Texas Instruments, Dallas Texas.
10.	Skudrna, Joseph	Program Manager, Allied-Bendix, Townsend Maryland.
11.	William McKinley	Technical Attache, British Embassy, Wash DC.
12.	Louis Napolitano	Technical Attache, Italian Embassy, Wash DC.

Interviews were primarily unstructured and designed to derive further insight into the NIS program and armaments cooperation in general. In addition, it permitted the flexibility to tailor the interview to the knowledge level of the interviewee since it was anticipated that the knowledge level of government and foreign officials with respect to the NIS program may be limited. The structured portion of the interview was designed to ensure adequate coverage of the interview questions which are provided in the Appendix. Interviewees were granted anonymity to any

response they so desired due to the sensitivity of international programs. It was also designed to encourage the interviewee to be as open as possible, in order to facilitate the collection of genuine views and opinions. Anonymous responses will be cited with an asterisk.

There are many advantages of interviewing over mailed questionnaires. Interviewing allows the interviewer to examine areas which specific questions are difficult to construct. They also permit inquiring for more specifics for ambiguous responses. Interviews permit a greater degree of flexibility especially when interviews are unstructured, thus allowing the interviewer to deviate from the intended course of the interview if he/she deems it appropriate. Also, the nonrespone rate is very low, and the individuals being interviewed are in fact those intended to participate in the research effort (52:289-290).

Interviews have some inherent disadvantages also. They are the most expensive, and the data being collected is often a matter of interpretation. Also, training is usually required to properly conduct an interview to maximize data collection, and to handle unstructured and ambiguous responses (52:289-290).

Definition of Terms

The following terms are predominately used in the area of armaments cooperation, and are subsequently used throughout this text. Therefore, the following definitions are

provided to clarify the meaning of these terms with respect to this research effort.

1. Standardization: The process by which member nations of NATO achieve the closest practical cooperation among forces, the most efficient use of research, development, and production resources, and agree to adopt on the broadest possible basis the use of (a) common or compatible operational, administrative, and logistics procedures; (b) common or compatible technical procedures and criteria; (c) common, compatible, or interchangeable supplies, components, weapons, or equipment; and (d) common or compatible tactical doctrine with corresponding organizational compatibility [12:1-4].

2. Interoperability: The ability of systems, units, or forces to provide services to and accept services from other systems, units or forces and to use the services so exchanged to enable them to operate effectively together [11:7-3].

3. Rationalization: Any action that increases the effectiveness of allied forces through more efficient, effective use of defense resources committed to the alliance [11:7-3].

4. Coproduction: Any program wherein the U.S. Government through either diplomatic agreement or an agreement between a Ministry of Defense and DOD: (1) enables an eligible foreign government, international organization, or designated commercial producer to acquire the technical information and know-how to manufacture or assemble in whole or in part an item of U.S. defense equipment for use in defense inventory of the foreign government; or (2) acquires from a foreign government, international organization, or foreign commercial firm the technical information to manufacture domestically a foreign weapon system for use by the U.S. Department of Defense [11:7-5].

5. Codevelopment: Development of a system by two or more nations in which the costs of development as well as the design effort are shared [12:2-10].

II. Literature Review

Introduction

Armaments cooperation among the allied nations dates back to the formation of NATO. However, cooperative programs following the formation of NATO were sparce, and much of the literature on armaments cooperation is concentrated from 1974 to the present. It was during the latter era that the U.S. stressed the need for improved standardization and interoperability characteristics among allied equipment. Due to this need and the persistent debate surrounding the concept of the 'two-way street', which depicts the balance of defense trade among allied nations, armaments cooperation has evolved from coproduction to codevelopment programs. These programs involve the joint R&D efforts in the development of a weapon system. This chapter is arranged to provide a brief coverage of the conditions and U.S. policies which impeded the use of armaments cooperation following the formation of NATO, and a more in-depth coverage of armaments cooperation from 1974 to the present, in which coproduction programs, and more recently codevelopment programs, have been used to achieve NATO RSI. The final section of this chapter will concentrate on the NIS program.

History

Since the formation of NATO, the alliance recognized

the need to produce collective conventional forces for the defense of Europe through armaments cooperation (12:1-1). Despite this recognition, armaments cooperation did not emerge to any degree of significance. Several reasons have accounted for the lack of armaments cooperation during the early years following the formation of NATO. First, the European economies were devastated following World War II (WWII). Only three nations, the U.S., the U.K., and the Soviet Union, were capable of designing, developing, and producing major weapon systems after the war (12:5-1). Secondly, Soviet aggression after the war prompted the U.S. policy of communist containment. This policy is depicted by the Truman Doctrine which states:

> I believe that it must be the foreign policy of the United States to support free people who are resisting attempted subjugation by armed minorities or by outside pressure...the free people of the world look to us for support in maintaining their freedom. If we are to falter in our leadership, we may endanger the peace of the world and we shall surely endanger the welfare of our own nation [43:38].

These conditions resulted in U.S. military grant aid programs which supplied obsolete and surplus WWII equipment to allied nations. These programs were established to ensure the economic recovery of Europe, and to prevent the spread of communist influence through Europe. As a result of the European economic conditions and the U.S. military grant aid programs which fostered from the U.S. communist containment policy, armaments cooperation programs during this period were rare.

Early Efforts. It wasn't until 1956, after the European economies had sufficiently recovered, that the U.S. took a heightened interest in armaments cooperation. On 14 December 1956, Secretary of Defense Charles Wilson announced a policy in which the U.S. would supply designs and technical assistance on newer and more sophisticated weapon systems to certain allied countries. This policy was designed to create a coordinated production base in Europe for modern weapon systems. This marked the beginning of coproduction programs (9:11). Coproduction is a government agreement which permits a foreign government to manufacture all or part of a U.S.-origin defense item (20:29). These early coproduction programs produced major weapons systems to include the Hawk, the Bullpup, the Sidewinder, and the F-104 (9:12).

Foreign Military Sales. In 1961, the U.S. shifted away from grant aid programs and toward sales. The passage of the Foreign Assistance Act (FAA) in 1961 became the statutory basis for the U.S. Foreign Military Sales (FMS) program (9:13). The main objectives of FMS were to:

1. Promote the defensive strength of U.S. allies consistent with U.S. political-economic objectives.

2. Promote the concept of cooperative logistics with U.S. allies.

3. Offset the unfavorable balance of payments resulting from essential U.S. military deployment abroad [37:6].

Secretary of Defense Robert S. McNamara iterated the importance of the military sales program in a statement to Congress in 1964. He stated:

> The sale of military equipment, supplies, and services to other countries is of considerable importance to the United States at this time. First, it contributes to our economic well-being by providing jobs in this country. Second, the receipts from these sales help to reduce our adverse balance of payments, and--third, the use of common equipment, supplies, and services helps to promote the continuing cooperation of the U.S. and allied forces [9:14].

The FMS program was a success in reducing the unfavorable balance of payments that the U.S. incurred due to troop deployments in Europe. By 1966, the cumulative sales total reached $11.2 billion (9:15). However, a by-product of the FMS program was the increased demands by foreign countries for offset arrangements in order to finance their purchases of U.S. military equipment.

Offsets. The use of offsets is not uncommon. The U.S. has traditionally used arms transfers and defense offsets in the pursuit of foreign policy objectives (20:30). These foreign policy objectives include deterring aggression by the preparedness of allies and friends, increase the ability of the U.S. to project power through access or base rights on foreign soil, supporting interoperability with the forces of friends and allies, and strengthening of collective security arrangements (54:30). Foreign countries seek offset arrangements to finance their purchases of military

equipment, build domestic employment, and to gain access to technology and managerial techniques (20:28).

Offsets are categorized as being either direct or indirect. Direct offsets are related to the military equipment being purchased. These offsets involve co-production, licensed production, subcontractor production, overseas investment, and technology transfer. Indirect offsets on the otherhand are unrelated to the military equipment being purchased. These offsets include foreign investment, technology transfer, and countertrade (20:30). These offset arrangements are listed and defined below.

1. Coproduction - government agreements which permit the foreign government to manufacture all or part of a U.S.-origin defense item.

2. Licensed production - overseas production of a U.S.-origin defense article based upon transfer or technical information under direct commercial arrangements between a U.S. manufacturer and a government or producer.

3. Subcontractor production - overseas production of a part or component of a U.S.-origin defense article.

4. Overseas investment - investment arising from the offset agreement, taking the form of capital invested to establish or expand a subsidiary of joint venture in the foreign country.

5. Technology transfer - transfer of technical information that occurs as a result of an offset agreement and may take the form of research and development conducted abroad; technical assistance provided to a subsidiary or joint venture of overseas investment; or other activities under direct commercial arrangement between the U.S. manufacturer and a foreign entity.

6. Countertrade - a transaction that specifies the exchange of selected goods and services for another of equivalent value; an agreement by the exporter to buy or find a buyer for a specific value of goods; an

> agreement by exporter to accept full or partial repayment for products derived from the exported product [20:29].

Despite the lack of armaments cooperation during this era, standardization of allied equipment was achieved. However, the demands for increased offset agreements due to the FMS program resulted in more international collaboration of which coproduction became the prominent form.

Coproduction

Since 1974, the U.S. government has emphasized the need for military equipment to be standardized or at least interoperable within the armed forces of NATO. The primary goal of this policy was to increase NATO defense efficiency due to the growing military capabilities of the Warsaw Pact and the budgetary constraints of allied nations (26:1). This came during a period in which the term 'structural disarmament' was coined to depict the procurement of fewer weapons with more money, at a higher per unit cost, thus resulting in a diminishing combat capability (1:66). This policy towards standardization and interoperability later led to the Culver-Nunn Amendment to the DOD Authorization Act for FY 1977 (PL 94-361) which set U.S. policy towards NATO RSI. The amendment states:

> It is the policy of the United States that equipment for use of personnel of the Armed Forces of the United States stationed in Europe under the terms of the North Atlantic Treaty should be standardized or at least interoperable with equipment of other members of the North Atlantic Treaty Organization [11:7-4].

