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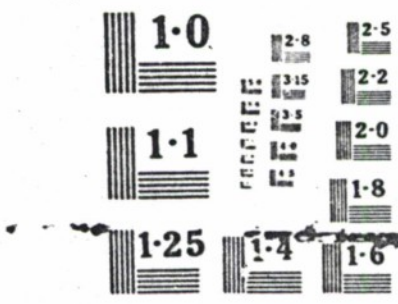

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TYPES OF WEAPON PROGRAMS AND THEIR IMPLICATIONS FOR NATO STANDARDIZATION OR INTEROPERABILITY

Norman J. Asher
Janice B. Lilly

July 1978

Prepared for

Office of the Under Secretary of Defense for Research and Engineering
and
Deputy Under Secretary of Defense
(Tactical Warfare Program)

INSTITUTE FOR DEFENSE ANALYSES
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The degree of achievement of standardization or interoperability is directly linked to the types of programs used in the procurement of weapon systems by the NATO allies. In this paper we review the types of programs that can be used among nations in the development and procurement of weapon systems, discuss a number of considerations involved in program choice, and present a case study of the types of aircraft development and procurement programs used by our NATO allies since the 1949 establishment of NATO.

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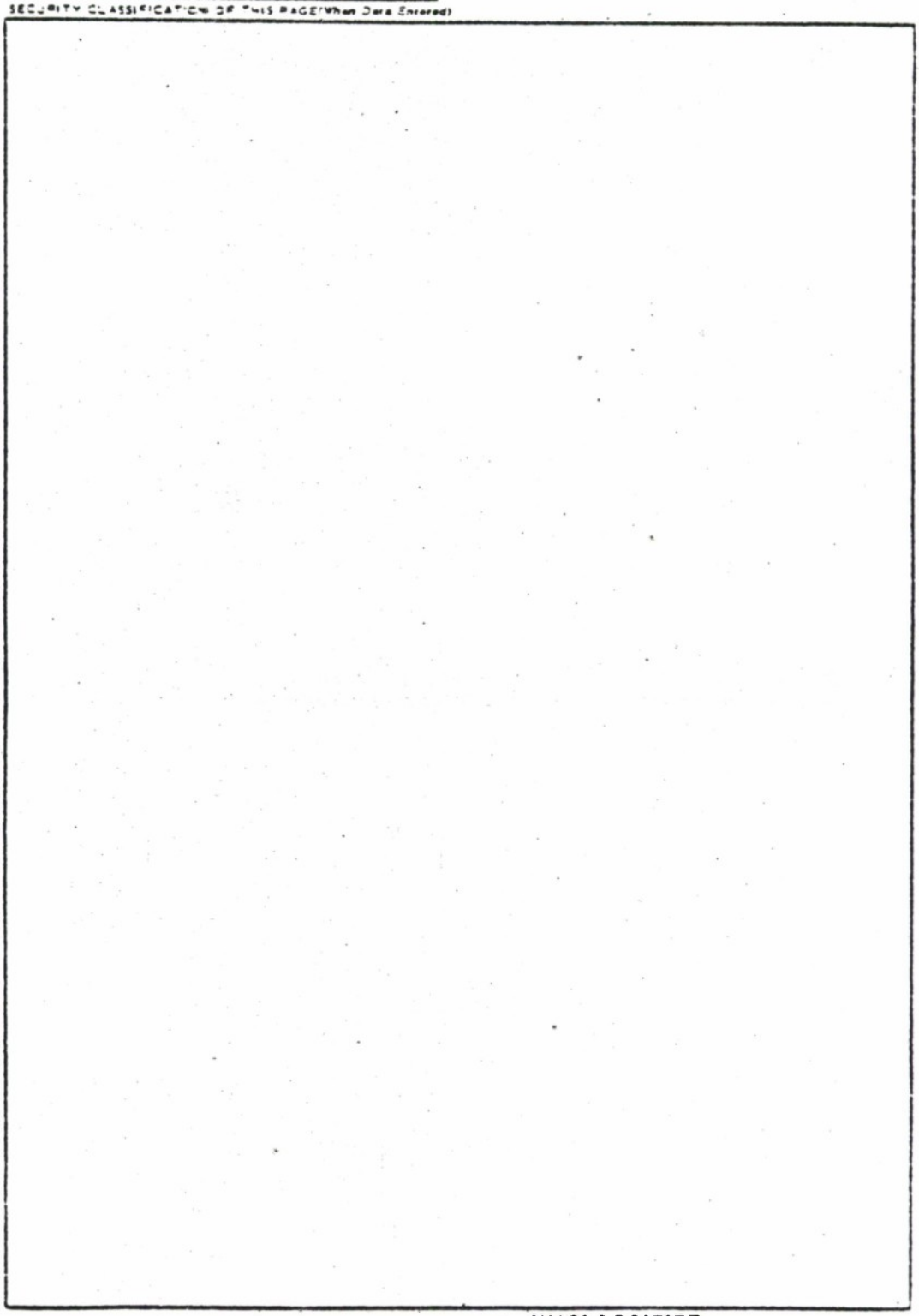

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TYPES OF WEAPON PROGRAMS AND THEIR IMPLICATIONS FOR NATO STANDARDIZATION OR INTEROPERABILITY

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TABLES

FOREWORD

This paper has been prepared at the request of the Deputy Under Secretary (Tactical Warfare Programs), Office of the Under Secretary of Defense for Research and Engineering. The task order included a requirement for an examination of the political, economic, and military aspects involved in achieving standardization or interoperability. This paper includes a discussion of a number of political, economic, and military considerations that are involved in decisions relative to choosing the type of program to be used in the development and procurement of weapon systems by the NATO allies.

SUMMARY

The degree of achievement of standardization or interoperability (S/I) is directly linked to the types of programs used in the procurement of weapon systems by the NATO allies.[1] The basic types of programs (some of which have sub-variations) are--

(1) direct purchase
(2) licensed production
(3) cooperative R&D
(4) competitive R&D
(5) pre-planned interoperability
(6) *ad hoc* interoperability
(7) non-interoperable.

In deciding which of the above program options to adopt for any given weapon system, a number of considerations involving combat effectiveness, economics, and political factors (both domestic and international) must be taken into account. These considerations differ depending upon the status of the weapon system, which could range anywhere from planned future development to a fully operational system.

The principal considerations are as follows:

Military doctrine and requirement
Combat effectiveness
Enemy countermeasures

[1]In this paper we use standardization to mean the use of common equipment by NATO allies and interoperability to mean the ability of systems to accept services from other systems of different design and to use the services so exchanged to enable them to operate effectively together.

R&D cost
Procurement cost
Conversion cost
Logistics cost
Schedule
Employment
Dependence upon foreign country
Supply vulnerability
Industrial workload
Technology security
Competition
Commercial spin-off
Third country sales
Balance of payments
National prestige.

A review of the types of aircraft development and procurement programs used by our NATO allies since the establishment of NATO in 1949 shows a considerable decrease over time in the total number of types of aircraft being procured per year. By far the largest number of programs have been national developments (principally of type 7, non-interoperable, in the first paragraph above), direct purchases, and licensed production. These were the only three methods of procurement through 1958.

In the 1959-1964 period, there were eight procurements[1] by our NATO allies of the Fiat G-91 fighter and the Breguet Atlantic maritime patrol bomber, both of which were winners of NATO design competitions and the only two cases of NATO aircraft procured via a NATO design competition. A more recent innovation is the cooperative development scheme wherein two or more countries jointly develop and then produce an aircraft.

