Hist

(b)(3)
(b)(1)

~~Secret~~

APPROVED FOR
RELEASE DATE:
16-Sep-2009

DIRECTORATE OF
SCIENCE & TECHNOLOGY

Scientific and Technical Intelligence Report

Proliferation of Missile Delivery Systems for Nuclear Weapons

~~Secret~~

FMSAC-STIR/67-5
30 November 1967

Copy № 16

~~SECRET~~

Scientific and Technical Intelligence Report

PROLIFERATION OF MISSILE DELIVERY SYSTEMS FOR NUCLEAR WEAPONS

FMSAC-STIR/67-5

30 November 1967

CENTRAL INTELLIGENCE AGENCY
DIRECTORATE OF SCIENCE AND TECHNOLOGY
FOREIGN MISSILE AND SPACE ANALYSIS CENTER

~~SECRET~~

PREFACE

The proliferation of nuclear-capable ballistic missile systems poses many problems for the United States. This paper discusses the capabilities, incentives, and likelihood of various countries to acquire nuclear-capable ballistic missile systems over the next ten years. The judgments presented herein represent the views of the Foreign Missile and Space Analysis Center and have not been coordinated with other components of CIA.

[redacted]

CONTENTS

	Page
PREFACE	iii
PROBLEM	1
CONCLUSIONS	1
SUMMARY	2
DISCUSSION	4
Introduction	4
[redacted]	
Belgium	31
[redacted]	
Eastern European Countries	31
Italy	32
Netherlands	32
Switzerland	32
Argentina	32
Brazil	33
Denmark	33
Indonesia	33
Nationalist China	34
Norway	34
[redacted]	
Republic of South Africa	35
Spain	35
Cooperative space programs	35

[redacted]

PROLIFERATION OF MISSILE DELIVERY SYSTEMS FOR NUCLEAR WEAPONS

PROBLEM

To assess the prospects for the proliferation of strategic nuclear-capable ballistic missile systems over the next ten years.*

CONCLUSIONS

1. France, the UK, are expected to acquire nuclear-capable ballistic missile systems in the near future. France is the only country which thus far has clearly demonstrated both the intention and capability to develop a native system.

* A strategic ballistic missile system is arbitrarily defined as one that can carry a nuclear warhead to a distance of at least 200 nautical miles.

SUMMARY

During the next 10 years a number of additional nations may become involved in the proliferation of strategic ballistic missiles capable of delivering nuclear warheads. Some may be motivated to acquire such systems more by a desire for national prestige than by realistic military considerations. Others may decide that the possession of such weapons will guarantee their safety in the face of some similar regional threat. In all cases, the nation involved will first have to choose whether to attempt to develop such systems domestically or to purchase them abroad.

The costs and resources involved in developing, testing, producing, and deploying even a small ballistic missile force are great, and a major national commitment is required. Although basic missile technology and some of the necessary hardware are readily available, even relatively advanced nations encounter difficult, costly and time-consuming problems when attempting to develop and produce strategic missile systems in quantities.

The degree of difficulty of producing such missile systems clearly depends on the circumstances of the particular nation involved, especially on its scientific and industrial base, and the kinds and numbers of missiles it desires. Nations already producing small sounding rockets, tactical missiles, or advanced aircraft would be better able to undertake a ballistic missile program than nations not having these kinds of capabilities. However, only an advanced space rocket technical capability would significantly reduce the time and effort necessary for a successful indigenous ballistic missile program. On the other hand, external assistance from major powers in the form of needed components and equipment and in establishing and operating production and test facilities could substantially reduce the burden. Similarly, acquiring the services of foreign missile experts would be extremely helpful to an otherwise indigenous program.

Several other nations could, over the ten years, achieve some capability to develop such systems, but have no presently foreseeable incentive to have them. They include Belgium, East Germany, Czechoslovakia, Italy, the Netherlands, and Switzerland. Of the remaining nations—those which, regardless of their desires, appear to lack the capability to acquire strategic missiles during the ten-year period by any means—we have discussed Argentina, Brazil, Denmark, Indonesia, Nationalist China, Norway, the Republic of South Africa, and Spain.

DISCUSSION

INTRODUCTION

It is sometimes assumed that any nation with a moderate scientific and technical base can develop ballistic missile weapons systems* without great difficulty. The only nations that have developed ballistic missile systems using essentially native resources have been World War II Germany, the USSR, and the United States, and both of the latter initially made extensive use of German equipment, personnel, and experience in their programs. Since World War II, five other nations have established serious programs to acquire missile delivery systems capable of carrying nuclear payloads. These are Communist China, France, and the UK. Despite a great investment of time and effort, together with a considerable amount of foreign assistance, none of these countries has yet successfully deployed a military missile system. The Chinese program, although now apparently self-sufficient, originally was primarily dependent on Soviet assistance and direction.