The amendment addressed Congress' 'sense' that NATO RSI would be substantially increased through the use of coproduction programs with NATO allies (11:7-4). This led to the U.S. adopting three approaches aimed specifically to achieve increased standardization and interoperability among the alliance and are outlined in DOD Directive 2010.6, which has become Attachment 1 to AFR 73-3. The three approaches are:

> a. Establishment of general and reciprocal Memorandum of Understanding with NATO member nations. These are intended to encourage bilateral arms cooperation and ...to make efficient use of Alliance resources through expanded competition.
>
> b. Negotiation of dual production of developed or nearly developed systems...Dual production programs can lead to the near-term introduction of weapon systems with the latest technology in NATO's deployed forces and a more efficient use of resources.
>
> c. Creation of families of weapons (program packages) for systems not yet developed. Under this concept, participating NATO nations would reach early agreement on the responsibility for developing complimentary weapon systems within a mission area [14:6].

The amendment provided a waiver to the Buy American Act in order to facilitate coproduction agreements with NATO allies. In addition, the amendment requires the Secretary of Defense to the best of his ability, procure weapon systems that are standardized or interoperable with NATO (11:7-4). This policy led to increased coproduction efforts and would further increase the large imbalance of defense trade between the U.S. and its allies. As a result, Europeans demanded greater offset arrangements to finance their purchases of U.S. defense equipment.

The F-16 coproduction program, the largest of all coproduction programs, involving the sale of F-16s to Norway, Denmark, Belgium, and the Netherlands, was valued at $2.8 billion (January 1975 dollars) and involved the following offset arrangement. The participating nations would collectively coproduce ten percent of the value of the initial U.S. aircraft, fifteen percent of the value of all third country aircraft, and forty percent of the value of their own aircraft. Collectively, these countries were guaranteed fifty-eight percent of their initial F-16 purchase (25:4).

The Canadian purchase of F-18 aircraft resulted in McDonnell Douglas granting a hundred percent offset agreement. This agreement included coproduction, establishment of non-related industrial capabilities in Canada, and marketing of Canadian goods and services (25:6).

Prior to 1978, the DOD regularly entered into offset arrangements with foreign nations (20:30). As a result of the problems the DOD had in administering indirect offsets from the Swiss F-5 fighter program, Deputy of Defense Charles Duncan issued a memorandum on 4 May 1978 which took the government out of the offset business and shifted the role and responsibility in meeting offset arrangements to industry. The memorandum stated:

> Because of the inherent difficulties in negotiating and implementing compensatory coproduction and offset agreements, and the economic inefficiencies they often entail, DOD shall not normally enter into such agree-

ments. An exception will be made only when there is not feasible alternative to ensure the successful completion of transactions considered to be of significant importance to the United States national security interests (e.g., rationalization of mutual defense arrangements) [20:30].

Duncan viewed offsets as contradictory to U.S. procurement law in that they limit competition, and are too complicated, time consuming, and expensive to manage properly (7:68).

A DOD Task Group re-examined in 1982/1983 the U.S. position of offsets. They concluded that the 1978 Duncan Memorandum should be retained for the following reasons:

1) the potential resource drain on DOD in negotiating and implementing offsets;

2) the concern that offset agreements created the impression of obligating DOD to place orders in foreign countries (at the expense of U.S. contractors);

3) a belief that offset commitments were business judgments, rather than policy decisions; and,

4) the belief that offset commitments were the responsibility of the U.S. defense contractors, not DOD [7:68].

Despite the governments withdrawl from administering offset arrangements, they are still continue to be a major factor in selling defense equipment abroad. This is exemplified by the fact that from 1980-1984, $22.4 billion in U.S. overseas defense sales generated $12.3 billion in offset commitments (20:28).

U.S. Perspective. The U.S. views coproduction program as being extremely successful. They have over the years accomplished a variety of U.S. objectives. The objective in 1956 was to build and pool European military-industrial

capabilities to aid in the rearmament of Europe in order to better support the defense capabilities of the alliance (9:11). During the 1960s with the U.S. emphasis on sales, coproduction as an offset agreement was used to enhance the sales of U.S. military equipment in order to reduce the unfavorable balance of trade payments (37:6). In the 1970s, coproduction was used to increase NATO RSI (26:1). As a result of coproduction programs, the U.S. has realized many benefits.

Benefits. The U.S. has benefited through coproduction programs. These programs have been influential in promoting sales of U.S. military equipment. This has benefited the U.S. by reducing the unfavorable balance of trade payments and the standardization of military equipment among allied nations (9:14). Coproduction programs have also increased production runs by exploiting foreign markets. This has provided the U.S. with some per unit costs savings of equipment, and also increased the availability and lead times for spares procurement (1:70). From the management aspect, coproduction programs are relatively simplistic due to coproducing a proven and fielded U.S. weapon system in which design and performance specifications are known. This fosters more of an industry-industry approach to the coproduction agreements between countries (24:45). These programs also established additional manufacturing sources, as well as improving

foreign relations with participating nations (25:4). Lastly, coproduction programs have resulted in domestic employment as a result of increased foreign sales. The Defense Security Assistance Agency which supervised the DOD security assistance program estimated that for every $1 million in foreign sales, 100 jobs are created and or saved (36:68-69).

Drawbacks. The General Accounting Agency (GAO) reported several disadvantages of offset arrangements. These disadvantages include:

1. Promotion of competition from foreign producers
2. Increased cost of trade
3. Increased company risk
4. Distortion in trade patterns (54:23)

Additional disadvantages include the transfer of technology, which has been for the most part non-reciprocal, the increased costs of administering offset agreements, and the loss of jobs resulting primarily in the subcontractor field as a result of coproduction programs with allied nations (20:32,33).

The U.S. Departments of Treasury and Commerce, as well as the U.S. Trade Representative are opposed to offset arrangements. Despite this opposition, U.S. law does not forbid offset arrangements. In fact, U.S. agencies are permitted to provide advisory and marketing intelligence services to U.S. exporters involved in countertrade arrangements as part of a business deal (20:30).

European Perspective. The European objectives of coproduction programs are to increase domestic employment by producing portions of U.S. systems, create and strengthen the defense industrial base, acquire modern technology and managerial techniques, and assist in reducing the balance of payments. These programs aided in making European industries more competitive in the international arms market (25:3). Despite realizing many of their objectives to varying degrees, the Europeans do not view coproduction programs as favorably as the U.S. due to the limited benefits realized from them.

Benefits. The European allied nations have benefited from coproduction programs. These programs have led to the Europeans acquiring the most sophisticated, modern weapon systems. Also, the defense industrial base capabilities and domestic employment of participating allied nations has been increased. Additional offset agreements associated with coproduction programs have improved European economies, as well as assisting in the balance of trade payments. Coproduction programs have permitted access to U.S. technology and managerial techniques which have enhanced the European's competitiveness in the international arms market. These programs have also been instrumental in the opening of U.S. markets for European goods, services, and military equipment (6:33:53:22).

Drawbacks. Despite the substantial benefits associated with coproduction programs, many disadvantages were also realized. Coproduction programs have led to an increased reliance on U.S. defense equipment, and also follow-on logistics support. Also, due to the technology transfer restrictions, Europeans often felt they received a less sophisticated weapon system than what the U.S. procured. Coproduction programs tend to be 'unattractive because it does not necessarily lead to further programs' (24:45). This is largely because of the significant capital investment required to increase industrial production capacity with no follow-on production to use it. Since coproduction programs were of U.S. designed systems, they lacked the European operational requirements. Finally, the Europeans perceived coproduction as one sided, since the U.S. was not procuring or producing military equipment of European-origin (25:5). The disadvantages associated with coproduction programs between European allied nations and the U.S. has stimulated a heightened interest in inter-European armaments cooperation.

Independent European Programme Group

According to Jan Van Houwelingen, State Secretary for Defence of the Netherlands, European armaments cooperation has been stimulated by:

> An excessive variety of equipment, rocketing prices, stagnating economic development, protectionalism, un-

> necessary duplication, a threatening technology gap between Western Europe and the United States and Japan, and a disturbing imbalance in the procurement of weapons between Western Europe and the United States [51:44]

As a result of this interest, Michael Heseltine, former Minister of Defence of the United Kingdom and chairman of the NATO coalition, Eurogroup, used his influence to aid in the formation of the Independent European Programme Group (IEPG) in 1976 to promote European cooperative efforts (13:22). The IEPG is composed of the thirteen European allied nations and serves as a forum for defence ministers in equipment and procurement cooperation. Since its foundation the IEPG has become the dominant force in the promotion of European armaments cooperation. The goal of the IEPG is to strengthen Western European defense industries in order to competitively produce technologically advanced weapon systems (51:49).

The IEPG has concentrated its activities in three primary areas. The first area is that of replacement schedules for outdated military equipment; the second area is the development and procurement of new military equipment; and the third area is the establishment of comparable military-operational requirements among member nations (40:10-11).

There are 35 categories of equipment identified for cooperative efforts. Examples of such cooperative efforts include the development of a medium surface-to-air missile,

a main battle tank, and a large cargo aircraft. The IEPG estimates that joint development and production of these three projects would save #250 billion with respect to each country developing and producing this equipment on their own (13:22). In addition, the IEPG has been instrumental in promoting technological cooperation. These cooperative technology projects (CTPs) are designed to provide the advanced technology capabilities in micro-electronics, high strength lightweight materials, compound materials, image processing, and conventional warhead design (51:45). The CTP programs are expected to ultimately lead to future European armaments cooperation of advanced weapon systems.

The development and procurement of the Tornado by Italy, Germany, and the United Kingdom exemplifies the European commitment to cooperate. Stanley Sloan, a U.S.-NATO alliance relations specialist with the Congressional Research Service (CRS) categorized the Tornado program as a failure with respect to its economic practicality; however, he deemed the program a success in producing a very capable weapon system (13:20). Europeans plan to use their 'lessons learned' from the Tornado program to effectively structure and manage future European cooperative projects in order to fully realize the benefits associated with cooperative programs (13:22).

Stifled Cooperation

By 1979, American military, industry, and Congress became frustrated with armaments cooperation. The House Armed Services Committee on NATO Standardization, Inter-operability and Readiness issued a report assessing the value of armaments cooperation. The report stated:

> The term 'two-way street' as applied by Europeans and some U.S. defense officials is a political device to secure economic benefits for European industries and often has nothing to do with enhancing military effectiveness [8:27].