[1]We consider an aircraft obtained by a country under a grant aid program to be a procurement of that aircraft by the receiving country.

Since 1962, there have been 19 procurements by our NATO allies of cooperatively developed aircraft.

The fact that only two aircraft were developed via the competitive R&D route, and that no more procurements of competitively developed aircraft have taken place for 14 years, would indicate that this approach probably has been permanently abandoned by our NATO allies. On the other hand, there have been eleven aircraft developed cooperatively since 1962 and it appears likely that this approach may be used even more widely by our NATO allies in the future.

TYPES OF WEAPON PROGRAMS AND THEIR IMPLICATIONS FOR NATO STANDARDIZATION OR INTEROPERABILITY

A. INTRODUCTION

The degree of achievement of standardization or interoperability (S/I) is directly linked to the types of programs used in the procurement of weapon systems by the NATO allies. In this paper we review the types of programs that can be used among nations in the development and procurement of weapon systems, discuss a number of considerations involved in program choice, and present a case study of the types of aircraft development and procurement programs used by our NATO allies since the 1949 establishment of NATO.

B. TYPES OF WEAPON PROGRAMS

The following weapon program options generally cover the spectrum from full standardization to complete non-interoperability.

1. Direct Purchase. One country does all the development and production of a system. Allies procure the end product. This results in full standardization unless changes are incorporated in the system. Example: US purchase of the UK AV-8A Harrier.

2. Licensed Production. One country does all the development of a system and all production for its own forces. Allies produce the system under license, usually in a phased program wherein they initially purchase major components from the licensor and progressively produce a greater percentage of the system over time. Example: NATO-licensed production of US F-104 Starfighter.

3. Cooperative R&D. Two or more countries cooperate in the development of a system and then--

a. one country does all production; Allies buy end product from the one country. No known examples.

b. produce the system jointly. Example: the UK-FRG-Italy Multi-Role Combat Aircraft (MRCA).

c. produce the system jointly (as in b. above) and in addition license production to other countries. Example: FRG-France Roland being produced under license in US.

d. produce the system separately. The US-FRG MBT-70 main battle tank development was an unsuccessful attempt at this approach.

4. Competitive R&D. Two or more countries develop similar systems for a competition. One is selected for production and--

a. one country does all production; Allies buy end product from the one country. Example: Fiat G-91 aircraft.

b. two or more countries produce it jointly. Example: NATO Air Defense Ground Environment (NADGE).

c. each Ally does own production. No known example.

5. Pre-Planned Interoperability. Separately developed and produced weapons are made interoperable through standardization agreements. Example: Different small arms use common NATO 7.62mm ammunition.

6. *Ad Hoc* Interoperability. Separately developed and produced weapons are made interoperable through use of adaptors and cross-certification of personnel and equipment. Example: US aircraft are being certified to carry Allied air-to-ground munitions.

7. Non-Interoperable. Separately developed and produced weapons which are non-interoperable. Example: US M16 5.56mm.

Starting at the top of the list, the options generally decrease in short run economic and combat efficiency (from the NATO point of view) but increase in political acceptability

(from the individual country point of view). (Later we will discuss long run economic and combat efficiency effects that work in the other direction). Option 1 (direct purchase) is the most efficient economically; duplicate R&D is eliminated and full economies of scale in production are realized. Further, all weapons are fully standardized so that the entire systems, maintenance parts, and associated munitions can be shared among Allies if required by combat conditions. On the other hand, direct purchase is unpopular politically (from the point of view of the purchasing country) because of its negative impact on domestic industry and employment, balance of payments, and dependence upon a foreign country for supply. Option 7 (non-interoperable) is probably least efficient economically; each Ally must perform the required R&D and then produce less efficiently because of reduced volume of production. Combat effectiveness may be reduced since entire systems, maintenance parts, and associated munitions cannot be shared among Allies; on the other hand, multiple systems complicate the enemy's countermeasure problem.

The intermediate options are essentially compromises that involve some degradation in economic efficiency and combat effectiveness but some increase in political acceptability relative to Option 1. Options 3.b. and 3.c. are the approaches currently being used by the European NATO nations on a number of programs such as Roland air defense missile system (France, FRG), MRCA aircraft (UK, FRG, Italy), Jaguar aircraft (France, US), FH-70 and SP-70 155mm howitzers (FRG, UK, Italy), Martel air-to-surface missile (France, UK), helicopters (France, UK), Milan and Hot anti-tank missiles (France, FRG), Alphajet trainer (France, FRG), etc. Option 3.b. also is being used in civil projects such as the Concorde and A300 transport aircraft.

Note that a program might move from one category to another during its lifetime. For example, a program might

start as a purely national program (Option 7); later it might be purchased by an Ally (Option 1) or be built under license (Option 2).

C. CONSIDERATIONS IN CHOICE OF TYPE OF WEAPON PROGRAMS

In deciding which option to adopt for any given weapon system, a number of considerations involving combat effectiveness, economics, and political factors (both domestic and international) must be taken into account. The principal considerations are enumerated below. These considerations differ depending upon the status of the weapon system, which could range anywhere from planned future development to a fully operational system. All of these considerations come into play in decisions involving standardization of weapons. Later we will discuss the more limited range of considerations that are involved in decisions as to whether to make interoperable non-standard weapons that have already been developed (item 6 above).

1. Military Doctrine and Requirement. It is very difficult to achieve standardization unless NATO allies can first agree on a common military doctrine and requirement. As an example, member nations must agree upon the role and mission of a fighter aircraft before they can agree upon a hardware design. This is a difficult problem in many cases, particularly in the case of U.S. weapons which often incorporate features that enable them to operate effectively in non-NATO environments.

2. Combat Effectiveness. What are the inherent capabilities of the weapon alternatives? Beyond inherent capabilities, what are advantages of S/I in a combat environment. Are weapons likely to be involved in a situation where they are operated with forces of other NATO countries? If so, could resources of other NATO countries enhance their combat capability? For example, geographical considerations would suggest that it is

not important for Norwegian and Turkish forces to be interoperable. Mobile systems (aircraft, tanks) are more likely to interact with Allied forces than are relatively fixed systems (land and sea mines, etc.).

3. Enemy Countermeasures. Lack of standardization or interoperability complicates Warsaw Pact problem by forcing them to counter different types of weapons.

4. R&D Cost. What will be the resulting R&D costs to each involved country?

5. Procurement Cost. What will be the resulting procurement costs to each involved country? These costs should reflect cost-quantity effects and tariffs.

6. Conversion Cost. Problems of international programs with language, measurement systems, safety standards, materials standards, testing standards, quality control procedures, tax laws, export controls, and security of information regulations must be considered in estimating R&D and production costs.

7. Logistics Cost. What will be the follow-on logistics support costs for each country? If a country already has an inventory of one system, there may be a major scrappage cost involved in replacing it with another system.

8. Schedule. Timing of weapon deployment must be projected.

9. Employment. Will workers be laid off? This is an important consideration, particularly in Europe where stability of the workforce is a prime political objective. Will the opportunity to employ new workers be lost? This is important, particularly if the lost job opportunities are in a high unemployment area.

10. Dependence Upon Foreign Country. For each country, what is the risk that a foreign country may cut off source of supply for political or other reasons? The US, in particular,

would prefer not to be dependent upon a foreign country for supply because of its role in other areas of the world. For example, the US resupply of Israel during the October 1973 war was inhibited by actions of our NATO allies.

