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GUIDED MISSILE AND ASTRONAUTICS INTELLIGENCE COMMITTEE

11 July 1974

MEMORANDUM FOR: Deputy to the DCI for National Intelligence Officers

SUBJECT: SNIE 4-1-74: PROSPECTS FOR THE PROLIFERATION OF NUCLEAR CAPABILITIES

REFERENCE: D/DCI/NIO Memorandum, subject as above, dated 18 June 1974

The Attachment is provided in response to the reference. It represents the views of the OWI/DDS&T and this Committee.

[redacted]

R. E. HINEMAN
Chairman

Attachment:
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ATTACHMENT

GUIDED MISSILE AND ASTRONAUTICS INTELLIGENCE COMMITTEE

CONTRIBUTION TO

SNIE 4-1-74: PROSPECTS FOR THE PROLIFERATION OF NUCLEAR CAPABILITIES

PROBLEM

To estimate the capability and intent of those countries, which are deemed serious candidates for acquiring nuclear weapons, to acquire a nuclear-capable ballistic missile delivery system by 1980.

SUMMARY

Of the 15 countries considered, only one--Israel--has developed and probably deployed a nuclear-capable ballistic missile. Several other countries, however, have acquired ballistic missiles from foreign sources. One of these is West Germany, which has acquired the Sergeant and the Pershing systems (both SRBMs) from the US. It also is planning to purchase the US Lance (also an SRBM) to replace both the Honest John (a FROG) and the Sergeant. In addition to West Germany, other NATO countries are planning to purchase the Lance.

The USSR has provided the Mobile SCUD-B SRBM to Egypt, and it appears that they also may have provided it to Iraq as well.

None of the other countries has as yet either acquired a missile system from a foreign country or has an active native program to develop one.

Five countries are believed to have a good enough technology and industrial base to develop a missile on their own without major outside assistance. They are Canada, Italy, Japan, Sweden and West Germany. Only Japan and West Germany are judged to have the capability to develop and deploy an IRBM system by 1980. Sweden may have the capability to develop and deploy an SRBM by that time. None of the five is expected to begin a native program within the period of this estimate. Like Germany, Sweden might consider purchasing an operational SRBM, either the Lance from the US or the Pluton from France.

Of the remaining countries that are not judged capable of developing a system on their own without considerable outside assistance, India, Pakistan, and Taiwan are judged to have a high desire to acquire ballistic missiles. All probably would want IRBMs. None of these countries could develop their own missiles by 1980.

India is attempting to establish the technology and industrial base necessary for a native program and is expected to seek outside assistance, chiefly from the West but perhaps

from the USSR also. Pakistan also could approach the West but might be able to obtain assistance from China. It seems unlikely that Taiwan could obtain any assistance from any major Western country or the USSR but might be able to acquire aid from Israel.

None of the other countries are expected to acquire ballistic missiles by 1980.

ARGENTINA and BRAZIL

Both Argentina and Brazil already are attempting to purchase tactical missiles from both the US and Western Europe. Neither country has the industrial capability to produce ballistic missiles on their own without significant outside help. It appears likely that, for prestige reasons, both eventually will want to acquire ballistic missiles. It is doubtful, though, that they will acquire any ballistic missile system before the end of the period of this estimate.

CANADA

Canada clearly has an industrial and technology capability for developing a strategic missile system. However, recent Canadian governments have firmly renounced any interest in acquiring either nuclear weapons or advanced delivery

systems. In light of the special relationship between the US and Canada in the area of continental defense, it is unlikely that the Canadians would undertake the development of a strategic missile force.

EGYPT

Beginning in 1960, the UAR attempted to develop offensive ballistic missiles The program, however, encountered considerabe difficulties, primarily due to an inadequate technological and industrial base. Research and development were conducted on two missiles: the 75 nm Victor and the 170 nm Conqueror. Neither of the missile programs was completed, and by late 1967 all were cancelled. The UAR's entire missile program was abandoned after an expenditure of over 50 million dollars. It is extremely unlikely that the Egyptians will renew a native ballistic missile development program.

During the October 1973 war, the USSR supplied the SCUD-B mobile SRBM to the UAR. The Soviets have developed HE, chemical, and nuclear warheads for this missile.

At least one SCUD with an HE warhead was fired during the recent conflict.

The SCUD-B has a range of about 160 nm with a payload weight of 1,800 lbs. In order for this missile to have strategic significance in the Middle East, this range would have to be maintained. Any Egyptian-developed nuclear weapons, if used on the SCUD, would have to be of this weight or less.