This report would stifle cooperative efforts for several years. With this U.S. perception of armaments cooperation, legislation was enacted that would further subdue cooperative efforts. In December 1981, several 'anti-cooperation' riders were attached to the Defense Appropriations bill and were enacted, and later rescinded in 1983, without debate in order for the 97th Congress to adjourn its first session . The 'specialty metals' rider required European allies to buy U.S. produced specialty metal alloys; otherwise, cooperative development or production would be out of the question. These riders heightened the tension among the U.S. and its European allies (8:27-28).

There was also many in Congress that doubted Europeans' dedication to its own defense, and felt the European governments were unwilling to equitably share in the common defense of Europe (42:31). It was during this

period that increased European armaments cooperation efforts were undertaken, and the familiar 'Buy American' approach to military equipment was leading to a 'Buy European' approach among European allied nations. However, despite this vocal minority, it was not the majority consensus among Congress. To reaffirm the U.S. commitment to armaments cooperation, Senators John Glenn (Democrat, Ohio), Sam Nunn (Democrat, Georgia), and William Roth (Republican, Delaware) introduced the Roth-Nunn-Glenn Amendment. This amendment was aimed to facilitate bringing Europe and U.S. defense cooperation efforts back to tolerance, and also to demonstrate that there was indeed Congressional support for cooperative efforts (8:28).

The passage of the Roth-Nunn-Glenn Amendment (Sec. 1122) to the 1983 DOD Authorization Act produced renewed U.S. policy towards armaments cooperation. The amendment outlined the following policy guidelines between the U.S. and its NATO allies:

> 1. To coordinate more effectively their defense efforts...;
>
> 2. To establish a cooperative defense industrial effort with Western Europe and between Western Europe and North America that would increase the efficiency and effectiveness of NATO expenditures by providing a larger production base while eliminating unnecessary duplication of defense-industrial efforts;
>
> 3. To share more equitably and efficiently the financial burdens, as well as the economic benefits (including jobs, technology, and trade) of NATO defense; and

4. To intensify consultation promptly for early achievement of the above [50:6-7].

Despite passage of the Nunn-Roth-Glenn Amendment, little was accomplished in the ensuing year. As a result, Senators Nunn and Glenn introduced an amendment in 1984 which would call for the withdrawl of 30,000 U.S. troops from Europe annually over a three-year period starting in December 1987 unless its allies increased defense spending by three percent annually which they agreed to in 1979 (42:31,23:1). The amendment was defeated; however, it caused renewed discussions in armaments cooperation within the alliance.

Efforts to Improve

It was during this stifled period, from 1979-1984, in armaments cooperation that numerous studies were conducted to improve cooperative efforts. These studies include the Defense Science Board (DSB) study, 'Industry-to-Industry International Armaments Cooperation Phase I - NATO Europe', the Report of the Department of Defense Task Group on 'International Co-Production/Industrial Participation Agreements', the Denoon Report, and the Currie Report (25:9,50:11). These studies were conducted to identify the impediments in armaments cooperation and make recommendation to improve cooperative efforts.

The Currie Report, named after the chairman of the DSB Task Force, Dr. Malcolm Currie, made the several recom-

mendations to improve armaments cooperation within the alliance. A few of these recommendations are listed below:

1. Facilitate the reciprocal transfer of technology in the sense of technology sharing.

2. Find adequate arrangements to protect transferred technology.

3. Set up satisfactory rules covering sales to third countries.

4. Recognize and use European defense contractors as a 'second source' of procurement if they are competitive.

5. Be willing to adopt equipment developed abroad.

6. Be willing to harmonize military requirements among the allies so as to facilitate cooperative projects [48:59].

As a result of these studies, U.S. and European commitment to cooperate, and the need for interoperability among allied equipment, the Quayle and Nunn Amendments were enacted to improve armaments cooperation. These amendments will be addressed in the next section of this chapter. In addition to these amendments, the Defense Cooperation Working Group was formed to oversee all DOD planning and execution of armaments cooperation policy (47:1). The Working Group will:

1. Track ongoing NATO cooperative programs on a bi-weekly basis with particular emphasis on projects entering complex MOU negotiations;

2. Review and recommend new candidates for cooperative developments;

3. Work with the services to implement cooperative projects via the budgeting process.

4. Serve as a forum for resolving intra-departmental differences on issues regarding funding, technology transfer, third country sales, etc.;

5. Work closely with Congress to obtain support for armaments cooperation initiatives;

6. Develop recommendations and guidelines for implementing provisions of the Fiscal Year 1986 and 1987 DOD Authorization Acts [47:1].

U.S. Legislation

Quayle Amendment. The Quayle Amendment was designed to increase cooperative efforts by eliminating barriers which have restricted cooperative efforts between the U.S. and its NATO allies. The amendment addressed restrictions in the Arms Export Control Act and the DOD procurement code (Title 10) and authorized the Secretary of Defense to waive legal and contract provisions that formerly applied to NATO cooperative programs (22:11). In addition, the amendment permitted equitable burden sharing with respect to total costs. A major change was production and delivery schedules were based on full partnership arrangements, and the Secretary of Defense was able to direct subcontracts as necessary to fulfill the obligations of the partnership arrangement. The amendment also authorized the Secretary of Defense to allow foreign partners to use their own regulations and procedures, including contracting, on behalf of the U.S., providing that the competition is open to qualified U.S. sources (22:11).

Nunn Amendment. The Nunn Amendment, commonly referred to as the Nunn Initiative, to the 1986 Defense Authorization Act (Section 1103), directed specific activities for cooperative R&D efforts with allies in order to promote RSI. The amendment appropriated $100 million for cooperative research, which was to be divided equally among the Services and Defense agencies with an additional $25 million appropriated for side-by-side cooperative testing (1:68).

It was the intent of Congress, under the side-by-side testing appropriation, that DOD would test developed foreign equipment prior to developing a new weapon system (41:32). This approach was based on an example established by Army Under Secretary James R. Ambrose which resulted in the Army's acquisition of the French RITA system, known as the Mobile Subscriber Equipment (MSE). This resulted in the saving of a billion dollars in R&D costs, and also in earlier deployment of the equipment (41:32).

The funds appropriated were earmarked to carry out joint R&D programs to either develop new conventional defense equipment or modify existing military equipment to meet U.S. military requirements while promoting NATO RSI (22:13). The amendment also mandated that the Services consider cooperative efforts when proposing development of new systems. Under this direction, the respective Service was responsible for conducting detailed analysis of whether an existing project already existed among NATO members,

determining if a comparable project could satisfy, or be modified in scope to satisfy U.S. military requirements, and to assess the advantages and disadvantages with regard to program time, development, life cycle costs, technology sharing, and RSI objectives. This assessment required a recommendation as to the feasibility and desirability of a cooperative development program with NATO allies (22:13-14).

The Nunn Initiative was continued in FY 1987 with the appropriation of $185 million, of which $40 million was to be used for side-by-side testing. In 1988, $200 million was approved by the Senate Armed Services Committee, even through the Pentagon only requested $59 million for FY 1988 and 1989. Their report accompanying the FY 1988 DOD Authorization Bill stated:

> it has always envisioned annual increments of $200 million to sustain momentum behind the cooperative projects [21:18].

Codevelopment

Codevelopment programs, those involving joint R&D ventures between the U.S. and other allied nations in the development of a weapon system have substantially increased in the 1980s. This was a result of increased inter-European armaments cooperation, and the basic rationale for armaments cooperation, better utilization of allied resources. As a result of the the Quayle and Nunn Amendments to the 1986 Defense Authorization Act, U.S. participation in codevelopment programs have increased with allied nations. Two years

after the enactment of these amendments, twelve codevelopment projects have been undertaken by the U.S. (5:2).

Codevelopment programs represent a dramatic increase in complexity over coproduction programs for several reasons. First, there is no developed weapon system. Instead, the operational requirements of all participating nations are considered, and the appropriate R&D measures are taken to design and develop the proposed weapon system. Secondly, codevelopment programs have an increased political aspect to them, where as coproduction agreements were relatively simplistic in that industry-industry type of arrangements could be made due to producing a developed weapon system (24:45). Codevelopment agreements are manifested from a government-to-government MOU, which outlines the terms and conditions of all participants in the cooperative endeavor (12:2-15). The MOU process itself is a complex and time consuming process, since the terms and conditions are carefully debated. Thirdly, the technology transfer issue becomes paramount. Since codevelopment programs involve the joint R&D efforts of allied countries in the development of an advanced weapon system, a determination of the extent that technology transfer will occur must be rendered by appropriate governments (4:2,7). Lastly, the requirements determination from participating members is cumbersome due to each country's defense structure and its defense commitments (24:45).

It is recognized that a primary motivating factor for codevelopment programs is the anticipated cost savings resulting from the pooling of allied resources. These savings are based on sharing expenses among the participating nations, and are relative to what it would have cost each country to develop the item separately (4:7).

There are many advantages associated with codevelopment programs. Standardization and interoperability among military equipment is enhanced due to the early requirements determination and joint development characteristics of these programs. Also, domestic employment is increased. Unlike coproduction programs were domestic employment is increased in the production sector, codevelopment programs increase domestic employment among participating nations at the scientific and technical level. In addition, domestic employment may be increased in the production sector later when the program reaches the production stage of the acquisition process (6). Additional benefits include work and cost sharing, the formation of high quality teams, and the obtainment of advanced technology as a direct result of the combined team effort (10:155,4:7).

There are several disadvantages inherent in codevelopment programs. These programs often result in significant compromises regarding the proposed system which result in the development of a less than optimal weapon system. Also the increased organizational complexities and structure

emanating from these programs is greatly increased. Co-development programs usually take longer than comparable development programs by a single contractor, and are more costly in total (4:7). Also, early termination of codevelopment programs is often delayed due to the program having a NATO 'label' associated with it (33).