11. Supply Vulnerability. Multiple sources of supply reduce vulnerability to loss of source due to political, natural, or war causes, and also vulnerability to monopolistic price gouging.

12. Industrial Workload. Violent swings in level of activity (either up or down) tend to be inefficient. A fairly constant level of defense activity by industry is a major concern, particularly in Europe.

13. Technology Security. Technology transfer involves security risks. There is a danger that technology might be transmitted to Warsaw Pact countries by communist sympathizers or used against donor country by recipient country after change of government, etc.

14. Competition. Will a country's competitive position for future similar programs be affected? If a country does not participate in a program, it may lose its ability to compete for future programs in that field. This loss of future competitive capability could be bad not only for that country but for NATO as a whole by reducing future competition.

15. Commercial Spin-Off. Are there current or future commercial spin-off considerations? Many technologies are developed, applied in military programs, and then applied in the industrial market and eventually the consumer market.

16. Third Country Sales. These are of particular importance to some European countries where the domestic market is relatively small. They provide economies of scale, earn foreign exchange, and increase the influence of the selling country in other areas of the world.

17. Balance of Payments. Balance of payments (B/P) effects are particularly important if an adverse effect would be incurred where a country already is experiencing a deficit in its B/Ps.

18. National Prestige. What are the national prestige considerations involved, particularly in high technology/high cost programs?

From the US point of view, item 10 is of great importance. Because of our role in other areas of the world, we should be careful not to become overly dependent upon other countries for our military supplies. Within the last decade we have seen at least two instances where our actions were not popular with some of our NATO allies: the Vietnam war and our resupply of Israel during the October 1973 war. Similarly, we opposed the 1956 British-French attack on Egypt and cut off weapons to Turkey after their 1974 invasion of Crete. Hence, even among NATO allies, there are clearly cases where one would not want to be dependent upon one's allies for military supplies. In addition to the danger of official government action, there is perhaps an even greater danger of action by labor unions (including work stoppages, sabotage, etc.) or even by individuals. For example, US longshoremen have refused to load grain ships for Russia. The importance of this consideration (together with items 9, 11, 14, 15, 16, 17, and 18) can be seen in the efforts of less developed countries (Israel, India, Brazil, etc.) to develop national armaments industries. These considerations work against Option 1. Accordingly, the proposal of Callagan[1] and others for development of a NATO-wide common market for armaments will be unacceptable politically, we believe, at least for the next 25 years or so. Countries will be glad to sell to their allies, but will be reluctant to buy from them.

[1]Thomas A. Callagan, Jr., *U.S./European Cooperation in Military and Civil Technology*, The Center for Strategic and International Studies, Georgetown University, September 1975.

Item 14 involves important long-run considerations. A single NATO-wide procurement might be most cost-effective in the short run, but could weaken the Alliance in the long run through reducing competition. In order to be truly competitive, a country must participate in the entire cycle of R&D, production and operation of a system, because the learning involved in one generation of a weapon system provides the foundation for developing an improved next-generation system. If only one country (or even one company) has a capability in a given area, competition is lessened and future systems will be adversely affected. Competition also has advantages insofar as item 3 (enemy countermeasures) is concerned. From an individual country's point of view, the decision to compete in a particular area also can have positive long-run benefits as reflected in items 9, 10, 11, 12, 13, 15, 16, 17, and 18.

The above discussion indicates the great complexity involved in selecting the correct program option for a particular weapon system. The roughly 18 considerations must be played against the roughly 12 program options (counting the variants under Options 3 and 4). This is clearly a complicated decision process involving both short and long run considerations. Any simplistic mandated solution to the problem almost certainly is doomed to failure. About the most that can be hoped for is that each new system will be subjected to searching analysis with the objective of pushing it up to the optimum level from Program Option 7 in the direction of the armaments common market represented by Option 1.

A more limited range of the above considerations are involved in decisions as to whether to adapt for interoperability non-standard weapons that have already been developed (see Option 6, *Ad Hoc* Interoperability). An example of this type of decision might involve the modification of US aircraft to carry an Allied air-to-ground munition. This type

of decision does not involve weapon procurement programs--it simply involves the capability of an ally to load its national munitions on US aircraft. Some additional ground handling equipment may be required, and ground and flight crews must be cross-certified. In such an interoperability decision, only considerations 2, 4, 5, 6, 7, 8, 13, and 18 would be involved. Further, the seriousness of the considerations are generally much less than in the case of standardizing on a new weapon system. For example, R&D costs would be much less than in the case of a new system; procurement conversion and logistics costs would probably only involve ground handling equipment, adaptors for weapons racks, etc.; the schedule would be much shorter and more predictable; technology security would be less of a problem because no production of weapons would be involved; and national prestige would be less of a consideration.

D. A CASE STUDY OF NATO AIRCRAFT PROGRAMS

The NATO allies probably spend more funds on the procurement of military aircraft than on any other class of weapon. We have assembled data on NATO military aircraft programs since the establishment of NATO in 1949 to the present time. Each program is assigned to one of the following five categories: (1) National Development and Production, (2) Direct Purchase, (3) Licensed Production, (4) Competitive R&D, or (5) Cooperative R&D. The last four categories correspond directly with the first four program options listed on pages 1 and 2. The first category (National Development and Production) can correspond to program options 5, 6, or 7 on page 2, depending upon the particulars of the program. Each program is categorized according to the country operating the aircraft, and the categorization therefore can change over time, depending upon which country is being considered. For example, the Lockheed F-104 Starfighter was first developed for the US Air Force. It was

later produced under license by Belgium, Canada, the FRG, Italy, and the Netherlands. In addition, a substantial number of US-produced F-104s were purchased by Canada, the FRG, the Netherlands, and Norway. Canadian-built F-104s were then sold to Greece and Turkey. Hence, each aircraft program is listed separately from the point of view of the procurement method employed by each of the using countries. We consider an aircraft obtained by a country under a grant aid program to be a direct purchase of that aircraft by the receiving country. US aircraft developed for and utilized solely by the US military are omitted from the study.

The aircraft programs are entered in Table 1 (pages 16 through 35) by the year in which each aircraft type was first ordered into production for a specific country's military inventory. The data of Table 1 are aggregated into three year time intervals, with two exceptions. The first grouping, which begins in 1949, encompasses four years, while the last grouping covers only 1977 and roughly the first half of 1978. In many cases, licensed production was preceded by direct purchase of a number of aircraft. In those cases, the procurement method was categorized as licensed production only. US procurements involving aircraft from other NATO nations are included in Table 1; most US procurements are of US-developed aircraft and have not been included in Table 1 because there have been so many of them and because we are primarily interested in examining the procurement methods of other NATO nations--not those of the US. Each NATO nation is considered except for Iceland and Luxembourg, neither of which has been involved in any military aircraft procurement programs.

The data of Table 1 are summarized in Tables 2 through 7 by procurement method (see pages 36 through 41). Tables 2-4 indicate that in the early years of NATO, many new military aircraft types were being introduced. Of these, the largest number were being developed nationally by the UK for their own

forces (Table 2). The UK has continued since that time to be the largest producer of new aircraft types among the European NATO nations. It is interesting to note, however, that although they have developed most of their own airplanes, many helicopters built there have been built under license from US designs (these are the only aircraft which have been built under license there). The number of new military aircraft types produced in the UK from 1949 to the present has constantly diminished. Intermittently from 1949 through 1967, new aircraft have been purchased directly from other NATO countries, primarily the US. Since 1968, the UK has participated in five cooperative R&D programs.

