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French Nuclear Weapons and Delivery Capabilities
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FRENCH NUCLEAR WEAPONS AND DELIVERY CAPABILITIES

THE PROBLEM

To assess the capabilities of the French nuclear force and its probable future development through the mid-1970's.

CONCLUSIONS

A. The prime goal of French military policy under de Gaulle has been creation of an independent nuclear deterrent force, the force de dissuasion. Eventually, this will comprise three weapons systems: medium-range bombers, a small number of land-based intermediate-range ballistic missiles (IRBMs), and 4 or 5 nuclear submarines with Polaris-type missiles. So far, only the strike force of 36 Mirage IV-A aircraft with the existing 70 KT fission bombs is operational. The performance of the aircraft gives this system a very limited capability.

B. The planned land-based IRBM force of 27 missiles (three squadrons of nine each) was originally scheduled to begin replacing the Mirage IV-As as the principal element of the French deterrent in 1966. But the target date has been repeatedly moved back, most recently because of last spring's internal disturbances in France and the ensuing budgetary stringencies. Our present judgment is that the first IRBMs will not become operational before late 1970; a more likely date is 1971. The first Polaris-type nuclear submarine will probably enter service in late 1971 or 1972. The additional 3 or 4 will probably become operational at about two-year intervals thereafter.

C. It would probably take the French, with an active testing program, 3 to 5 years to develop and start deployment of thermonuclear warheads for their
missiles with yields in the megaton range. The recently announced cancellation of nuclear tests in the Pacific in 1969 means that they are unlikely to have such warheads before 1973, and then only if testing is resumed in 1970.

D. Recent decisions to slow down the program suggest that the French feel they have been spending as much as, or more than, they can afford on their nuclear force. Any new economic setbacks, financial difficulties for the franc, or increases in the cost of presently planned military programs, would probably bring a further stretch-out. Our best judgment, however, is that the French will continue their efforts to build their nuclear force along the lines presently programmed.

DISCUSSION

1. The prime goal of French military policy for over a decade has been creation of an independent nuclear deterrent force, the force de dissuasion. The government initially decided in the mid-1950's to develop nuclear weapons, and de Gaulle has given the program top priority since his return to power in 1958. The French have regarded possession of nuclear weapons as indispensable for the achievement of great-power status, for their campaign to supplant US leadership in Western Europe, and for their drive to achieve political superiority in Europe over West Germany and at least equality with Great Britain. De Gaulle has realized that his nuclear force could never be in a class with the US or Soviet nuclear arsenals, but he believes that even a modest force can further his political goals.

2. The French had settled on definite plans by the early 1960's for the development of three successive elements in their strategic force: first a jet bomber force, then a small number of land-based intermediate-range ballistic missiles (IRBMs), and finally a somewhat larger submarine missile force. Until 1968, despite delays and costs far greater than originally planned, the French had been carrying out this program with persistence and single-mindedness. They had even begun planning for the further development of their force beyond the mid-1970's and beyond the presently projected three systems.

3. But in the past year, several developments have created new uncertainty about the future of the French force. Last spring's internal crisis, wage and price increases, and the austerity measures recently introduced to ward off devaluation of the franc have already led to a slowdown in some areas. Further delays or cutbacks may become necessary. Another uncertainty is raised by the events in Czechoslovakia. Although de Gaulle may seek to shrug off the implications of the Soviet invasion, it has at least temporarily undercut some of the assumptions on which his foreign policy of recent years has been based—
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namely, the expectation of broader East-West rapprochement cutting across
NATO-Warsaw Pact lines and the expectation that NATO and the US role in
it would decline in importance to the Germans and other West Europeans.

4. In the following paragraphs we discuss first the military capability of
present and planned French nuclear weapons systems, and then some of the
possibilities for change in the French program which arise from the evolving
political and economic situation in Europe.