U.S. Perspective. The U.S. perspective towards codevelopment programs is largely mixed, with both proponents and opponents for such endeavors. This is largely due to the unfamiliarity of such programs and the fact that these programs, the twelve codevelopment programs undertaken by the U.S., are relatively new and are still on going. Therefore, the benefits of codevelopment programs have yet to be fully realized. It is clearly documented that Congress, as supported by previous legislative enactments, and top DOD officials are strong proponents for codevelopment programs. According to the Deputy Secretary of Defense, William H. Taft IV, cooperative efforts:

> allow allied nations to share the cost of developing and building military systems and eliminates the exorbitant price of redundant R&D [10:155].

Taft feels that the combined effort of the allied nations' scientific and technical resources will provide a higher quality and more effective defense equipment for allied nations, increase the economies of scale resulting from larger production runs, and increase the interoperability

and commonalty of allied forces thus improving 'joint warfighting capability for the free world' (10:155).

Despite the high endorsement for codevelopment programs, opposition remains. According to Michael N. Beltramo, President of Beltramo and Associates, a defense acquisition consulting firm, codevelopment programs are...

> rapidly becoming the rule rather than the exception without support of either empirical evidence or cogent theory to suggest its eventual success as a cost saving measure. Rather, it appears likely that it will raise costs and lengthen program schedules [4:7].

According to Beltramo, the total development costs of codevelopment programs are considerably greater than for a single developer. In addition, due to the growing number of participants involved in a codevelopment program, the economies of scale associated with longer production runs may diminish as a result of increased production lines in various countries (4:2).

European Perspective. The Europeans view codevelopment programs positively; however, some skepticism is apparent. The Europeans have recognized and promoted inter-European armaments cooperation diligently since the formation of the IEPG in 1976 (23:45). However, codevelopment programs between European nations date back to the 1950s. These early programs resulted in producing tracked military vehicles, tactical missiles, helicopters, and aircraft. Due to the large capital investment associated with R&D for aircraft, the Europeans have strongly emphasized

codevelopment programs in the aerospace sector. Their efforts resulted in the Atlantic anti-submarine patrol aircraft, the Transall military transport, the Concorde supersonic commercial transport, the Airbus wide-body commercial transport, the Jaguar and Alpha attack/trainer aircraft, and recently the Tornado multi-role combat aircraft (26:2).

The European skeptism surrounding U.S.-allied arms cooperation is the lack of 'concrete' results. This skeptism is evident in the Dutch Defense Minister's, Henk Vredeling, speech to a task force study on NATO cooperation. He stated:

> We have heard that much political will exists to improve the procurement of armaments in Europe and to make our defense industries more efficient and competitive, and we have no doubt that this is so,... There is little evidence, however, that this is being translated into real practical progress [16:77].

In addition, trade protectionism as well as the restrictive technology transfer policies on the part of the U.S. undermine the cooperative aspect of these programs. Europeans feel that such restrictions may ultimately result in them fulfilling subcontractor roles in the weapon system production stages (51:50,16:77).

III. The NATO Identification System

NIS Background

The NIS program is one of the twelve codevelopment programs undertaken as part of the Nunn Initiative (5:2). It is a large and complex codevelopment program. The program consists of the R&D efforts on common subcomponents of the interoperable identification systems being developed by the participating nations involved in the NIS program (17:65). It is a tri-service (U.S. Air Force, Army, Navy) program and involves international collaboration with four NATO allies; Germany, France, Italy (MOU still in negotiation), and the United Kingdom. The foreign industry participants include Cossor and Plessey for the U.K., La Materiel Telephonique for France, Siemans Corporation for West Germany, and Italtel for Italy (28:11). The NIS program differs from most codevelopment programs in two distinct ways. First, most codevelopment programs undertaken by the U.S. are U.S. initiated programs which have been identified as candidates for codevelopment. The U.S. then solicits participation from foreign countries to jointly develop the proposed system. However, Germany had begun initial work starting in 1970 on a new identification system known as Combat Active/Passive Radar Identification System (CAPRIS) and France started work on its new version called SINTAC 3 (45:176). Both of these early efforts have formed the basis for each country's requirements with

respect to NIS. It is clearly evident that the program was not a U.S. initiated program, but more so a European effort. The second distinction is that there is no cost sharing associated with the program. According to the terms outlined in the MOU...

> Each participant will bear the cost of its own activities undertaken pursuant to this MOU. There are no shared costs under the MOU. All work to be undertaken by a participant under this MOU is subject to the availability of its own appropriated funds [30:9].

Tom Fowler, Deputy Director of Combat Identification Systems, depicted the NIS program as a 'parallel' development program, since each participating nation is developing its own version of NIS within the guidelines of STANAG 4162 to ensure interoperability (19). STANAG 4162 is the standardization agreement among NATO members which defines the electromagnetic transmission of signals in space, as well as the technical characteristics, operational applications, and performance of the NIS (34:106,30:2). Although the preliminary draft of the STANAG was prepared in 1978; however, it has yet to be completely ratified (44:1420).

Dennis Kloske, former special advisor on NATO Armaments for the Deputy Secretary of Defense, described the NIS program as follows:

> The NIS (NATO Identification System) is one of the flagship cooperative programs. We've been working on it now for at least 20 years. We've brought to bear enormous amounts of political capital and significant amounts of money and R&D expertise [15:25].

The quote above depicts the program as a large, complex, expensive, and seemingly endless program. The magnitude of the NIS program is evident when one considers the military inventories of the participating nations, and other NATO allies, with respect to aircraft, naval vessels, tanks, anti-tank and anti-aircraft weapons which will theoretically be modified with NIS, commonly referred to as Mark XV (45:175). The program also represents a substantial expense. It was estimated in November 1987 that the U.S. has already spent approximately $150 million, Germany and the U.K. $50 million each, and France over $10 million (28:11). If codevelopment leads to the acquisition of the Mark XV system, procurement and retrofit costs will run the program into the billions. The program is complex. According to Dennis Kloske, the more participants involved in a cooperative program, the "harmonization of requirements in not the easiest thing in the world to do" (16:81). The final point the quote addressed is that the program has been going on for approximately twenty years. This is not entirely exact. Direct U.S. involvement, concept exploration phase, in the NIS program did not begin until 1980 (27:5). However, the need for an improved identification system was widely recognized by the late 1960s, in which studies were undertaken to examine possible solutions to overcome the shortcomings of the identification systems currently used throughout NATO (45:175).

Identification Shortcomings

Two types of identification systems which are predominately used throughout NATO are the Mark 10A and Mark 12 systems. The Mark 12 system is currently used by the U.S., Germany, Canada, and the Netherlands. The Mark 10A system is used throughout the rest of NATO. These systems have been in operation for over thirty-five years, and have become obsolete due to the technological advancements with regard to speed, range, lethality, and electronic counter measure (ECM) equipment of weapon systems being fielded now and in the future (34:104).

The current identification systems have several shortcomings. First, only the Mark 12 system is communications secure. Secondly, the two systems are very susceptible to jamming with ECM equipment. Also, jamming or interference caused by numerous transmissions from a vast array of weapon systems deployed over the battlefield will render the identification system ineffective. Third, there is no adequate means for identifying ground vehicles on the battlefield. Fourth, these systems lack the means to determine friend or foe in the event of no response (45:175,34:104-105).

The identification systems function by means of an electronic question, generated by the interrogator component, and an electronic response, generated by the transponder component. Based on the shortcomings of the

identification systems mentioned earlier, the dilemma surfaces when no reply is received after interrogation. Several possibilities may exist. These are listed below.

1. The aircraft is friendly and has a damaged transponder.
2. The aircraft is friendly and the transponder is turned off.
3. The aircraft is friendly and has the wrong code.
4. The aircraft is friendly and the reply has been jammed.
5. The aircraft is friendly and the antenna is shadowed thereby blocking the reply.
6. The aircraft is neutral.
7. The aircraft is foe [18:50].

In the event of a positive response, one still must ascertain whether the enemy has intercepted the code due to the lack of communications security of the Mark 10A system and has replicated it (45:175). Due to these shortcomings and the dilemma that exists with a response or non-response have intensified the need for a new identification system and have formed some of the basic requirements of the NIS.

NIS Requirements

The shortcomings of the presently used identification systems used throughout NATO as exemplified above have formed the basic requirements for the NIS. The NIS will be resistant to jamming from ECM equipment, and will not be susceptible to interference caused by multiple transmissions associated in a dense combat environment (45:105). In

addition, the system will not only have the capability for air-to-air and ground-to-air operations which now currently exists, but also the added capability to operate air-to-ground and ground-to-ground (3:36). The system will also have the necessary communications security in order to prevent enemy forces from intercepting coded transmissions.

In addition to overcoming several of the shortcomings of the current system, NIS also has the requirement to include the new civil radar mode (Mode S), interface with the new air traffic control system, Traffic Alert and Collision Avoidance System (TCAS), and to be interoperable with the identification systems being developed by participating nations involved in the NIS program (27:2).

Economic considerations have also played a significant role in the requirements determination of the NIS. The NIS is to be backward compatible with the existing Mark 12 system . This allows a Mark 15 system to accept the reply signal from the Mark 12 system; thus providing some degree of interoperability between the two systems (19). This backward compatibility also serves to maintain the existing identification capability during the transition period to the Mark 15 system, as well as providing an alternative for allied nations who can't or won't procure the Mark 15 system due to the significant costs to deploy the system. In addition, the U.S. has a form, fit, and function (F3) design goal for replacing Mark 10/12 system components (27:2).

This provides cost savings by deleting expensive modifications to retrofit and install the Mark 15 system.

NIS Program

As previously stated, the NIS program started as a tri-service program with the Air Force designated as the lead service. The Combat Identification System Program Office (CISPO) was established at Aeronautical Systems Division (ASD), WPAFB Ohio, to manage the acquisition of all common (core) equipment, with the exception of communications security (COMSEC) equipment which is the responsibility of the National Security Agency (27:1-2). The core requirements of the Mark 15 system include the interrogator, transponder, COMSEC unit, control panel, and antennas.