France and Italy are the only other European members of NATO who have nationally produced a substantial number of military aircraft. France is responsible for developing twenty-seven new models from 1949 through 1961, but only five since then. Italy has independently produced aircraft on a smaller but more constant scale. Both countries have occasionally made arrangements to build aircraft under license. The last such French agreement occurred during the 1962 to 1964 time period, and no new licensed production has been initiated in Italy since 1970. From 1949 through 1964, France directly purchased ten different aircraft from other NATO countries. None have been purchased since then. Italy bought seven such models from 1949 through 1961. One other type was ordered in 1972. France and Italy each participated in one competitive R&D program: the Breguet 1150 Atlantic maritime patrol bomber and the Fiat G-91 fighter, respectively. These were the only two NATO competitive R&D aircraft programs to date. France has participated in seven cooperative R&D programs while Italy has participated in two.

After World War II, the Federal Republic of Germany was forbidden to design, build, or purchase military aircraft. The restriction was lifted in 1954 and the FRG started to rebuild

its military forces. The quickest way to obtain military aircraft was through direct purchases from other countries. A total of seventeen military aircraft types were purchased from NATO nations between 1956 and 1970 (Table 3). An additional six types were produced under license during this time (Table 4), and three were developed nationally (Table 2). During the last two years another such aircraft has been developed for the German military. The FRG also participated in both of the competitive R&D programs and in four cooperative R&D programs.

Belgium and the Netherlands rely primarily upon direct purchases to fulfill their military aircraft requirements. Each also has been involved, however, in the licensed production of five or six aircraft types since the inception of NATO. The Netherlands is also responsible for developing three original aircraft models. Both countries participated in the Breguet Atlantic competitive R&D program.

Denmark, Greece, Norway, Portugal, and Turkey are all similar in that they rarely produce military aircraft either on a national basis or under license. The few exceptions are as follows: Denmark and Turkey are each responsible for producing one original light airplane type that has been utilized by their military forces; Portugal has built one light aircraft type under license from the UK; and Denmark and Norway are now involved in building the F-16 under license. Greece and Turkey procured aircraft under the Fiat G-91 fighter competitive R&D program. All of these NATO countries, however, have acquired military aircraft on a continual basis through either direct purchase or by being supplied by the US under military aid programs (categorized as direct purchase in the tables).

Canada has satisfied its military aircraft requirements largely through a combination of national development, licensed production, and direct purchase. They also participated with the US in one cooperative R&D program. The distinguishing

characteristic of all their licensed production and aircraft purchases is that they have been restricted almost exclusively to dealings with the US. The only exceptions have been for agreements made with the UK, all of which occurred prior to 1959.

The majority of US military aircraft purchases have been, in turn, from Canada. Some of these aircraft are not Canadian designs, but have been built there under license. The one example of US licensed production dates back to 1951. The UK's English Electric Canberra bomber was built in America by the Martin Company and redesignated the B-57 bomber. As mentioned earlier, US domestic military aircraft production has not been included in this study unless it in some way involves other NATO nations. Examples of US designed aircraft which are or have been utilized by these other countries are numerous. US military aircraft have been supplied to all of the NATO nations, with the exception of Iceland and Luxembourg, at some point since 1949, and many aircraft, such as the North American F-86 Sabre fighter, the Lockheed F-104 Starfighter, and the Sikorsky SH-3D Sea King helicopter have been built under license by several members of NATO.

Table 7 summarizes the number and percentage of aircraft procurement programs by type. The table shows a considerable decrease in the total number of types of aircraft being procured per year by the NATO nations. By far the largest number of programs have been national developments, direct purchases, and licensed production. These were the only methods of procurement through 1958.

In the 1959-1964 period, there were eight procurements involving the Fiat G-91 fighter and the Breguet 1150 Atlantic maritime patrol bomber. Italy's G-91 fighter won a 1954 competition. By 1961 it was in production for the armed forces of Italy, the FRG, Greece, and Turkey. Arrangements were also made

for the FRG to build it in Germany under license. The NATO competition of 1953 was won by the French Breguet Atlantic. The development and production of this aircraft was then undertaken in the early 1960s by a consortium of France, Belgium, the FRG, and the Netherlands. These remain the only two cases of NATO aircraft that were procured via a NATO design competition.

A more recent innovation is the cooperative development scheme wherein two or more countries jointly develop and then produce an aircraft. Since 1962, there have been 19 procurements of the following 11 cooperatively developed aircraft (the developing nations are noted in parentheses): Sud Aviation SA321C Super Frelon helicopter (France, US); Transall C-160 transport (France, FRG); D.H. DHC-5 Buffalo STOL transport (Canada, US); Piaggio-Douglas PD-808 utility aircraft (Italy, US); Westland Lynx helicopter (UK, France); Sud Aviation SA330 Puma helicopter (UK, France); Sud Aviation SA341 Gazelle helicopter (UK, France); Sepecat Jaguar fighter/trainer (UK, France); Panavia Tornado MRCA (UK, FRG, Italy); Dassault-Breguet/Dornier Alpha Jet trainer/close support aircraft (France, FRG); and the VFW-Fokker VFW 614 jet transport (FRG, Netherlands, Belgium).

Table 7 indicates that direct purchases have accounted for about 45 percent of total purcurements and licensed production for about 15 percent throughout the 30 year period. The growth in procurement of cooperatively developed aircraft (now accounting for about 20 percent of total procurements) has been at the expense of national developments, which accounted for about 45 percent of total procurements in the early years of NATO and have dropped to around 25 percent in recent years.

The fact that only two aircraft were developed via the competitive R&D route, and that no more procurements of competitively developed aircraft have taken place for 14 years, would indicate that this approach has probably been permanently

abandoned by our NATO allies. On the other hand, there have been 11 aircraft developed cooperatively since 1962 and it appears likely that this approach may be used even more widely by our NATO allies in the future.

Table 1. AIRCRAFT PROCUREMENT METHOD BY COUNTRY

Period: 1949-1952

National Development and Production

U.K.

- Avro Shackleton maritime reconnaissance a/c
- English Electric A-1 Canberra bomber
- Armstrong Whitworth Meteor II fighter
- Blackburn Y.B.1 ASW a/c
- Bolton Paul P.108 Balliol advanced trainer
- D.H. 112 Venom fighter
- D.H. Chipmunk trainer
- Fairey Gannet ASW a/c
- Hawker Sea Hawk fighter
- Percival P.56 Provost basic trainer
- Percival P.57 Sea Prince communications a/c
- Short S.B.3 ASW a/c
- Short Sturgeon target-tower
- Supermarine 541 swift attacker
- Vickers Type 668 Varsity general-purpose trainer
- Vickers Valiant bomber
- Westland Wyvern fighter

Canada

- Avro CF.100 Canuck fighter
- D.H. DHC-2 Beaver utility a/c
- D.H. DHC-1 Chipmunk trainer
- Canadair Five long range trainer and transport

France

- Dassault M.D. 315 Flamant light military transport
- Dassault M.D. 450 Ouragan fighter
- Nord 1400 Noroit flying boat
- S.I.P.A. S.10 advanced trainer
- Nord 2501 Noratlas transport
- Sud-Est 161 Languedoc transport a/c

Italy

- Caproni Ca.313 advanced trainer
- Ambrosini S.7. military trainer
- Macchi 308 utility a/c
- Piaggio P.136 flying boat

Netherlands

- Fokker S.11 trainer

Table 1. (cont'd)

Direct Purchase

Belgium

D.H. Chipmunk trainer (Canada)
Gloster G.43 Meteor trainer (U.K.)
Republic F-84 Thunderjet fighter (U.S.)