I. PRESENT AND PLANNED DELIVERY SYSTEMS

A. Strategic Systems

5. The Mirage IV Bomber Force. The bomber force of 58 Mirage IV-A
medium-range jet bombers (of which 22 are spares, electronic countermeasure
carriers, trainers, etc.) has been in service for several years and is the only part
of the force de dissuasion now operational. Twelve KC-135 tanker aircraft
were purchased from the US in 1964 for refueling purposes. Production of the
Mirage IV-A ceased in 1967, and since then the aircraft have been modified
to provide an improved low-level capability. In addition, some or all of the
Mirage IV-As are being equipped with a short-range air-to-surface missile inten
ted for use against enemy radar installations. The French have also been
developing an electronic jamming device which they may install on the aircraf
to make detection and tracking by enemy radar more difficult.

6. Even with these improvements, however, the Mirage IV-A is a stop-gap
system which poses only a limited threat to the USSR. The French aircraft,
operating at medium or high altitude, would be highly vulnerable to Soviet
and East European air defenses. Their ability to get through the air defenses
would probably be greater at low altitude. However, with such a flight pro
cfile, they could reach only a relatively small portion of Soviet territory except
on one-way, no-return missions, and they would encounter severe navigational
difficulties. The potential range and deployment of the Mirage IV-A against
the USSR are given in Figure 1.
Mirage IV Deployment and the Threat to the USSR

Refueling zones over neutral air space

Pick-shaded area on map shows maximum one-way coverage at low altitude. On two-way flights, the aircraft could reach only 350 NM from the refueling zones on a high-in-mission (one dashed red line). On a two-way high-in-mission (high altitude except for short portion over target area), the aircraft could reach 650 NM from the refueling zones, about halfway between the two types of mission shown above. The distances assume that the aircraft carries a 3,400 lb. bomb load.

Figure 1

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7. The French decided a year or so ago to extend the active life of the bomber force from 1970 to 1975. The decision was not prompted mainly by financial problems—it was made before the May-June internal crisis—but by the realization that the missile systems would not become operational as soon as originally planned. There are no present plans for a follow-on bomber, though a bomber version of a new French variable geometry aircraft, designed to fly at Mach 2.5, is under study. The French Government has ordered two prototypes of this aircraft, which could also meet French requirements for a high speed interceptor and strategic reconnaissance plane after 1975.

8. Land-Based Intermediate-Range Ballistic Missiles. The French began serious development of IRBMs about 1960. Their land-based missile program was originally intended to provide a more formidable deterrent than the Mirage IV-A bombers until the submarine missiles entered service. But the program has encountered a series of delays and the first missiles probably will not be deployed much before the first submarine is operational. The first land-based missiles were originally scheduled to enter service by the end of 1966, but the French have had to postpone the target date successively from 1966 to 1968, and then to 1969. Recently they again postponed the date, this time to 1970 largely as a result of last spring's internal crisis and subsequent increases in wages and costs. The fall of 1968 a preliminary version of the missile—with a smaller first stage than the final missile will have—had been tested successfully at least twice. Late 1970 is probably the earliest date by which the first missiles could become operational; we believe that 1971 is more likely.

9. The estimated characteristics of the land-based IRBM, called the SSBS (Sol-Sol Ballistique Stratégique) by the French, are:

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
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<tr>
<td>Maximum Operational Range</td>
<td>1,800 n.m. with 1,500 lb. reentry vehicle</td>
</tr>
<tr>
<td>Propellant</td>
<td>Solid</td>
</tr>
<tr>
<td>Guidance</td>
<td>Inertial</td>
</tr>
<tr>
<td>Configuration</td>
<td>Two-stage tandem</td>
</tr>
<tr>
<td>Total Length of Missile</td>
<td>40.4 feet</td>
</tr>
<tr>
<td>Deployment</td>
<td>Hardened and dispersed sites</td>
</tr>
</tbody>
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The potential coverage of Soviet targets by these missiles is shown in Figure 2.
Land-based IRBM Deployment and the Threat to the USSR

The range of 1,800 nm assumes a 1,500 lb. re-entry vehicle. The range of 1,100 nm assumes a 2,000 lb. re-entry vehicle.
10. The French intend to deploy only 27 of these missiles in an area of about 140 square miles. Of the three planned missile complexes (each with nine sites), the first is under construction, and site clearing and leveling for the second has begun. The French plan to harden each silo and the underground launch control centers. In addition to hardening the ground facilities, the French have done some research on penetration aids for their IRBMs. It is unlikely, however, that they will install any significant penetration aids much before the mid-1970s.