U.S. involvement in the NIS program began June 1980 when the Request for Proposal (RFP) soliciting bids for studies for improved Q&A alternatives was issued. This began the concept exploration (CE) phase of the acquisition process which lasted from FY80-83 (27:5,10). During the CE phase, three industrial teams were formed. Bendix teamed with Raytheon, Hazeltine with Harris and Martin Marietta, and Texas Instruments with E-Systems (44:1419). Contracts were let in October 1980 for each of the tree teams for a combined total of $3.5 million. Their studies were completed in August 1981, and showed improved operational capability operating in the E-F frequency band. However, the D band which is currently used in the Mark 10 and 12

systems was selected as the only 'affordable/operationally acceptable alternative' due to the substantial increase in costs that would be incurred (27:10). This decision eventually became the most debated characteristic of the Mark 15 system. The frequency problem will be discussed more indepth later in this section.

Following the CE phase, the demonstration and validation (D&V) phase of the acquisition phase began and lasted from FY83-88 (27:5). The D&V phase was divided into two phases. Phase 1 was to develop brassboard equipment to test the feasibility of the D-band waveform. Phase 2 was to develop and build advanced development models (ADMs) to prove and refine the Mark 15 waveform. The teams of Bendix and Texas Instruments were awarded contracts of $1.6 million and $4.6 million respectively for the Phase 1 portion of the D&V phase; after successfully competing against the teams of Hazeltine/Harris/Martin Marietta, and Hughes/Collins/AIL. The large difference between the two contracts was a result of Bendix's low bid and their previously developmental work on Mode S for the Federal Aviation Agency (FAA) (44:1422).

After the critical design review (CDR) following Phase 1, the Defense Systems Acquisition Review Council (DSARC) I in August 1984 initiated Phase 2 of the (D&V) phase . DSARC I provided the direction to reduce the length of the D&V phase in order to enter full scale development (FSD) (27:11,44:1422). DSARC I also directed a cost sharing ratio

among the services. This ratio was 40-30-30 percent for the AF, Army, and Navy respectively (27:11). Under this arrangement, each service was responsible for budgeting for the development of core requirements and to transfer funds to the AF in order for them to administer the program. This resulted in the late receipt and shortage of funds from the services. Due to the complications that arose from the cost sharing ratio, the General Offices Steering Committee as well as the Joint Requirement Management Board recommended in 1986 that the AF be given Total Obligation Authority (TOA) for core funding beginning with the FSD phase of the acquisition process. This recommendation was incorporated into the FY88 budget (27:11). The new arrangement transferred the responsibility for all core funding activities to the AF.

It was during the latter part of Phase 2 of the D&V phase that the NIS program officially involved international collaboration. Unofficially however, international collaboration has been evident throughout the program in attempting to ratify STANAG 4162. These efforts will be clearly exemplified in the next section, Problems Encountered. The MOU dated 27 February 1986 contains the signatures of eleven National Armaments Directors (NADs) intent to explore a cooperative development program of the NIS (32). In February 1987, the 'five power' MOU between the U.S., Germany, Italy, France, and the U.K., marked the

beginning of the NIS becoming an international codevelopment program (30:1). Although Italy is included in the MOU, their undertaking is reflected in a separate MOU between the U.S. and Italy (which has yet to be signed by the U.S.) which specifies the terms to attain the Production Data Package (PDP) in order for them to produce and maintain NIS equipment within the limits of technology transfer restrictions and commercial property rights (31:13).

Some of the goals/objectives stated within the 'five power' MOU are outlined below:

> 1. That interoperability...is essential and must be ensured under all foreseeable circumstances.
>
> 2. Develop and implement the NIS Q&A for the use of their armed forces from 1992 onwards.
>
> 3. ...refining NATO Standardization Agreement (STANAG) 4162 regarding the technical characteristics of NIS and in determining the operational application and performance of NIS.
>
> 4. ...make use of the best possible use of their respective industrial capabilities to eliminate unnecessary duplication of work and to obtain the most efficient and cost effective results.
>
> 5. Minimize the development timescale [30:3].

The MOU provides a general agreement among the participating nations on the NIS program. The specific agreements, which are source selection sensitive, are separate agreements among industrial participants. Under the terms of the MOU, each country will have a project director, who is responsible for monitoring and coordinating work performed to achieve the stated objectives, and to

identify opportunities for collaboration between two or more participants. The project directors are to meet at least every six months, and all decisions relating to the activities of the MOU are by unanimous consent. In addition, the financing arrangement specified under the MOU, which was previously mentioned, requires each participant to finance their own activities in the development of the NIS (30:6,9). This is due to the development of interoperable identification systems among the participating nations. However, the financing arrangements for the codevelopment effort are part of the specific industry-to-industry agreements.

It should be noted that the cooperative effort has centered around ensuring interoperability among all new developed identification systems. This effort for the most part has revolved around the ratification of STANAG 4162 which provides the guidance for each participant to effectively pursue activities in the accomplishment of this goal. Cooperative efforts in interoperability testing and information exchange (within the provisions of foreign disclosure laws) have been utilized to ensure interoperability (19). One source noted that little has been done in terms of codevelopment due to the program only recently involved international collaboration. This source also noted the industry-to-industry arrangements have been made between the U.S. industries and its foreign counter-

parts, and much of the cooperative effort in the development of common components will occur in the FSD phase (*). Currently the program is at source selection for the FSD contract which started 6 June 1988 and is scheduled to conclude later this year. The FSD RFP states that non-U.S. contractors are not authorized to bid as prime contractors. Although they received the RFP, with the exception of several documents and appendixes, it was only for their information in order to 'facilitate potential subcontractual relationships with U.S. prime contractors' (46:2). In addition, RFP bids from contractors must include a NATO cooperative plan (46:2). The Defense Acquisition Board (DAB) decision initiating the full scale development phase of the acquisition process is scheduled in early 1989 (39).

Problems Encountered

The literature review exclusively concentrated on the problem of determining the frequency requirement of NIS. As previously mentioned, the U.S. opted for D-band; however, European efforts on their new identification systems were concentrated in the E/F-band. European proponents advocated that the higher frequency (E/F-band) would increase operational performance and the systems' resistance to jamming and interference. They also felt D-band was already saturated with TACAN, DME, and civil ATC systems. An additional advantage of the E/F-band was the reduction in the size of hardware which they felt was a major con-

sideration due to the space limitations of many weapon platforms (44:1420).

The U.S. claimed that the NIS operating in D-band would not increase the interference level from that of currently used systems, and may produce less as a result of using spread-spectrum signals. In addition, the U.S. felt that adopting a E/F-band NIS would be too costly due to the added requirement of antennas that would have to be designed and procured for all weapons platforms (44:1420,1422).

The differences among the U.S. and the Europeans concerning the waveform requirement led to a detailed evaluation beginning in September 1982 of the U.S. proposed frequency. The evaluation examined waveform performance, interference with civil networks, signal parameters, and cost. In addition, computer simulations were conducted to verify the waveform's resistance to jamming and interference. The results of the evaluation which supported the U.S. position, were reported to the NIS working group in March 1983. However, despite the results of the evaluation, Germany was still reluctant to accept the D-band waveform. They proposed an additional study to test the frequency compatibility and interference levels among the nations developing identification systems (44:1420).

The new study proposed that each country build two brassboard systems, one for each proposed frequency. This study which began in mid-1983 lasted eighteen months ending

in December 1984. Although the U.S. was clearly committed to the D-band frequency, they participated in the study which increased costs and the length of the program (44:1421). The U.S. study revealed no increase in interference levels with the Mark 15 operating in D-band. The final outcome of all the testing was a compromise alternative, which had previously been accepted by the U.K., to operate the NIS in D-band/radar mode. The system will operate in D-band and have the capability to receive transmissions in a radar mode (J-band). This compromise feature is estimated to raise U.S. program costs by twenty percent (44:1421).

The controversy which surrounded the frequency requirement has subsequently delayed the ratification of STANAG 4162, which was originally drafted in 1978. In fact, the STANAG has yet to be totally ratified. This is now due to the requirements determination of the J-band waveform. Ratification is expected later this year, 1988 (19,45:176).

IV. Presentation of the Data

Question 1: Do you feel U.S. laws and policies promote armaments cooperation? Explain.

This question was used to determine if U.S. laws and policies provide a positive climate in which armaments cooperation endeavors could foster. The question invoked mixed responses from both U.S. and foreign interviewees. Those interviewed who responded positively to the question cited the recent passage of the Quayle-Nunn Amendments to the FY 1986 Defense Authorization Act. These amendments provided the enabling legislation to enter into cooperative R&D efforts by modifying the Arms Export Control Act, and also mandated the services to actively consider international participation in the development of a weapon system. These respondents felt that this legislation has dramatically increased and reaffirmed the U.S. commitment to cooperate with its allies. Negative responses were also received from those interviewed. These responses were primarily centered around the technology transfer restrictions which arise in the development of advanced weapon systems. Many felt that these restrictions are too constrictive, and defeat the purpose of cooperative R&D efforts. In addition, these restrictions force foreign nations to invest in previously developed technology causing duplication of effort as well as wasting valuable resources. Although this question was directed at U.S. laws,

interviewees pointed out that such protectionist measures were also evident among allied nations. This point was therefore justly noted.

Question 2: What factor, military, economic, or political, do you feel plays the dominant role in promoting armaments cooperation? Explain.

The literature review identified three factors; military, economic, and political, that are relevant in promoting armaments cooperation. This question was designed to determine which factor has played the dominant role in promoting armaments cooperation. The majority of those interviewed noted that all three factors have played a role in promoting armaments cooperation. However, after narrowing the selection of alternatives down to one, it was determined that from the U.S. viewpoint that the political aspect has been the dominant force in promoting armaments cooperation in the U.S.. One respondent depicted the military position in terms that they do not actively seek international participation unless they expect to gain something from the joint venture above procuring the weapon system themselves (*). This point was also noted from a foreign source who expressed his observation that everyone at the higher echelons of government and in the DOD are very supportive of cooperative ventures; but at the service level there is much less enthusiasm and support (*). From the foreign viewpoint, they felt that the military has been the

dominant force in their country in promoting armaments cooperation. Justification of their responses was more for the money, declining military budgets, and the procurement of technologically advanced weapon systems. The research in this area supported the U.S. selection of the political factor for playing the dominant role in promoting armaments cooperation. For the foreign nations, the literature depicts the economic factor as the dominant factor. However, the responses from the foreign nations clearly exemplified a significant economic undertone for the military playing the dominant role.