U.K.

Lockheed P2V Neptune naval search a/c (U.S.)

Denmark

Fairey Firefly target-tug (U.K.)
D.H. Chipmunk trainer (U.K.)
Gloster G.43 meteor trainer (U.K.)
Republic F-84 Thunderjet fighter (U.S.)

France

Gloster G.43 Meteor trainer (U.K.)
Republic F-84 Thunderjet fighter (U.S.)

Greece

Republic F-84 Thunderjet fighter (U.S.)

Italy

Republic F-84 Thunderjet fighter (U.S.)

Netherlands

Gloster G.43 Meteor trainer (U.K.)
Republic F-84 Thunderjet fighter (U.S.)

Norway

Republic F-84 Thunderjet fighter (U.S.)

Portugal

D.H. Chipmunk trainer (U.K.)
Republic F-84 Thunderjet fighter (U.S.)

Turkey

Republic F-84 Thunderjet fighter (U.S.)

U.S.

D.H. Beaver utility a/c (Canada)
(known as L-20 in U.S.)

Table 1. (cont'd)

Licensed Production

Belgium

Gloster Meteor fighter (U.K.)

U.K.

Sikorsky S-55 helicopter (U.S.) (Westland "Whirlwind")
Sikorsky S-51 helicopter (U.S.) (Westland "Dragonfly")

Canada

F-86 Sabre fighter (U.S.) (Canadair)
Lockheed T-33 Silver Star trainer (U.S.) (Canadair)

France

D.H. Vampire fighter (U.K.) (Sud-Est "Mistral")
D.H. Sea Venom fighter (U.K.) (Sud-Est "Aquilon")
Grumman Widgeon amphibian flying boat (U.S.) (S.C.A.N. 30)

Italy

D.H. Venom fighter (U.K.) (Fiat)
D.H. Vampire fighter (U.K.) (Fiat)
Fokker S.11 trainer (Netherlands) (Macchi)

Netherlands

Gloster Meteor fighters (U.K.) (Fokker)
Hawker Sea Fury fighters (U.K.) (Fokker)

U.S.

English Electric Canberra bomber (U.K.) (Martin B-57)

Period: 1953-1955

National Development and Production

U.K.

Avro Vulcan bomber
Blackburn Beverley C.mk. 1 heavy transport
Bristol Type 173 helicopter
Bristol Sycamore helicopter
D.H. 110 Sea Vixen fighter
Gloster Javelin F. mk. 1 fighter

Table 1. (cont'd)

U.K. (cont'd)

Handley Page H.P. 80 Victor bomber
Hawker Hunter fighter
Hunting Percival P.66 Pembroke communications a/c
Scottish Aviation Prestwick Pioneer II light transport a/c

Canada

D.H. DHC-3 Otter utility a/c

Denmark

KZ X artillery observation a/c

France

Dassault M.D. 452 Mystere II fighter
Dassault Mystere IV interceptor fighter
Fouga C.M. 170R Magister fighter trainer
Max. Holste M.H. 1521 Broussard utility a/c
Morane-Saulnier M.S. 733 basic trainer
Nord N.C. 856 - Norvigie light liaison a/c
Sud-Ouest S.O. 4050 Vautour bomber/fighter
S.I.P.A. S. 121 trainer

Italy

Fiat G.59 fighter trainer
Piaggio P.148 primary trainer

Direct Purchase

Belgium

Armstrong Whitworth Meteor II fighter (U.K.)
Fairchild C-119 Flying Boxcar transport (U.S.)

U.K.

Canadair F-86 Sabre fighter (Canada)
Hiller HTE-2 helicopter (U.S.)
Sikorsky S-55 helicopter (U.S.)

Canada

D.H. Comet transport (U.K.)
Beechcraft Expeditor transport (U.S.)
Fairchild C-119 Flying Boxcar transport (U.S.)
Lockheed P2V Neptune naval search aircraft (U.S.)
McDonnell Banshee F2H fighter (U.S.)
Piasecki H-21 Work Horse helicopter (U.S.)
Bristol Type 170 transport (U.K.)

Table 1. (cont'd)

Denmark

Armstrong Whitworth Meteor II fighter (U.K.)
Hawker Hunter fighter (U.K.)

France

Armstrong Whitworth Meteor II fighter (U.K.)
Lockheed P2V Neptune naval search a/c (U.S.)
Piasecki HUP-2 helicopter (U.S.)

Italy

Fairchild C-119 Flying Boxcar transport (U.S.)

Netherlands

Lockheed P2V Neptune naval search aircraft (U.S.)

U.S.

Beechcraft T-34A trainer (built under license by Can-Car in Canada)
North American F-86 Sabre fighter (built under license by Canadair in Canada)
North American F86K fighter (built under license by Fiat in Italy)

Licensed Production

Belgium

Hawker Hunter fighter (U.K.) (in close cooperation with Netherlands) (Avions Fairey)

Canada

Beechcraft T-34A trainer (U.S.) (Can-Car)
Grumman S2F ASW a/c (U.S.) (D.H. CS2F)

France

Sikorsky S-55 helicopter (U.S.) (Sud-Est "Joyeux Elephant")

Italy

Agusta Bell Model 47 helicopter (U.S.) (Agusta)
North American F86K fighter (U.S.) (Fiat)

Netherlands

Hawker Hunter fighter (U.K.) (Fokker)(in close cooperation with Belgium)

Table 1. (cont'd)

Period 1956-1958

National Development and Production

U.K.

Auster MK 9 observation aircraft
Bristol type 192 helicopter
Folland 141 Gnat fighter
Hunting Percival P.84 Jet Provost trainer
Saunders-Roe Skeeter helicopter
Scottish Aviation Twin Pioneer light transport
Supermarine Scimitar fighter

France

Breguet 1050 Alize ASW aircraft
Dassault Super-Mystere fighter
Morane-Saulnier M.S. 760 Paris communications aircraft
Nord 3202 trainer
S.E. 3130 Alouette II helicopter
S.O. 1221 Djinn helicopter

Federal Republic of Germany

Dornier DO 27 utility aircraft

Netherlands

Fokker S.14 Mach trainer

Turkey

M.K.E.K. Model 4 Ugur trainer

Direct Purchase

Belgium

Hunting Percival P.66 Pembroke light transport (U.K.)

Canada

Cessna L-19 reconnaissance/observation aircraft (U.S.)
Vertol HUP-2 helicopter (U.S.)

Denmark

Hunting Percival P.66 Pembroke light transport (U.K.)

France

Cessna L-19 reconnaissance/observation aircraft (U.S.)

Table 1. (cont'd)

Federal Republic of Germany

Canadair F-86 Sabre fighter (Canada)
Armstrong Whitworth Sea Hawk fighter/bomber (U.K.)
D.H. 114 Heron light transport (U.K.)
Fairey Gannet ASW aircraft (U.K.)
Hunting Percival P.66 Pembroke light transport (U.K.)
Saunders-Roe Skeeter helicopter (U.K.)
Bristol Type 171 Sycamore helicopter (U.K.)
Vertol H-21 helicopter (U.S.)