11. Nuclear-Powered Ballistic Missile Submarines. The French Government has approved plans for construction of four nuclear-powered ballistic missile submarines carrying 16 missiles each.\(^1\) The Defense Ministry has urged construction of a fifth, but authorization for it has not yet been forthcoming. Work on the first submarine is well underway. The hull was completed and the vessel launched in 1967. It is now being fitted out, but as of late 1968 the nuclear power plant had not been completely installed. This first submarine was originally scheduled to enter service in late 1970, and the French now claim that it will be operational in 1971, with only a six-month slippage resulting from the internal and financial problems of the past year. We believe that 1972 is a more likely date. The second submarine, now in an early stage of construction, probably will not reach operational status until 1974, with the others following at approximately two-year intervals.

12. The missile to be used with the submarines will be similar to the US Polaris. Called the MSBS (Mer-Sol Balistique Stratégique) by the French, its estimated specifications are:

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
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<tbody>
<tr>
<td>Maximum Operational Range</td>
<td>1,600 n.m. with 1,500 lb. reentry vehicle</td>
</tr>
<tr>
<td></td>
<td>1,350 n.m. with 2,200 lb. reentry vehicle</td>
</tr>
<tr>
<td>Propellant</td>
<td>Solid</td>
</tr>
<tr>
<td>Guidance</td>
<td>Inertial</td>
</tr>
<tr>
<td>Configuration</td>
<td>Two-stage tandem</td>
</tr>
<tr>
<td>Total Length of Missile</td>
<td>34.4 feet</td>
</tr>
</tbody>
</table>

The test program for this missile began in 1964. The first underwater launch of the final version was successfully made from a conventionally powered test submarine in November 1968.

13. The present pace of development of the submarine missile system indicates that the French will not achieve a continuous operational capability with this system until the latter 1970s. Given normal maintenance and upkeep cycles, the French would need three submarines in order to have one—with 16 missiles—on station at all times. With a force of 4 or 5, two boats could probably be kept at sea most of the time. Their patrol areas would probably be in the Norwegian Sea, the eastern Mediterranean, and possibly the Bay of Biscay. (See Figure 3 for likely patrol areas and coverage of Soviet targets.)

\(^1\) The estimated characteristics of the submarines are as follows: Displacement—7,900 tons on surface, 9,000 tons submerged; length—420 feet; beam—35 feet; submerged speed—21-23 knots; diving depth—1,300 feet.
Possible Nuclear Submarine Deployment and the Threat to the USSR

Figure 3

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Range with 1500-lb re-entry vehicle

Range with 2200-lb re-entry vehicle

Possible launch area

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14. The overall design of the French submarine-missile system appears to be good. As with any highly complex system, difficulties undoubtedly will be encountered which will limit its effectiveness for the first few years. Even if performance and accuracy are substantially less than that of the US Polaris system, however, a force of 4 or 5 submarines will ultimately give France a significantly increased capability to threaten Soviet cities in the western USSR, and indeed some capability against other areas of the world.

15. French military thinking envisages the eventual use of nuclear attack submarines for the protection of the submarine-missile force, and plans have been on the books for some time for the construction of at least one nuclear attack submarine. This program has been in limbo for at least a year, however, and is likely to be considerably postponed by budgetary restrictions.