Question 3: How could you categorize NATO armaments cooperation overall based on current international programs, as successful or unsuccessful? Explain.

This question was used to ascertain how interviewees would classify the codevelopment programs currently underway as a result of the Nunn Initiative. Although the initial responses were for the most part positive, interviewees cited the F-16 and other coproduction programs as examples. These responses revealed that the question as stated failed to depict what the author had intended. After rephrasing the question in terms of codevelopment programs, the overall response was that the jury was still out because the programs are still on-going. However, categorizing them at this point in time, the majority categorized them as being unsuccessful. Their rationale was for the most part

emphasized cost and program length. Although no specific details were provided with respect to cost, program length was elaborated on. Examples were given of programs which started in the early 1980s and are currently in the D&V phase or just starting the FSD phase of the acquisition process. For those who responded positively of these programs, they revealed that all programs started are still on-going, and therefore the cooperative effort is still viable. They also realized that the criticism of these programs with respect to cost and length are somewhat substantiated, they felt that codevelopment programs are in their infantcy and therefore had anticipated less than optimum program performance.

Question 4: From your experience, what problems are most prevalent in NATO armaments cooperation programs?

Several problems were cited as being common among cooperative programs. Communication was the most common response among those interviewed. This problem was cited due to the geographical separation among participants and the language differences of the participants. Uncertainty was also recognized as a problem. This was cited by most respondents and largely due to the budgetary process of the U.S. which is capable of terminating programs quickly. Respondents felt that this uncertainty characteristic causes some concern among foreign participants. The requirements determination was also cited as a problem. This problem

addressed ensuring the requirements of the proposed weapon system meet the operational needs of all participants. Another problem which was frequently cited was technology transfer. Many U.S. personnel believed that even though the Europeans are catching up with the U.S. with respect to technology, that it is still perceived as U.S. giving to allied nations. Foreign officials interviewed felt that the technology restrictions are too stringent.

Question 5: Do you feel participation NATO armaments cooperation programs is worthwhile?

The unanimous response to this question was 'Yes.' Despite the problems associated with cooperative programs, all felt that the problems can be overcome, and the benefits which can be realized from a successful cooperative program are worth the effort. Many benefits were depicted resulting from cooperative programs. These include increased standardization and interoperability among alliance forces, increased production runs as a result of expanded markets, improved foreign relations, decreased duplication of effort in the development of a weapon system, and a decreased overall cost of the procurement of a weapon system due to reduced R&D costs as well as increased production runs.

Question 6: Do you believe that codevelopment programs realize any cost savings in the procurement of a weapon system? Explain.

This question was asked due to the controversy surrounding codevelopment programs with respect to cost savings. The responses to this question were divided equally among those interviewed. Those respondents who said that codevelopment programs realize cost savings expressed cost savings in terms of the cumulative costs among all participants involved in the cooperative effort compared to the cumulative costs of what it would have cost each country to individually develop the weapon system. In addition, interoperability and standardization features were noted to further justify the cost savings associated with co-development programs. Many who responded negatively to this question defined cost savings in somewhat different terms. Their definition related to what it would have cost a single country to develop the weapon system compared to the cumulative costs of the participants in the codevelopment effort. It should be noted also, that many of those who responded negatively also felt that even when using the other definition of cost savings, they still did not believe any cost savings occur due to the program length and the compromises, which usually result in added features in the weapon system, that are prevalent in codevelopment programs.

Question 7: What suggestions do you have for improving the NATO armaments cooperation process or programs?

This question was asked to solicit respondents' suggestions on how the process or programs could be improved

upon. The responses focused on improving the current process. The most frequent response was to improve upon the requirements determination aspect of the proposed weapon system, and not to commit large amounts of funds until a firm requirement does exist. Many felt that the MOU process, with respect to the amount of time it takes to complete) could be improved upon. Currently, this process takes approximately a year. They did note that the process has been improved considerably; they felt more could be done to reduce the time involved. However, they did not offer any specific recommendations in this area. Another suggestion was offered by an industry representative. The representative suggested that during the negotiations, that countries need to be more frank (don't beat around the bush) in relaying their national objectives in which they wish to realize from the cooperative effort. Also, several felt that a lessons learned book be established to assist those responsible for implementing the program. The source that suggested this felt with the turnover among the services' personnel in the international program arena that such a book would be helpful in providing a reference to assist new personnel in international programs.

Question 8: Do you believe the use of the NATO armaments cooperation programs will continue to increase in the future? If so, why?

This question prompted a unanimous positive response. Rationale given for the responses was declining military budgets, increased costs associated with the development of advanced weapon systems, interoperability and standardization objectives among alliance equipment, and political emphasis on cooperative efforts. One government source estimates that the current level of services' international R&D budgets which is approximately 2 1/2 to 3 percent will increase to 25 percent by the year 2000 (*). All responses are consistent with the research predicting the growth of armaments cooperation, and especially codevelopment programs.

Question 9: What problems have been encountered thus far in the NIS program?

Several problems were cited as being encountered in the NIS program. Communication problems have resulted not only due to the geographical separation of participants; but also in the understanding of the English language. As one source pointed out, that the U.S. and Britian do not have as much a problem since both countries speak English (all meetings are conducted in English) and therefore pick up the subtle remarks. However, this creates somewhat of a problem for the other participants. Another problem, and the most publicized of the program, has been the problem of defining the waveform frequency. After additional testing and a compromise by the Germans, an agreement was reached. Now

there is still a problem in determining the frequency requirement for the J-band. As one source noted, "it is hard enough to get our services to agree on the requirement, much less the participating countries [*]." Many feel that defining the frequency requirement has cultivated additional problems. These consist of the increased cost of the program due to additional testing and added requirement of the radar mode receiver capability, and also the program length. These increases have led to much discontentment for the program and its progress for the amount of resources committed. The ratification of the STANAG has also been delayed due to firming up the requirements for the NIS. Originally scheduled for ratification in 1981, it has yet to be fully ratified. Funding problems among the services initially in the program have caused some problems. These problems have been resolved by the TOA to the AF starting with the FSD phase of the program. The literature supports the many of the problems encountered in the NIS program, and in codevelopment programs in general.

Question 10: Do you expect the NIS program to increase NATO RSI? Explain.

This question was asked to ascertain if the program will increase NATO RSI due to the substantial cost involved in the procurement of the Mark 15 identification system for smaller allied nations. Currently, the Mark 10 and 12 systems are interoperable, and the Mark 15 system will only

be interoperable with the Mark 12 system. Therefore, to increase interoperability among the allied nations, the acquisition of the Mark 15 system by all allied nations would be required. All those interviewed responded positively to this question. Detailed measures have been taken to ensure interoperability among identification systems being developed by the participating nations. The cost dilemma was recognized by many respondents as a problem; however, others felt that the smaller allied nations could afford acquiring the system. In view of this problem, several alternatives have been expressed. One alternative is to sell surplus Mark 12 systems to those countries utilizing the Mark 10 system. This would therefore make the systems interoperable. The second alternative is coproduction arrangements with these smaller countries in the production of the Mark 15 system. Both alternatives are viable; however, several sources stated that the first alternative would be futile since many felt that once a large percentage of the forces acquired the Mark 15 system, the Mark 12 backward compatibility characteristic of the system would be turned off due to the shortcomings of the Mark 12 system.

Question 11: Would you consider the NIS program as successful or unsuccessful? Explain.

Although the NIS program is still on-going, this

question was asked to determine how the program is perceived to this point in time. Most respondents initially hesitated to categorize the program since it has yet to be completed; however, in selecting one of the alternatives, the majority categorized the program as unsuccessful. This response was largely due to the program length and its respective progress. As previously stated, the NIS program started in late 1980 and is now under going source selection for the FSD contract award. Many felt that the program should have been much further along by now. Additional rationale for the negative response was program cost, and skepticism concerning the operational benefits of procuring the system. The cost of the NIS program has increased for the U.S. due to the additional testing of the waveform requirements and the added requirement for a radar mode receiver. The question as to whether NIS will improve the identification shortcomings of the alliance was also questioned. This skepticism is due for several reasons. First, the operational performance of the NIS is largely dependent upon the alliance as a whole procurring the Mark 15 system. Earlier it was stated that there is a question as to what other allied nations plan to procure the Mark 15 system. Without all the allied nations using the Mark 15 system, there still remains the inherent shortcomings of the Mark 12 and 10 systems, which will dramatically effect the operational performance of the new identification system.

Secondly, in order to reduce costs, the U.S. has reduced the number of weapon platforms to be modified with the Mark 15 system. One significant platform, the F-16 aircraft, will only be equipped with a transponder. The F-16 represents a significant percentage of tactical aircraft, and has recently acquired the AMRAMM missile to enable it to hit beyond visual range targets. However, without a interrogator component, the F-16 will not have a direct identification capability to effectively deploy these weapons. It must also be mentioned that a combined transponder/interrogator component is to be developed for the F-16s which will be Mark 15 compatible. Many felt that the new identification system should provide the capability to deploy weapons against beyond visual range targets. They did not feel that the Mark 15 system would provide them with this capability since its usage is still speculative among other allied nations, thus the operational performance of the system is still constrained by the older identification systems currently in use.

Question 12: What benefits do you expect to realize from the NIS program?

The responses to this question came as somewhat of a surprise to the author, largely due from the lack of significance and responses with respect to the economic benefits expected from the program. This is somewhat contradictory to the noted national interests of the foreign

participants which opted for the development of inter-operable identification systems rather than a single identification system to maintain their defense industry. Also, the literature on the subject portrays the economic aspect of codevelopment as a significant consideration. The majority of respondents cited the development and acquisition of an effective identification system to meet the future needs of the alliance as the most important benefit to be derived from the cooperative effort. Surprising, the U.S. personnel (excluding industry) replies were solely concentrated on the military aspect of fulfilling the need, where as the foreign officials interviewed expressed the same views, but also briefly touched upon the economic advantages. These include maintaining the defense industry, increasing domestic employment, and also attaining technological advancements. One country's official concentrated its response on the economic benefits; foremost the technology gains from participating in the cooperative effort, and also the ability to produce the developed system. Although these responses are consistent with the literature on the benefits derived from a codevelopment effort; they were concentrated more on the military rather than the economic benefits.