Greece

Canadair F-86 Sabre fighter (Canada)

Italy

Canadair F-86 Sabre fighter (Canada)
Convair 440 transport (U.S.)
Grumman S2F ASW aircraft (U.S.)

Netherlands

Armstrong Whitworth Sea Hawk fighter/bomber (U.K.)

Turkey

Canadair F-86 Sabre fighter (Canada)

U.S.

D.H. DHC-3 Otter utility aircraft (Canada)

Licensed Production

U.K.

Sikorsky S-58 helicopter (U.S.) (Westland, "Wessex")

Canada

Canadair CC-106 transport (derivative of the Bristol Britannia, U.K.)
Canadair CP-107 Argus maritime reconnaissance aircraft (modification of the Bristol Britannia, U.K.)

Federal Republic of Germany

Air-Fouga C.M. 170K Magister trainer (France)
Nord 2501 Noratlas transport (France)
Piaggio P.149-D liaison/trainer (Italy)

Table 1. (cont'd)

Period 1959-1961

National Development and Production

U.K.

Armstrong Whitworth AW. 660 transport
Bristol Britannia transport
English Electric P.1 Lightning fighter
Short SC.5 Britannic transport (Belfast C.Mk1)
Westland Belvedere H.C. Mk.1 helicopter
Westland P.531 Wasp Scout helicopter

Canada

D.H. DHC-4 Caribou transport

France

Dassault Mirage IV bomber
Dassault Mirage III fighter
Dassault Etendard IV-M interceptor
Fouga C.M. 175 Zephyr naval trainer
Max Holste Super Broussard transport
Nord 3400 artillery observation aircraft
S.E. 3160 Alouette III helicopter

Netherlands

Fokker F.27 Friendship troopship

Direct Purchase

Belgium

Avro CF 100 Canuck fighter (Canada)
Fouga C.M. 170R Magister trainer (France)
(for joint program of Belgian and Dutch Air Forces)

U.K.

D.H. DHC-2 Beaver utility aircraft (Canada)

Canada

Grumman Albatross sea-rescue aircraft (U.S.)
Lockheed Hercules C-130 transport (U.S.)
Sikorsky S-58 helicopter (U.S.)

Denmark

North American Super Sabre F-100 fighter (U.S.)

Table 1. (cont'd)

France

Martin P5M ASW aircraft (U.S.)
North American Super Sabre F-100 fighter (U.S.)
Sikorsky S-58 helicopter (U.S.)

Federal Republic of Germany

S.O. 1221 Djinn helicopter (France)
Grumman Albatross sea-rescue aircraft (U.S.)
Sikorsky S-58 helicopter (U.S.)

Italy

Grumman Albatross sea-rescue aircraft (U.S.)
Sikorsky S-58 helicopter (U.S.)

Netherlands

Grumman S2F ASW aircraft (U.S. and Canadian version built under license in Canada)

Norway

Grumman Albatross sea-rescue aircraft (U.S.)

Portugal

Grumman Albatross sea-rescue aircraft (U.S.)

U.S.

D.H. DHC-4 Caribou transport (Canada)

Licensed Production

Belgium

Lockheed Starfighter F-104 fighter (U.S.) to be built jointly by German, Dutch, and Belgian companies

Canada

Lockheed F-104G Starfighter (U.S.) (Canadair CL-90)
Convair 440 Metropolitan (U.S.) (Canadair CC-109)

Federal Republic of Germany

Lockheed F-104G Starfighter fighter (U.S.) built jointly German, Dutch and Belgian companies

Table 1. (cont'd)

Netherlands

Lockheed F-104 G Starfighter (U.S.) built jointly by German, Dutch and Belgian companies

Competitive R&D

Federal Republic of Germany

Fiat G91 fighter (Italy)

Greece

Fiat G91 fighter (Italy)

Italy

Fiat G91 fighter (winner of 1954 NATO competition)
Macchi M.D. 326 jet trainer
Piaggio P.166 Portofino communications aircraft

Turkey

Fiat G91 fighter (Italy)
North American Super Sabre F-100 fighter (U.S.)

Period 1962-1964

National Development and Production

U.K.

Vickers VC10 transport
Beagle Basset C.C. Mk 1 light transport
Handley Page H.P.R.7 Dart Herald transport
Hawker Siddeley Andover (748) transport
Hawker Siddeley Argosy C.mk.1 transport
Hawker Siddeley Dominie T. mk. 1 trainer

Canada

Canadair CT-114 Tutor basic trainer

Table 1. (cont'd)

Direct Purchase

Belgium

Sud-Aviation SE 3130 Alouette II helicopter (France)

U.K.

Hiller OH-23 helicopter (U.S.)
Sud-Aviation SE 3130 Alouette II (France)

Canada

Boeing-Vertol Model 107 helicopter (U.S.) (known as CH-113 in Canada)
Hiller OH-23 helicopter (U.S.) (known as CH-112 in Canada)
Lockheed Starfighter F-104 fighter (U.S.)
McDonnell F-101 Voodoo fighter (U.S.)
Sikorsky S-61 helicopter (U.S.) (known as CHSS-2 in Canada)

France

Boeing Stratotanker tanker/transport (U.S.)

Federal Republic of Germany

Sud-Aviation SE 3130 Alouette II helicopter (France)

Greece

Canadair CL-90 fighter (Lockheed F-104 Starfighter built under license in Canada)
Northrop F-5 fighter (U.S.)

Netherlands

Agusta-Bell Model AB 204-B helicopter (U.S. design built under license in Italy)
Sud-Aviation SE 3130 Alouette II helicopter (France)
Sikorsky S-58 helicopter (U.S.)

Norway

Bell UH-1 Iroquois helicopter (U.S.)
Lockheed Starfighter F-104 (U.S.)

Portugal

Nord 2501 Noratlas transport (France)
Cessna T-37 trainer (U.S.)
Sud-Aviation SE 3130 Alouette II (France)

Table 1. (cont'd)

Turkey

Canadair CL-90 fighter (Lockheed F-104 Starfighter built under license in Canada)

Licensed Production

France

Sikorsky S-58 helicopter (U.S.) (Sud-Aviation)

Italy

Agusta-Bell Model AB 204-B helicopter (U.S.) (Augusta)
Fiat joined the European production program of the Lockheed F-104 G Starfighter fighter

Competitive R&D

Belgium

Breguet 1150 Atlantic maritime patrol bomber. Member of the consortium

France

Breguet 1150 Atlantic maritime patrol bomber
(French winner of 1958 NATO competition. Being built by a consortium involving France, Germany, Belgium, and the Netherlands)

Federal Republic of Germany

Breguet 1150 Atlantic maritime patrol bomber. Member of the consortium

Netherlands

Breguet 1150 Atlantic maritime patrol bomber. Member of the consortium

Cooperative R&D

France

Transall C-160 transport being jointly developed by French and German companies

Federal Republic of Germany

Transall C-160 transport being jointly developed by French and German companies

Table 1. (cont'd)

Period 1965-1967

National Development and Production

U.K.

BAC Jet Provost T. mk 5 trainer
Hawker Siddeley Nimrod MP.MK 1 maritime reconnaissance aircraft

France

Breguet 941 STOL transport

Federal Republic of Germany

Hamburger Flugzeugbau HFB 320 Hansa transport

Direct Purchase

U.K.

Lockheed Hercules C-130 transport (U.S.)
McDonnell Phantom II fighter (U.S.)

Denmark

Sikorsky S-61 helicopter (U.S.)