16. French Consideration of Intercontinental Ballistic Missiles (ICBMs). In late 1967, the government began to reveal plans for development of the strategic nuclear force beyond the three systems originally envisaged. The French Chief of Staff, the Defense Minister, and de Gaulle himself issued statements indicating that in the shifting relationships and uncertainties of the present world France could no longer think in terms of protecting itself against a single European antagonist. Instead France must be prepared to deal with threats from anywhere in the world—from “all azimuths.” The Chief of Staff publicly suggested that France should build a “significant quantity” of ICBMs for this purpose. At about the same time, French military planners began studying the relative merits of an enlarged submarine missile force versus the development of ICBMs to achieve a “worldwide” capability.

17. Then came the internal upheaval and financial difficulties of 1968, and any programs for either ICBMs or a submarine missile force with more than 4 or 5 boats have been postponed. Some feasibility studies of ICBMs are continuing, and we would expect de Gaulle again to press for an “all-azimuth” weapon system when and if the financial situation permits. With the experience gained on intermediate range missiles, the French clearly have the technical competence to develop ICBMs. But it seems highly unlikely that they could deploy an operational system by the mid-1970’s.

B. Short Range or Tactical Delivery Systems

18. The French could use their existing Mirage III-E aircraft as tactical nuclear weapons carriers. The Super Mirage F-1, which is now under development, could also be used for this purpose. The Jaguar fighter-bomber, now being developed jointly by Britain and France and expected to enter service in 1972, will also be able to carry nuclear weapons. In addition, some Mirage IV-As probably will be retained in a tactical nuclear role after they are phased out of the strategic force.

19. For some years a short-range surface-to-surface ballistic missile, named the Pluton, has been under development for the French Army. The missile is to
be capable of carrying a nuclear warhead to a range of about 65 n.m. This program has lagged badly, however, and not only because technical problems have arisen with both the solid propellant motor and the guidance system. Perhaps more important, there has been little enthusiasm for this project in the government outside the army. A major French criticism of the project is that tactical nuclear weapons imply the possibility of a graduated nuclear response, a concept de Gaulle has vigorously disclaimed for years. At the same time, failure to develop the Pluton would leave the army the only service without nuclear weapons. The Pluton is still scheduled to become operational in 1972, but we doubt that the government will allocate the resources necessary to achieve that objective.

20. The French Dassault aerospace company has developed another short-range surface-to-surface ballistic missile—the MD-620—under a contract with Israel. This missile has a range of about 270 n.m. with a 2,200 pound reentry vehicle, but the French have indicated that they do not plan to use it for their own forces.

C. Military Aspects of French Space Research

21. Since 1965 the French have been engaged in a modest effort to develop military space and support systems. Military officials would like a navigational satellite system for their missile-carrying submarines, and eventually a national satellite reconnaissance capability as well. The generally low priority given these projects by the government is reflected by the fact that only $30 million was allocated to them for the years 1965 through 1968. Nevertheless the French probably are capable of developing a satisfactory navigational satellite system by the time their first submarine becomes operational. They probably could also acquire a satellite reconnaissance capability by the middle or late 1970's if they were willing to divert enough scarce resources to the task.

22. Civilian space facilities which may be helpful to the military program are under construction in French Guiana. To date, only sounding rockets have been launched there, but the facilities could be ready for satellite launches by late 1969 or 1970. The base in French Guiana would be more suitable than metropolitan France for launches into polar orbit, or toward the east (necessary for stationary or near-stationary satellites). Launches in both these directions would be desirable for any navigational, reconnaissance, or military communications satellites which the French might develop. In addition, if France does ultimately develop ICBMs, the Guiana facilities might be used for long range tests.

23. In other areas, military missile programs have greatly assisted the development of space boosters, but have received limited benefits in return from the civilian space program. Civil projects involving geodetic satellites and satellite tracking systems have provided some information and have tested some
technological developments useful to the military. Much of this, however, is research which the military itself would do if there were no civilian space program.

II. THE NUCLEAR PROGRAM

(Prior to 1968, the French had conducted 25 nuclear tests, 17 in Algeria from 1960 to 1966, and eight in the Pacific in 1966 and 1967. All these tests used plutonium as the fissionable material.)