Question 13: Do you feel the program will be successfully completed? Explain.

This question was asked to determine the current

perspective as to whether the NIS program would be successfully completed. It was asked for several reasons. First, in early 1988, there was some speculation that the AF was going to terminate the program. Secondly, the literature on the subject of codevelopment programs revealed some skepticism among allied nations concerning the ease of program termination due to the U.S. budgetary process. In fact, the budget for the program past 1993 was at one point zeroed out (39). However, despite these conditions, the responses were all positive, indicating successful program completion. The primary reason given for this reply was the critical need for a new identification system. The alliance has recognized this as one of its top deficiencies. Despite the unanimous positive responses to this question, it was noted that the program probably wouldn't be terminated because it involves international collaboration. Some respondents believed that the program would have been terminated by now if it was solely a U.S. effort. As one source exclaimed, 'If it were up to me, I'd terminate it in a heartbeat [*].' The literature depicts the U.S. hesitation to terminate programs that involve international collaboration, therefore the responses are compatible with the literature on the subject.

Question 14: Do you feel the program will realize any cost savings? Explain.

This question was used to determine if the NIS

program would realize any cost savings as a result of the codevelopment effort. The majority of respondents felt there would be no cost savings associated with the program. Rationale for their responses reflected the additional costs associated with the radar mode receiver requirement, and additional testing that was conducted to solidify the waveform requirement. The respondents felt that the program would at best break even, and many felt that the program would be more costly. These responses were for the most part given with respect to cost savings defined as the cumulative costs of participant countries compared to the cumulative costs of participant countries working independently on the identification system. For those who stated cost savings would be incurred felt that countries independently working on the identification system would be more costly and not have the interoperability compatibility between the systems being developed as a result of this endeavor.

V. Conclusions and Recommendations

The objectives of this research effort were threefold. First, to identify what benefits do the participating countries plan to realize from the NIS program. Secondly, to determine if the NIS program will realize any cost savings. And third, to determine if NIS will increase NATO RSI. Responses to the interview questions concerning these objectives were summarized in Chapter IV, Presentation of the Data. This chapter will depict the author's conclusions based on those responses and the literature review on the NIS program.

The first research objective dealt with the benefits anticipated from participating in the codevelopment effort of the NIS. Interviewee responses were directed primarily at the military benefits of developing and deploying interoperable identification systems with a vastly improved identification capability to offset the shortcomings of the current identification systems used throughout the alliance. The foreign officials interviewed did however cite anticipated economic benefits as well as a result of their participation in the NIS program. These benefits include increased employment, build up of their industrial capability, and access to advanced technology. This was not surprising due to the prevalent national interests in producing interoperable systems, instead of a single identification system. It was surprising in the fact that

the economic benefits were cited distinctly as secondary to the military benefits. The political benefits of the program were cited only sporadically; however some respondents did feel that improved foreign relations have resulted from working cooperatively. The above comments depict the benefits anticipated from the cooperative effort, and are consistent with the literature on the benefits anticipated from codevelopment programs. These include military, economic, and to a lesser extent political benefits.

The second research objective deals with the cost savings which theoretically result from codevelopment programs. The objective was to determine if the NIS program will result in any cost savings. Based on the interviews and the literature, the author concludes that the program will not result in any cost savings in the procurement of the Mark 15 identification system. Some cost savings may be incurred in the FSD phase of the program due to the extensive work performed by the Europeans in the J-band area. However, they would be relatively minor considering the twenty percent increase in program costs already incurred by the U.S. as a result of the comprise in which the radar mode receiving capability requirement was added. Also, there is some debate as to how one defines or should define cost savings. The literature addresses cost savings with respect to codevelopment programs as the total cost

spent by the participating countries on the program compared to the cumulative costs of each country working independently. This definition goes back to the concept of 'structural disarmament'. However, the authors' definition of a cost saving is the monetary savings realized by a nation from codeveloping a weapon system compared to developing the system independently. The literature supports that a single nation could develop a weapon system at a much lower cost. Despite how cost savings is defined, the author concludes that the NIS program will not result in a cost savings in the development of the NIS. This conclusion was reached due to the development of several interoperable systems among the participants, and the financial arrangements specified in the MOU.

The third research objective attempted to determine if NATO RSI will be increased as a result of the successful completion of the cooperative effort. The responses to the interview question regarding NATO RSI strongly supported an increase. However, some doubt was apparent. This doubt centered around the procurement of the NIS by other allied nations not involved in the NIS program. Currently, the Mark 10 and Mark 12 identification systems are interoperable; and the Mark 15 system will only be interoperable with the Mark 12 system. Therefore, to increase RSI would require those countries currently using the Mark 10 system or another identification system, other than Mark 12, to

procure the Mark 15 system or foreign equivalent. The author feels that anything less than 100 percent interoperability degrades the operational capability of the NIS because it would prevent the use of beyond visual range weapons. Due to the lack of data and documentation concerning these nations' plans to procure the NIS, the author finds the conclusion to this research objective to be inconclusive.

During this research effort, one underlying theme was evident, not only from the research but also from those interviewed. This was that codevelopment programs are in their infancy. This, coupled with the fact that there is a strong and supported trend towards more codevelopment programs in the future, the author finds several recommendations applicable. First, these programs need to be studied in order to identify and resolve the shortcomings of these programs. The author believes that the potential exists for these programs to realize cost savings. One recommendation which was noted to improve cost savings is to not outlay large amounts of money until a firm requirement on the proposed system is agreed to by all participants. Although it is recognized that money must be spent to identify possible alternatives, the suggestion concentrates more on earlier international collaboration. The requirements determination process involving international collaboration takes place during the demonstration and

validation phase of a U.S. program. The author feels this is too late. International collaboration must start at the concept exploration phase in order for interested participants to ascertain their operational requirements and identify their alternatives. This would prevent the duplication of requirements determination after the program involves international collaboration, earlier industry-to-industry arrangements, and ultimately result in some cost savings.

Secondly, and another recommendation that was made which the author feels is relevant is the need for a 'lessons learned' book for new program managers and personnel in international programs. We live with high personnel turnover rates in the services, and such a book could be beneficial in decreasing the learning curve for new personnel involved in international programs.

Codevelopment programs are indeed becoming the trend in international collaboration. These programs encompass a variety of benefits for all participants which strengthens the alliance as a whole. They should be pursued. However, they must also be improved upon in order to fully realize the potential benefits and increased combat capability that results from cooperative efforts and interoperability among equipment within the alliance.

Appendix: Interview Guide

General Questions

Question 1: Do you feel U.S. laws and policies promote armaments cooperation? Explain.

Question 2: What factor, military, economic, or political, do you feel plays the dominant role in promoting armaments cooperation? Explain.

Question 3: How would you categorize NATO armaments cooperation overall based on current international programs, as successful or unsuccessful? Explain.

Question 4: From your experience, what problems are most prevalent in NATO armaments cooperation programs?

Question 5: Do you feel participation in NATO armaments cooperation programs is worthwhile? Why?

Question 6: Do you believe that codevelopment programs realize any cost savings in the procurement of a weapon system? Explain.

Question 7: What suggestions do you have for improving the NATO armaments cooperation process or programs?

Question 8: Do you believe the use of the NATO armaments cooperation programs will continue to increase in the future? If so, why?

Specific Questions

Question 9: What problems have been encountered thus far in the NIS program?

Question 10: Do you expect the NIS program to increase NATO RSI? Explain.

Question 11: Would you consider the NIS program as successful or unsuccessful? Explain.

Question 12: What benefits do you expect to realize from the NIS program?

Question 13: Do you feel the program will be successfully completed? Explain.

Question 14: Do you feel the program will realize any cost savings? Explain.

Bibliography

1. Abshire, Ambassador David M. "Arms Cooperation in NATO, Armed Forces Journal International, 123: 66-70 (December 1985).

2. Air Force Systems Command. AFSC Allied Cooperative Armaments Plan. Memorandum. Andrews AFB MD, undated.

3. B.G. "Friend or Foe: The New NATO Identification Standard," Defense Electronics, 15: 34-36 (March 1983).

4. Beltramo, Michael N. "Codevelopment as a Precursor to Production Competition," Program Manager, 17: 2-9 (January-February 1988).

5. Beyers, Dan. "Kloske: Choose Ambitious Cooperative Programs," Defense News, 3: 2 (18 April 1988).

6. Brandt, Dr. Craig. Class Lecture in LOGM 543, International Logistics Management, School of Systems and Logistics, Air Force Institute of Technology (AU), Wright-Patterson AFB OH, January 1988.

7. Calaway, Robert P. Final Report: A Strategy for NATO Armaments Cooperation. Report to the National Defense University. Resource Management International, Inc., Mclean VA, 1 June 1987.

8. Callaghan, Thomas A., Jr. "The Unbuilt Street: Defense Industrial Cooperation Within the Alliance," NATO's Fifteen Nations, 27: 26-30 (October-November 1982).

9. Catledge, Capt Morris B. and Capt Larrie F. Knudsen. Foreign Military Sales: United States Involvement in Coproduction and Trends Toward Codevelopment. MS thesis, AFIT/SLSR-20-69. School of Systems and Logistics, Air Force Institute of Technology (AU), Wright-Patterson AFB OH, August 1969 (AD 863840).

10. "Cooperative R&D Seen Threatened by "Buy American" Proposals," Defense Daily, 152: 155 (28 May 1987).

11. Defense Innstitute of Security Assistance Management. The Management of Security Assistance. Wright-Patterson AFB OH, 1986.

12. Defense Systems Management College. Guide for the Management of Multinational Programs: A Handbook for Managers Entering the World of International Acquisition (Second Edition). Fort Belvoir VA, 1987.

13. Denny, Jeffrey. "Europeans Eager to Build Their Own," Military Logistics Forum, 1: 20-26 (April 1985).

14. Department of the Air Force. Standardization and Interoperability of Weapon Systems and Equipment in the North Atlantic Treaty Organization (NATO). AFR 73-3. Washington DC: HQ USAF, 10 March 1981.

15. Dunn, Michael. "Dennis Kloske Talks to D&FA About NATO Armaments Cooperation," Defense and Foreign Affairs, 15: 22-28 (April 1987).