Federal Republic of Germany

Cessna T-37 trainer (U.S.)
Northrop Talon T-38 trainer (U.S.)

Greece

Cessna T-37 trainer (U.S.)

Netherlands

Westland P.531 Wasp Scout helicopter (U.K.)

Norway

Northrop F-5 fighter (U.S.)

Turkey

Agusta-Bell Model AB 204B helicopter (U.S. design built under license in Italy)
Lockheed Hercules C-130 transport (U.S.)
Northrop F-5 fighter (U.S.)

Table 1. (cont'd)

Licensed Production

U.K.

Agusta-Bell Model 47 helicopter (Italy) (Built by Westland using Agusta components)
Sikorsky SH-3D Sea King helicopter (U.S.) (Westland)

Canada

Northrop F-5 fighter (U.S.) (Canadair)

Federal Republic of Germany

Bell UH-1 Iroquois helicopter (U.S.) (Dornier)

Italy

Sikorsky SH-3D Sea King helicopter (U.S.) (Agusta)

Cooperative R&D

Canada

D.H. DHC-5 Buffalo STOL transport (development costs shared equally by U.S. Army, Canadian government, and DeHavilland)

Italy

Piaggio-Douglas PD-808 utility aircraft (joint development with Douglas of U.S.)

U.S.

D.H. DHC-5 Buffalo STOL transport (development costs shared equally by U.S. Army, Canadian government, and DeHavilland)

Period: 1968-1970

National Development and Production

U.K.

Beagle B.125 Bulldog trainer
Hawker Siddeley Harrier close support/reconnaissance aircraft

Table 1. (cont'd)

Canada

D.H. DHC-6 Twin Otter utility transport

France

Nord 262 transport
Dassault Mirage F1 fighter

Federal Republic of Germany

Dornier DO 28D-1 Skyservant
STOL utility transport

Italy

Agusta A106 helicopter
Siai-Marchetti S.208M utility aircraft

Direct Purchase

Belgium

Siai-Marchetti SF.260 MX utility aircraft (Italy)

Canada

Bell UH-1 Iroquois helicopter (U.S.)
(known in Canada as CUH-1H)
Bell OH-58A Kiowa helicopter (U.S.)

Denmark

Sud-Aviation SE 3160 Alouette III helicopter (France)

Federal Republic of Germany

Westland/Sikorsky SH-3D Sea King helicopter
(U.S. design built under license in U.K.)
McDonnell Phantom II fighter (U.S)
North American Bronco OV-10 target tower (U.S.)

Netherlands

Canadair NF-5 fighter (Canadian version of Northrop F-5
built under license in Canada)
Sud-Aviation SE 3160 Alouette III helicopter (France)
Bell UH-1 Iroquois helicopter (U.S)

Table 1. (cont'd)

Norway

D.H. DHC-6 Twin Otter utility transport (Canada)
Lockheed P-3 Orion ASW aircraft (U.S.)
Lockheed Hercules C-130 transport (U.S.)

Portugal

Sud-Aviation SE 3160 Alouette III helicopter (France)

Turkey

Siat 223 Flamingo trainer (Germany)
Agusta-Bell 206A Jet Ranger helicopter (U.S. design built under license in Italy)
Cessna T-37 trainer
Agusta-Bell 205 helicopter (U.S. design built under license in Italy)

U.S.

Hawker Siddeley Harrier V/STOL close support/armed reconnaissance aircraft (U.K.) (Known in the U.S. as AV-8A)

Licensed Production

Belgium

Mirage V (France) (SABCA)

Federal Republic of Germany

Sikorsky CH-53D helicopter (U.S.) (Built under license but using some U.S. built components)

Italy

Agusta-Bell 205 helicopter (U.S.) (Agusta)
Agusta-Bell 206A Jet Ranger helicopter (U.S.) (Agusta)

Cooperative R&D

U.K.

Westland Lynx helicopter jointly developed by Westland (U.K.) and S.A. (France)
Sud-Aviation SA 330 Puma helicopter jointly developed by S.A. (France) and Westland (U.K.)
Sud-Aviation SA 341 Gazelle helicopter jointly developed by S.A. (France) and Westland (U.K.)

Table 1. (cont'd)

U.K. (Cont'd)

Sepecat Jaquar fighter/trainer. Joint development by companies in France and the U.K.

France

Sud-Aviation SA 330 Puma helicopter jointly developed by S.A. and Westland in the U.K.
Sud-Aviation SA 341 Gazelle helicopter jointly developed by SA and Westland in the U.K.

Period 1971-1973

National Development and Production

U.K.

Scottish Aviation Jetstream trainer

Italy

Aeritalia AM.3 utility aircraft
Siai-Marchetti SM.1019 light STOL utility aircraft

Direct Purchase

Belgium

Lockheed Hercules C-130 transport (U.S.)

Canada

Beechcraft Musketeer utility aircraft (U.S.)
Boeing-Vertol CH-47 helicopter (U.S.) (known in Canada as CH-147)

Denmark

Hughes Model 500 M helicopter (U.S.)

Greece

McDonnell Douglas Phantom II fighter (U.S.)

Italy

Lockheed Hercules C-130 transport (U.S.)

Table 1. (cont'd)

Norway

Westland/Sikorsky SH-3D Sea King helicopter (U.S. design built under license in U.K.)

Turkey

Transall C-160 transport (Germany/France)
Beechcraft T-42A Cochise utility aircraft (U.S.)

Licensed Production

Netherlands

Northrop F-5 fighter (U.S.) coproduced with Canada under license

Period 1974-1976

National Development and Production

U.K.

Hawker-Siddeley Hawk trainer

France

Dassault Super Etendard fighter

Italy

Aeritalia G222 transport
Aermacchi M.B. 339 trainer/ground attack aircraft
Siai-Marchetti SF 260 MX trainer

Direct Purchase

Belgium

Dassault-Breguet/Dornier Alpha Jet trainer/close support aircraft (France/Germany)
Hawker Siddeley 748 transport (U.K.)
Westland Sea King helicopter (U.S. design built under license in U.K.)

Table 1. (cont'd)

Greece

LTV A-7 fighter (U.S.)
Rockwell T-2 jet trainer (U.S.)

Netherlands

M.B.B. BO 105 helicopter (Germany)
Westland/Aerospatiale Lynx helicopter (U.K./France)

Turkey

Aeritalia F-104 fighter (Lockheed F-104 Starfighter built under license in Italy)
Agusta-Bell 212 helicopter (U.S. design built under license in Italy)
McDonnell Douglas Phantom II fighter (U.S.)

Licensed Production

Belgium

General Dynamics F-16 fighter. Coproduction by U.S., Belgium, Denmark, the Netherlands, and Norway

Denmark

General Dynamics F-16 fighter. Coproduction by U.S., Belgium, Denmark, the Netherlands, and Norway

Netherlands

General Dynamics F-16 fighter. Coproduction by U.S., Belgium, Denmark, the Netherlands, and Norway.

Norway

General Dynamics F-16 fighter. Coproduction by U.S., Belgium, Denmark, the Netherlands, and Norway.

Cooperative R&D

U.K.

Panavia Tornado multi-role combat aircraft. Built cooperatively by the U.K., Germany, and Italy

France

Dassault-Breguet/Dornier Alpha Jet trainer/close support aircraft. Jointly produced by French and German companies.