After an acceptable nuclear design is achieved, it would probably take another year or two to begin production of warheads. Since the French, as part of their current austerity program, have canceled all nuclear tests in the Pacific for 1969, the development of usable thermonuclear weapons may be pushed still further into the future. Even if tests are resumed in 1970, we do not believe that the French could begin deployment of high-yield thermonuclear warheads before 1973. 28

On the other hand, the cancellation of the 1969 test program will not affect the initial deployment of the French missile forces. When they ran into difficulties several years ago in designing thermonuclear devices, the French decided to use fission warheads at first on both their land-based IRBMs and the submarine-launched missiles.

This section discusses only France's capabilities to design and produce warheads for its projected weapons systems. We have examined other aspects of the French nuclear program, and conclude that they are not limiting factors in the development of the French deterrent force. France has and probably will continue to have sufficient uranium, and produces enough fissionable materials, both plutonium and highly enriched uranium, for its military needs.
of these weapons now appears fixed. Actual production of warheads for the land-based IRBM probably will begin in 1969, and for the submarine missile in 1971. The French should have enough warheads to arm their missiles as they enter into service.

27. French officials had stated—prior to the internal difficulties of 1968—that they would also develop a nuclear bomb for their tactical aircraft and a warhead for the Pluton short-range missile by 1972. Some information indicates that France already has perfected the design of a [_____] weapon suitable either for aircraft delivery or as a warhead on the Pluton. Other information suggests that the nuclear device is not yet fully developed, and that further tests are necessary. Whatever the case, if testing is resumed in 1970, the French should encounter no technical problems in producing a nuclear system for their tactical weapons by 1972.

III. THE FUTURE OF THE FORCE DE DISSUASION

A. Impact of Economic Stringencies

28. France's pursuit of its nuclear ambitions has been an expensive proposition. This is only partially reflected in official French figures. The French have admitted concealing funds for the nuclear program within the budgets of many ministries and departments, in order to ease the problem of getting legislative authorizations and appropriations.

29. French estimates of total expenditures on the force de dissuasion from its inception in the mid-1950's to the completion of the presently planned three systems in the 1970's are just over the equivalent of $10 billion. Our own estimate is that actual expenditures will probably come to about $17 billion, of which almost $10 billion will have been spent through 1968. Of the $17 billion total, the Mirage IV-A weapons system, including the nuclear weapons assigned to it, has cost a little less than $2 billion; the land-based missile system with its nuclear warheads will cost somewhat over $2 billion; and the submarine missile system with nuclear warheads will cost about $4 billion. The remaining $9 billion—more than half the total cost—will be spent on costs common to all three elements of the force de dissuasion. Many of these common costs have arisen from the construction and operation of the Pierrelatte gaseous diffusion plant and the various test facilities.

30. All in all, expenditures on the force de dissuasion have been averaging on the order of $1 billion annually in recent years and appear likely to continue near this level through the mid-1970's. Until 1968, however, the visible impact on government finances had not been very great, in part because of a sharp and sustained cutback in conventional force expenditures following the liquidation of the Algerian war, in part because of sustained growth of the gross national product (GNP) at a rate of slightly less than five percent. This has enabled the government to hold military expenditures to about five percent of GNP in recent years.
31. Thus far the long-term impact of last spring’s disturbances, and of the more recent difficulties of the French franc, is not clear. To a considerable extent the pace of the advanced weapons program will depend on French ability to achieve successive technical and production goals as scheduled rather than on the availability of funds. But if a new monetary crisis occurs, or if there are further increases in industrial wages and prices, the government may feel compelled to introduce harsher austerity measures than it has so far. The question is whether such measures would mainly be imposed on other parts of the economy, or whether the government would accept further cuts and delays in the advanced weapons program beyond the fairly limited ones now in effect.

32. Our best judgment is that the French will continue their efforts to build an independent force de dissuasion along the lines presently programmed. We base this judgment on the sheer momentum of the program as well as the persistence and single-mindedness with which the French have pursued their nuclear ambitions during the last decade. In view of the long lead time required for advanced weapons, there is already a heavy commitment of physical resources, and the French would not willingly see these go to waste.