16. Feazel, Michael. "NATO Arms Cooperation Enters Critical Period," Aviation Week and Space Technology, 127: 77-81 (9 March 1987).

17. -----. "NATO Directors Agree to Cooperate on Weapons Development Projects," Aviation Week and Space Technology, 124: 65 (17 March 1986).

18. Ferenczy, Gabriel I. "The NATO Identification System," NATO's Sixteen Nations, 31: 49-51 (August 1986).

19. Fowler, Tom. Deputy Director of the Combat Identification System Program Office. Personal Interview. Wright-Patterson AFB OH, 28 July 1988.

20. Friedman, Thomas. "Defense Sales Offsets," National Defense, 121: 28-33 (March 1987).

21. Ganley, Michael and Harry J. Stephan. "Taft Says NATO Cooperative Programs Have Made Substantial Progress," Armed Forces Journal International, 124: 18 (July 1987).

22. Greinke, Everett D. "Toward a New Realism in Arms Cooperation," Defense, 14: 8-15 (November-December 1986).

23. Healy, Melissa. "Nunn Backs Off Pressure on Allies," Defense Week, 28: 1,14 (28 May 1985).

24. Industry-to-Industry International Armaments Cooperation: Phase I - NATO Europe. Report of Defense Science Board Task Force, HQ USAF, Washington DC, June 1983.

25. International Coproduction/Industrial Participation Agreements. Report of the Department of Defense Task Group, HQ USAF, Washington DC, 15 August 1983.

26. Lorell, Mark A. Multinational Development of Large Aircraft: The European Experience. Santa Monica CA: The Rand Corporation, July 1980.

27. Mark XV Tri-Service Annual Estimate. Wright-Patterson AFB OH, June 1987.

28. Marcus, Daniel J. "Cooperative Testing Slated for NATO Identification System," Defense News: 9 (9 November 1987).

29. McGarrah, Robert E. "U.S. Military-Industrial Complex: Cooperation Better Than Competition," Christian Science Monitor, (13 January 1988).

30. Memorandum of Understanding Between the Minister of Defence of the French Republic and the Minister of Defence of the Federal Republic of Germany and the Minister of Defence of the Republic of Italy and the Secretary of State for Defence of the United Kingdom of Great Britain and Northern Ireland and the Secretary of Defense of the United States of America Concerning Activities Necessary for Cooperative Development of the NATO Identification System (Question and Answer Component), February 1987.

31. Memorandum of Understanding Between the Ministry of Defense of the Republic of Italy and the Department of Defense of the United States of America on Cooperation in the Development of the NATO Identification System (Question and Answer Component) (Draft Copy), undated.

32. Memorandum of Understanding Concerning The Statement of Intent to Expolore Cooperative Development of the NATO Identification System, Question and Answer Components, 27 February 1986.

33. Mentecki, Maj Joseph A. Class Lecture in CMGT 523, Contracting and Acquisition Management, School of Systems and Logistics, Air Force Institute of Technology (AU), Wright-Patterson AFB OH, March 1988.

34. Murray-Rochard Alan. "A New Identification System for NATO," NATO's Fifteen Nations, 104-107 (Special 2/1980).

35. "The New Nunn NATO Amendment," NATO's Sixteen Nations, 26: 23 (July 1985).

36. Pierre, Andrew J. The Global Politics of Arms Sales. New Jersey: Princeton University Press, 1982.

37. Pocatorra, Col Richard C. and others. United States Arms Transfers as a Consistent Element of United States Foreign Policy. MS thesis, AFIT/LSSR-33-78B. School of Systems and Logistics, Air Force Institute of Technology (AU), Wright-Patterson AFB OH, September 1978 (AD-A061303).

38. Randolph, Gen Bernard P. Department of the Air Force. Memorandum to All MAJCOM Commanders Concerning NATO Armaments Cooperation, undated.

39. Reza, Maj Sal. Requirements and Analysis Specialist, Personal Interview. Combat Identification System Program Office, Wright-Patterson AFB OH, 29 July 1988.

40. Rose, Clive. "Western Europe: Prospects for Cooperation in Defense," Journal of the Royal United Services Institute for Defense Studies, 130: 10-13 (September 1985).

41. Schemmer, Benjamin F. "Army, USAF Step Up Side-By-Side Tests; 15 Cooperative Arms Programs Under Way," Armed Forces Journal International, 125: 32-36 (October 1987).

42. Sloan, Stanley R. "Transatlantic Tremors," National Defense, 119: 31-34 (January 1985).

43. Spanier, John W. American Foreign Policy Since World War II. New York: Frederick A. Praeger, 1968.

44. Sundaram, Gowri S. "NATO's Future IFF System: The U.S. Approach Gains Ground," International Defense Review, 16: 1419-1422 (October 1983).

45. -----. NATO Identification System: The U.S. and Europe More Friends Than Foes," International Defense Review, 14: 175-177 (February 1981).

46. Thurman, Gen William E. Memorandum to All Offerors Concerning Executive Summary, Request for Proposal (RFP), F33657-88-R-0063, Mark XV Identificaction Friend or Foe (IFF) System. Wright-Patterson AFB OH, 22 April 1988.

47. "Taft Forms New Pentagon Allied/NATO Arms Cooperation Working Group," Defense & Foreign Affairs Daily, 16: 1-2 (22 January 1987).

48. Tebbe, Wolfgang. "The Transatlantic Dialogue and the European Defence Industry," NATO's Sixteen Nations, 30: 52-60 (October 1986).

49. U.S. Army Material Systems Analysis Activity, Logistics Studies Office. "Identification and Documentation of Rationalization, Standardization, and Interoperability (RSI) Functions," Fort Lee VA, November 1984 (AD-A172884).

50. "U.S. Department of Defense Acquisition Policies," Government Printing Office, Washington DC, undated.

51. Van Houwelingen, Jan. "Towards European Defence Industry," NATO's Sixteen Nations, 30: 44-50 (October 1985).

52. Walizer, Michael H. and Paul Weiner. Research Methods and Analysis. New York: Harper and Row, 1978.

53. Welt, Leo G.B. "Military Offsets," National Defense, 118: 20-23 (March 1987).

54. -----. "Offsets for Exports," National Defense, 119: 22-27 (September 1984).

55. Weinberger, Casper W. Department of Defense. Memorandum for the Secretaries of the Military Departments, Chairman of the Joint Chiefs of Staff, Under Secretaries of Defense, Assistant Secretaries of Defense, and Directors of the Defense Agencies, Washington DC, 6 June 1985.

VITA

Captain John J. Hepner was born [redacted] He graduated from Middletown Area High School, [redacted] Upon graduation, he attended Slippery Rock State College, Slippery Rock Pennsylvania, and received the degree of Bachelor of Science in Business Administration in May 1983. Upon graduation, he received his commission in the USAF through the ROTC program. He was called to active duty in October 1983 and attended the Aircraft Maintenance Officer Course (AMOC) at Chanute AFB Illinois. After training he was assigned to Myrtle Beach AFB South Carolina until entering the School of Systems and Logistics, Air Force Institute of Technology, in May 1987.

[redacted]

UNCLASSIFIED
SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED	1b. RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY	3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; distribution unlimited
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE	
4. PERFORMING ORGANIZATION REPORT NUMBER(S) AFIT/GLM/LSM/88S-34	5. MONITORING ORGANIZATION REPORT NUMBER(S)
6a. NAME OF PERFORMING ORGANIZATION School of Systems and Logistics 6b. OFFICE SYMBOL (If applicable) AFIT/LSM	7a. NAME OF MONITORING ORGANIZATION
6c. ADDRESS (City, State, and ZIP Code) Air Force Institute of Technology Wright-Patterson AFB OH 45433-6583	7b. ADDRESS (City, State, and ZIP Code)
8a. NAME OF FUNDING/SPONSORING ORGANIZATION 8b. OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
8c. ADDRESS (City, State, and ZIP Code)	10. SOURCE OF FUNDING NUMBERS PROGRAM ELEMENT NO. / PROJECT NO. / TASK NO / WORK UNIT ACCESSION NO.
11. TITLE (Include Security Classification) See Box 19	
12. PERSONAL AUTHOR(S) John J. Hepner, B.S., Capt, USAF	
13a. TYPE OF REPORT MS Thesis 13b. TIME COVERED FROM _____ TO _____	14. DATE OF REPORT (Year, Month, Day) 1988 September 15. PAGE COUNT 89
16. SUPPLEMENTARY NOTATION	

17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB-GROUP	
01	03		NATO, Arms Cooperation, NATO Identification System, Codevelopment, Mark XV

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

Title: A CASE STUDY OF THE NATO IDENTIFICATION SYSTEM CODEVELOPMENT PROGRAM

Thesis Chairman: Craig M. Brandt, Ph.D.
Assistant Professor of International Logistics

Approved for public release IAW AFR 190-1.

WILLIAM A. MAUER 17 Oct 88
Associate Dean
School of Systems and Logistics
Air Force Institute of Technology (AU)
Wright-Patterson AFB OH 45433

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT ☒ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT ☐ DTIC USERS	21. ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED
22a. NAME OF RESPONSIBLE INDIVIDUAL Craig M. Brandt, Ph.D.	22b. TELEPHONE (Include Area Code) (513) 255-4149 22c. OFFICE SYMBOL AFIT/LSMA

DD Form 1473, JUN 86 Previous editions are obsolete. SECURITY CLASSIFICATION OF THIS PAGE

UNCLASSIFIED

The purpose of this study was to determine if the NATO Identification System (NIS) Codevelopment Program would increase NATO Rationalization, Standardization, and Interoperability (RSI). The study had three basic objectives: first, to identify what benefits do the participating countries plan to realize from the program; second, to determine if the NIS program will realize any cost savings; and third, to determine if NIS will increase NATO RSI.

The study found that participants plan to realize the military benefits associated with the development and deployment of interoperable identification systems, and also economic benefits, in both the production and scientific sectors, as a result of the program. The research effort was inconclusive in determining if the NIS program would increase NATO RSI. This was due to the lack of documentation as to whether or not other allied nations, excluding the participants, are going to procure the Mark 15 system or foreign equivalent.