Table 1. (concluded)

Federal Republic of Germany

Dassault-Breguet/Dornier Alpha Jet trainer/close support aircraft. Jointly produced by French and German companies.

Panavia Tornado multi-role combat aircraft. Built cooperatively by the U.K., Germany, and Italy.

Italy

Panavia Tornado multi-role combat aircraft. Built cooperatively by the U.K., Germany, and Italy.

Period: 1977-1978

National Development and Production

France

Dassault Mystere-Falcon transport

Federal Republic of Germany

MMB BO 105 helicopter

Direct Purchase

Belgium

Britten-Norman Defender utility aircraft (U.K.)

Turkey

Dornier DO 28D transport (Germany)

Cooperative R&D

Federal Republic of Germany

VFW-Fokker VFW 614 jet transport. Built as a collaborative venture by Germany, the Netherlands, and Belgium

Table 2. NATIONAL DEVELOPMENT AND PRODUCTION PROGRAMS

	1949-1952	1953-1955	1956-1958	1959-1961	1962-1964	1965-1967	1968-1970	1971-1973	1974-1976	1977-1978	Total
Belgium	0	0	0	0	0	0	0	0	0	0	0
U.K.	17	10	7	6	6	2	2	1	1	0	52
Canada	4	1	0	1	1	0	1	0	0	0	8
Denmark	0	1	0	0	0	0	0	0	0	0	1
France	6	8	6	7	0	1	2	0	1	1	32
F.R.G.	0	0	1	0	0	1	1	0	0	1	4
Greece	0	0	0	0	0	0	0	0	0	0	0
Italy	4	2	0	2	0	0	2	2	3	0	15
Netherlands	1	0	1	1	0	0	0	0	0	0	3
Norway	0	0	0	0	0	0	0	0	0	0	0
Portugal	0	0	0	0	0	0	0	0	0	0	0
Turkey	0	0	1	0	0	0	0	0	0	0	1
TOTAL	32	22	16	17	7	4	8	3	5	2	116

Table 3. DIRECT PURCHASE PROGRAMS

	1949-1952	1953-1955	1956-1958	1959-1961	1962-1964	1965-1967	1968-1970	1971-1973	1974-1976	1977-1978	Total
Belgium	3	2	1	2	1	0	1	1	3	1	15
U.K.	1	3	0	1	2	2	0	0	0	0	9
Canada	0	7	2	3	5	0	2	2	0	0	21
Denmark	4	2	1	1	0	1	1	1	0	0	11
France	2	3	1	3	1	0	0	0	0	0	10
F.R.G.	0	0	8	3	1	2	3	0	0	0	17
Greece	1	0	1	0	2	1	0	1	2	0	8
Italy	1	1	3	2	0	0	0	1	0	0	8
Netherlands	2	1	1	1	3	1	3	0	2	0	14
Norway	1	0	0	1	2	1	3	1	0	0	9
Portugal	2	0	0	1	3	0	1	0	0	0	7
Turkey	1	0	1	1	1	3	4	2	3	1	17
TOTAL	18	19	19	19	21	11	18	9	10	2	146

Table 4. LICENSED PRODUCTION PROGRAMS

	1949-1952	1953-1955	1956-1958	1959-1961	1962-1964	1965-1967	1968-1970	1971-1973	1974-1976	1977-1978	Total
Belgium	1	1	0	1	0	0	1	0	1	0	5
U.K.	2	0	1	0	0	2	0	0	0	0	5
Canada	2	2	2	2	0	1	0	0	0	0	9
Denmark	0	0	0	0	0	0	0	0	1	0	1
France	3	1	0	1	1	0	0	0	0	0	6
F.R.G.	0	0	3	1	0	1	1	0	0	0	6
Greece	0	0	0	0	0	0	0	0	0	0	0
Italy	3	2	0	0	2	1	3	0	0	0	11
Netherlands	2	1	0	1	0	0	0	1	1	0	6
Norway	0	0	0	0	0	0	0	0	1	0	1
Portugal	0	0	0	1	0	0	0	0	0	0	1
Turkey	0	0	0	0	0	0	0	0	0	0	0
TOTAL	13	7	6	7	3	5	5	1	4	0	51

Table 5. COMPETITIVE R&D PROGRAMS

	1949-1952	1953-1955	1956-1958	1959-1961	1962-1964	1965-1967	1968-1970	1971-1973	1974-1976	1977-1978	Total
Belgium	0	0	0	0	1	0	0	0	0	0	1
U.K.	0	0	0	0	0	0	0	0	0	0	0
Canada	0	0	0	0	0	0	0	0	0	0	0
Denmark	0	0	0	0	0	0	0	0	0	0	0
France	0	0	0	0	1	0	0	0	0	0	1
F.R.G.	0	0	0	1	1	0	0	0	0	0	2
Greece	0	0	0	1	0	0	0	0	0	0	1
Italy	0	0	0	1	0	0	0	0	0	0	1
Netherlands	0	0	0	0	1	0	0	0	0	0	1
Norway	0	0	0	0	0	0	0	0	0	0	0
Portugal	0	0	0	0	0	0	0	0	0	0	0
Turkey	0	0	0	1	0	0	0	0	0	0	1
TOTAL	0	0	0	4	4	0	0	0	0	0	8

Table 6. COOPERATIVE R&D PROGRAMS

	1949-1952	1953-1955	1956-1958	1959-1961	1962-1964	1965-1967	1968-1970	1971-1973	1974-1976	1977-1978	Total
Belgium	0	0	0	0	0	0	0	0	0	0	0
U.K.	0	0	0	0	0	0	4	0	1	0	5
Canada	0	0	0	0	0	1	0	0	0	0	1
Denmark	0	0	0	0	0	0	0	0	0	0	0
France	0	0	0	0	2	0	4	0	1	0	7
F.R.G.	0	0	0	0	1	0	0	0	2	1	4
Greece	0	0	0	0	0	0	0	0	0	0	0
Italy	0	0	0	0	0	1	0	0	1	0	2
Netherlands	0	0	0	0	0	0	0	0	0	0	0
Norway	0	0	0	0	0	0	0	0	0	0	0
Portugal	0	0	0	0	0	0	0	0	0	0	0
Turkey	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	3	2	8	0	5	1	19

Table 7. NUMBER AND PERCENTAGE OF AIRCRAFT PROCUREMENT PROGRAMS BY TYPE

	1949-1952	1953-1955	1956-1958	1959-1961	1962-1964	1965-1967	1968-1970	1971-1973	1974-1976	1977-1978	Total
National Development	32 (51%)	22 (46%)	16 (39%)	17 (36%)	7 (18%)	4 (18%)	8 (21%)	3 (23%)	5 (21%)	2 (40%)	116
Direct Purchase	18 (29%)	19 (40%)	19 (46%)	19 (40%)	21 (55%)	11 (50%)	18 (46%)	9 (69%)	10 (42%)	2 (40%)	146
Licensed Production	13 (21%)	7 (15%)	6 (15%)	7 (15%)	3 (8%)	5 (23%)	5 (13%)	1 (8%)	4 (17%)	0	51
Competitive R&D	0	0	0	4 (9%)	4 (11%)	0	0	0	0	0	8
Cooperative R&D	0	0	0	0	3 (8%)	2 (9%)	8 (21%)	0	5 (21%)	1 (20%)	19
TOTAL	63 (100%)	48 (100%)	41 (100%)	47 (100%)	38 (100%)	22 (100%)	39 (100%)	13 (100%)	24 (100%)	5 (100%)	340

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