33. The difficulties in which the French now find themselves, however, make this judgment less confident than it would have been a year ago. Much depends on whether financial problems force France into further deflation and cuts in government spending. In addition, if de Gaulle should leave the scene in the next year or two, further delays, technical problems, or higher costs in the advanced weapons program might convince a new government to review the whole program with a more critical eye.

34. A new government might also come to believe that its nuclear forces were becoming progressively less meaningful militarily in the face of continuing advances in offensive and defensive weapons by the US and Soviet forces. The increasing attention of the superpowers to development of ABM systems, and the possibility of some kind of arms agreement between them, both introduce uncertainty into the question whether the French nuclear program will retain the deterrent value it was expected to have. Since, however, the political benefits of having nuclear forces would be affected to only a limited extent by these factors, the decision of future governments to continue, expand, or curtail the nuclear weapons program would depend primarily on the French estimate of how the nuclear force would contribute to achievement of their foreign policy objectives.

B. Cooperation with Other States

35. Two questions frequently arise in connection with French policy toward nuclear weapons. One is whether France is likely to assist nonnuclear states to acquire such weapons, and the other is whether France in the future might favor some form of cooperative nuclear arrangements with other West European nations or the US.
36. France as a Potential Nuclear or Missile Supplier. French spokesmen have often expressed the view that the spread of nuclear weapons to additional countries was probably inevitable, and one rationale for their own nuclear force has been that any nation desiring true independence must have such weapons. In addition, France has shown a willingness in at least one instance to help another country—Israel—acquire a missile system able to carry a nuclear warhead. The French also provided Israel with a reactor capable of producing small amounts of fissionable material. On the other hand, French officials have privately assured the US on numerous occasions that they would not assist other countries to acquire nuclear weapons. On the whole, now that France is a nuclear power, we doubt that it will be any more prone than other nuclear powers to foster nuclear proliferation. We are somewhat less sure, however, that the French would abstain from selling nuclear-capable delivery systems or components thereof to other nations, if the price were right.

37. Prospects for Joint Arrangements in Western Europe or with US. The French Government has dropped broad hints in recent months that de Gaulle would like to improve his relations with the new US Administration.

38. In seeking such arrangements with the US or in discussing nuclear relationships with other countries of the Western Alliance, France under de Gaulle would almost certainly not accept any arrangement which entailed giving up one jot of sovereign French control over the force de dissuasion. He wants greater access to US nuclear know-how in order to increase French national power and because it would represent symbolic recognition of French leadership on the Continent. Giving the US, NATO, or any joint European grouping partial control or an implicit veto over the use of his nuclear force would defeat his purposes.

39. If de Gaulle's present efforts to get the US to accept a special status for France in Europe prove unsuccessful, he might at some time in the future again dangle his nuclear force as bait to encourage the West Germans to
weaken their close ties with the US. He might even agree to hold discussions with West Germany and other neighboring countries about a European nuclear force. But here also, we believe he would insist that such a force be based essentially on French nuclear weapons and French control; he would feel that the role of other nations should be limited to financial support and possibly participation in planning.

40. After de Gaulle's departure, his successors—of whatever party—are likely to give increasing attention to prospects for merging the French weapons systems into some kind of European nuclear defense arrangement. The variety of factors which will be operative and the uncertainty as to what the political climate in Europe will be makes consideration of this matter highly speculative. There has been periodic discussion in Europe of the possibility of putting the French and British nuclear forces together into a European defense force with which West Germany and other European NATO members would somehow be linked. Chances for achieving something along these lines would be greater if the pace of European unity had picked up in other respects by that time, and in particular if Great Britain had entered the European Community. But even in the most favorable circumstances it is unlikely that the French and British forces would be fully merged. Some lesser degree of coordination is the most that could be reasonably expected. Even this would depend on the general evolution of political relationships among the West European states over the next few years, as well as on their relationships with the US and the USSR.
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