The US Government has not provided major components or subsystems of actual missiles to any of these native development programs. However, US industry has been supplying considerable assistance. One form of this assistance has been general end-use items such as umbilical connectors, accelerometers, gyroscopes, tracking equipment, telemetry equipment, and computers, which play an important but secondary role in missile development. A second form of assistance have been component and subsystem production by foreign subsidiaries or licensees in the country concerned. These agreements usually provide for US technical personnel to assist in this production by means of training programs, both design and production assistance, and on-the-spot trouble shooting. A third category of assistance is the US export of equipment for use in fabricating and testing missile components. Many times these machines are general purpose; sometimes they are unique items.

There have been few if any instances in which the items or assistance provided by the US, if withheld, would be critical to the foreign missile development program. In each case, it is likely that the country concerned could acquire a substitute or develop a replacement for any US-supplied item by paying a penalty in time, money, and possibly a degradation in performance. However, when this assistance is taken in total it is clear that the cost of these foreign missile development programs and the time required for their fulfillment would increase markedly if access to US markets were denied. This denial would certainly cause a major policy review of the programs and might prompt cancellation altogether in certain cases. The time periods estimated in the following text assume that access to the US aerospace market remains unchanged.

In addition, the multi-national cooperative space research programs have been considered

* For the purposes of this paper, surface-to-surface ballistic missile systems have been defined in terms of their ranges as follows (in nautical miles): SRBM (short-range ballistic missile)—up to 600; MRBM (medium-range ballistic missile)—600 to 1,500; IRBM (intermediate-range ballistic missile)—1,500 to 3,000; and ICBM (intercontinental ballistic missile)—over 3,000.

briefly as potential sources of missiles, components, or missile-related equipment or technology.

SECRET

BELGIUM

Belgium has the technical ability and industrial base to develop a short-range ballistic missile system, and it is gaining some experience from its participation in the program and from its membership in ELDO and ESRO. However, because of its limited resources, there is little likelihood that Belgium will attempt to acquire a ballistic missile system in the coming decade.

EASTERN EUROPEAN COUNTRIES

No bloc country now has the capability to develop a nuclear-capable ballistic missile delivery system. East Germany and Czechoslovakia might eventually be capable of developing such a program;

however, under present and foreseeable circumstances, the USSR will not permit them to engage in such a program.

ITALY

Italy now has a limited capability in the missile and aerospace fields and probably could develop a satisfactory short-range ballistic missile within the period of this estimate without significant outside help. An IRBM or ICBM system, on the other hand, probably would require considerable foreign technology.

A limited research and development effort on advanced weapons commenced in Italy after World War II, but the lack of well-defined objectives and centralized control of the missile effort during these early years resulted in a series of disappointments and failures. A few native short-range missile systems are under development but none are in production. The most significant effort has been the production of some components, including the motor, for the surface-to-air missile system.

NETHERLANDS

The Netherlands has a small but good scientific, engineering and industrial base and is engaged in the production of some components for the missiles. They also are involved in both ESRO and ELDO programs.

SWITZERLAND

Switzerland has the capability to produce a short-range ballistic missile system, although flight tests would have to be made outside the country. However, it is believed that the Swiss have no requirement for missiles with ranges in excess of about 75 nautical miles, and there is no known development program in this category.

ARGENTINA

Argentina has had modest space research and sounding rocket development programs underway since 1960. Activities in these areas of rocket research, development and production are carried out by a number of governmental agencies and departments, with a number of universities contributing some basic scientific support. The military, provides supervision over the program, but thus far no serious work appears to have been accomplished on purely military missile systems.

A series of small sounding rockets has been under development in Argentina for several years.

In addition to purely indigenous efforts, the Argentine National Space Research Commission (CNIE), which is also under the direction of the Secretary for Aeronautics, has concluded agreements with the US for cooperative research rocket operations using Argentine facilities. Sounding rockets have been supplied by these two countries, and Argentine technicians have been trained in the use and maintenance of these vehicles. A number of these vehicles have been successfully fired by Argentine crews at Chamical.

BRAZIL

Brazil, the largest and most populous country in Latin America, established a modest rocket program in 1964. The decision to initiate such an effort was strongly influenced by Argentina's relatively successful entry into the field in the early 1960's. Rapid strides have been made during the past year, and Brazil's program is now generally comparable to that of Argentina in terms of accomplishment.

Brazil's space efforts to date have been directed toward cooperation with the US in an upper atmosphere research program. A rocket launch facility capable of handling vehicles in the US Nike-Apache class was completed during the spring of 1965.

The US provided much of the range equipment and has trained Brazilian technicians in the maintenance and firing of US vehicles.