INDIA

There is no direct evidence of an active Indian program to develop a strategic ballistic missile system. It does appear, however, that they intend to acquire such a system. We believe that the Indians are strongly motivated to acquire a missile force to act as a deterrent against the potential Chinese threat. For this purpose, they would require an IRBM capable of delivering a nuclear warhead to a range of about 2,000 nm. Such a weapon system, if deployed in the northern part of India, could provide coverage of a large percentage of China's population and industrial centers, including Peking. The Indians probably would not require such a missile for use against Pakistan.

The only way India could hope to attain a strategic missile delivery capability by 1982 would be through the acquisition of a weapons system from a foreign power.

Soviet SS-5 IRBMs satisfy the range requirements.

we believe it highly unlikely would provide strategic missiles which are capable of carrying nuclear warheads.

Thus, the only likely way the Indians can acquire such a system is for them to develop one on their own, with outside technical assistance. The experience gained from the planned Indian space program could be a very significant factor in a strategic missile effort. Although this program is still quite modest, the Indians have committed themselves to a major expansion over the next decade.

An important aspect of this expanded space program calls for the development of a four-stage solid-propellant launch vehicle designated SLV-3, which is similar in performance to the US Scout. This vehicle is to be about 64 feet long and have a 39 inch maximum diameter. An adaptation of this vehicle appears to be India's best prospect for obtaining a ballistic missile in the shortest possible time.

The Indians have recognized and acknowledged publicly that they cannot implement any major undertaking without a substantial infusion of technical know-how from abroad as well as the importation of critical hardware and components. They already have started to develop the necessary technical capability and industrial base for this satellite launch vehicle program.

The principal space research facility is the Thumba Equatorial Rocket Launching Station (TERLS) on India's southwest tip. A science and technology center at TERLS is the focal point for development of the satellite launch vehicle. Facilities for making solid propellants and fabricating rocket motors have supported the sounding rocket programs and are being upgraded to produce prototype motors for the satellite launcher.

A new test range is being constructed near Madras, the Sri Harikota Island Rocket Launch Station (SHIRLS), which not only will be the principal rangehead for future Indian satellite launches but also will be the location for some of the production facilities for both their satellite launch vehicles and expected IRBM programs.

The Indains are planning to build a solid-propellant rocket motor production plant at SHIRLS

If a decision were made to go ahead with such an effort now, and if the program were given high priority, we estimate that the Indians probably would require at least 10 years to deploy an indigenously designed IRBM. But significant imports of technology and related hardware would be required from abroad during at least the early phases of such an effort. They also probably would require the services of qualified foreign personnel, particularly for managing the program.

From a propulsion standpoint, the lower three stages of the SLV-3 seem suitable for use as a nuclear weapons delivery system. Stage 1 is 3.3 feet in diameter and approximately 29 feet long. Stages 2 and 3 are both 2.6 feet in diameter and approximately 19 and 7 feet long respectively. All three stages are to contain modern polybutadiene and/or polyurethane and ammonium perchlorate propellants. The first two stages are to employ a metal motor case and Stage 3 a fiberglass one. This vehicle should be capable of ranges in excess of 1,500 nm

So far, the most elaborate guidance the Indians have devised is an autopilot. But eventually they intend to employ an inertial measuring unit and rate gyros in the guidance system for the SLV-3, which are most of the constituent parts of an inertial guidance system. A precision facility has been set up to support the development and prototype production of gyros, accelerometers, and hydraulic control components. Furthermore, the Indians have acquired a sophisticated inertial guidance test system and have built a special facility for accommodating this equipment.

By the time an IRBM could be ready for flight testing, the Indians might reasonably be expected to develop their own inertial guidance system The missile's accuracy could be improved if they could obtain foreign technical assistance.

IRAN

There is no evidence of any Iranian interest in obtaining a nuclear-capable missile delivery system. With the exception of Israel, Iran probably has the best industrial potential in the Middle East for developing and producing their own ballistic missile systems. However, should they decide to acquire such a system, they probably would attempt to purchase one from the US.

ISRAEL

Of the countries under consideration, Israel is the only one that has developed a nuclear-capable ballistic missile of strategic importance. Development of the missile, called the MD-620 and Jericho, probably was completed about 1970.

The Jericho is a mobile, two-stage, solid-propellant, short-range ballistic missile system that has both tactical and strategic importance in the Middle East. The missile is about 43 feet long, weighs almost 15,000 lbs, Its maximum range is about 260 nm,

Initially, the Israelis seemed to postpone deployment of the Jericho deliberately, but the October 1973 war apparently forced them to begin deployment prematurely.