In addition to its cooperative program with the US, Brazil is also attempting to develop its own small sounding rockets. A few such vehicles have been produced and test fired,

Although Brazil has the most advanced scientific and industrial base in Latin America, its capabilities in these areas are far from sufficient to permit the indigenous development of a nuclear-capable missile delivery system

DENMARK

Denmark does not possess the technical capability needed to develop a ballistic missile delivery system and is not expected to acquire one.

Denmark has a very limited native missile and rocket development and production capability. Although she is not engaged in an independent development program, she is participating in ESRO

INDONESIA

Prior to President Sukarno's fall from power in the latter part of 1965, Indonesian officials were often prone to make highly exaggerated claims concerning their country's ability to develop strategic missile and space launch systems. In view of the recent developments in Indonesia, particularly the moderation of its formerly aggressive foreign policy, it is presumed that any incentive to acquire such a capability has been eliminated. At any rate, the backward condition of Indonesia's scientific, technical and industrial resources precludes the native development of nuclear-capable missile delivery systems

Indonesia has been supplied with a fairly extensive and modern array of missiles by the Soviet Union, all of which have been basically defensive

in nature. Indonesia has no capability to copy these systems and must rely on the Soviet Union for replacement parts. None of the Soviet-supplied missile systems are capable of being modified by the Indonesians for use as a nuclear-capable strategic missile delivery system.

Indonesia has been engaged in a rather limited native tactical rocket R&D program for several years. These rockets have no potential for use in a strategic missile role.

Indonesia also had, until recently, a fairly active, although relatively modest, research rocket program. The most sophisticated aspect of this effort involved the purchase of sounding rocket technology from It is true, however, that the level of Indonesian competence in rocketry was advanced considerably by the acquisition of this technology.

In addition to this program, Indonesia has been attempting to develop native-designed sounding rockets. Several small, solid-propellant vehicles but none have been developed to the point of becoming a useful launch vehicle. These rockets have no potential military applications.

NATIONALIST CHINA

Despite Nationalist China's obvious concern with Communist China's burgeoning progress in the nuclear and missile fields, it has neither the scientific, technological, or industrial resources to develop ballistic missile delivery systems and would probably be unable to obtain assistance in this area from foreign sources.

NORWAY

Norway does not now have and is not expected to attain the capability to develop a ballistic missile system in the next ten years. It is not anticipated that it would attempt to acquire such a system by purchase.

Norway has a very modest missile industry which is centered at the government-owned Kongsberg Armament and Guided Missile Plant in Kongsberg.

REPUBLIC OF SOUTH AFRICA

The Republic of South Africa has virtually no capability for the native development of even a short-range ballistic missile system. The only possible method of obtaining such a system would be by purchase.

SPAIN

Spain does not now have and is not expected to attain the capability to produce a native ballistic missile delivery system Such a system would have to be obtained through purchase from another country.

COOPERATIVE SPACE PROGRAMS

There are two principal multinational space efforts, ESRO (European Space Research Organization) and ELDO (European Launcher Development Organization), and several lesser joint efforts such as COSPAR (Committee on Space Research) and Eurospace. There also are a number of bilateral cooperative programs with NASA, and the Soviets recently signed a space cooperation agreement with the French. One of the inducements for joining cooperative space programs is the belief that such membership will advance aerospace technology. However, none of these international programs are believed to be supplying technology having significant application to the development of ballistic missiles.

It is believed that ESRO, for example, can only be of marginal assistance to any of the member countries* in the development of a ballistic missile system. The countries which will benefit the most are those, such as that have private or government-controlled firms to which ESRO has awarded contracts for satellite development and production. The type of technology involved, however, is only of secondary importance to missile development, such as the development of tracking and telemetry systems and the design and packaging of highly reliable electronic systems.

Some member countries of ELDO** are in a good position to benefit from the Europa-1 (or ELDO-A) satellite launch vehicle development program. As in the case of ESRO, the more advanced countries are gaining the most from this program because they are developing the liquid stages for the launch vehicle, although such liquid technology may not be optimum for ballistic missiles. In addition, these countries are obtaining valuable experience in program management, personnel training and experience, missile staging technology, guidance and control system development, and flight testing.

For the most part, the NASA programs involve the supplying of satellite launch vehicles and sounding rockets for foreign payloads. In the case of Italy's San Marco program, Italian technicians were trained in the launching of US Scout satellite launch vehicles. NASA also assists some foreign countries in the design, construction and testing of their own satellites.

---

* The members of ESRO are: The United Kingdom, West Germany, France, Italy, Sweden, Belgium, the Netherlands, Switzerland, Spain and Denmark.

** The members of ELDO are: The United Kingdom, West Germany, France, Italy, Belgium, Netherlands, and Australia.