Each Jericho firing unit may consist of four transporter/erectors, each with a check-out van, one command-and-control vehicle, and a small security force. For launching, the firing units would move to presurveyed sites

ITALY

Italy has a basic industrial and scientific competence which might enable it, with some outside aid, to develop a strategic missile system. From national and multilateral military and space programs, Italy has acquired experience in some advanced technology, which would be helpful in missile development programs. Italy has a good solid-propellant technology and has produced motors of up to about 2 feet in diameter for space applications. They probably have a good capability for the development of RVs. Italy's overall competence in missilery probably will continue to increase slowly. It is unlikely that they would undertake a major missile development program unless there were a breakup of NATO

JAPAN

Japan has no strategic ballistic missile program, but it has developed its own satellite launch vehicle capability. If a serious commitment is made in the near future to start development of a nuclear-capable missile system, initial deployment probably could take place within 3-5 years.

Most areas of strategic value are all within about 1,500 nm of Japan. The Japanese could present a reasonably credible threat to these areas with a force of about 50-75 medium-range missiles (MRBMs). Japan possesses most of the scientific, technical and industrial resources to successfully develop such a system. Of particular significant and direct applicability would be the experience gained during the past decade in the development, testing and production of launch vehicles and hardware for the Japanese space effort. If the largest Japanese satellite launch vehicle developed to date, the solid-propellant Mu-3C, were used as the basis for a ballistic missile, it probably could deliver a range of 1,375 nm. The main problems in the conversion would be the development of guidance and control systems. Improved and more powerful versions of the Mu (Mu-4SH and Mu-4SS) are scheduled to be tested over the next few years. If successful, these efforts would increase the payload and/or range capability of any military version of the Mu.

The Japanese can probably convert the Mu-3C or improved versions into a MRBM/IRBM without any major input of foreign technology. The most difficult and time-consuming task would be the development of a suitable guidance and control system. The Mu-3C employs a radio-inertial system for placing satellites in orbit. Some further improvement in the control system is planned in the next year or two. The Japanese probably could begin flight testing an inertially-guided SSM version of the Mu in about 1-2 years.

The US Thor booster is being produced under license that will give the Japanese a capability for orbiting synchronous satellites by the mid- to late 1970s. Although this vehicle could be converted to a MRBM/IRBM, the use of cryogenic liquid propellants in the booster stage makes it unattractive from an operational point of view. But US-Japanese cooperation will lead to a substantial improvement in the overall level of Japanese space technology and will enhance their missile development capabilities.

Japan already has the basic test facilities required for missile development and these are scheduled to be upgraded over the next few years. The Kagoshima Space Center on the southern tip of Kyushu, from which the Mu-3C has been fired, is a relatively modern launch facility. It

would be well suited, with appropriate modifications and expansion, for use in any missile development program the Japanese might undertake. A larger satellite launch complex is also under construction some 50 nm to the south on Tanegashima Island which will support the Thor program. Either site would provide adequate firing ranges to the east or southeast for a MRBM/IRBM flight test program. Downrange facilities would have to be established and would probably involve the use of instrumented ships.

PAKISTAN

The Pakistanis are believed to have a very strong motivation to acquire a ballistic missile system, primarily for use against targets in India. Pakistan's technology and industrial capability are inadequate to develop a missile system on its own. Massive assistance or purchase of a complete missile system from an outside source would be required. The only countries from which such assistance appears possible are [redacted] and China, with China being the more likely. Pakistan would probably prefer an IRBM, but they could have use for a shorter-range tactical ballistic missile.

SOUTH AFRICA

South Africa does not have the capability to produce a ballistic missile on its own. If they should decide to acquire one, they would have to either develop their own industrial base, which appears unlikely, or purchase a system from a foreign country The South Africans, however, are known to be chiefly interested in air and coastal defense and do not appear to have a requirement for a surface-to-surface ballistic missile.

SWEDEN

Should Sweden decide to develop and deploy a nuclear-capable ballistic missile force, they would need substantial outside aid. Although Swedish industry is sophisticated and is producing small tactical missiles, no work has been done on ballistic missiles. For such a program, the Swedes probably would be forced to import technology and components on a fairly large scale. In view of their many failures in trying to develop their own tactical missiles, a more probable course would be for them to purchase a complete missile system or to manufacture under license a system developed and tested elsewhere.

In order not to provoke the USSR, any nuclear-capable missile system that the Swedes might attempt to acquire

probably would be restricted in range to less than 100 nm and be designed for defensive use only. There are only two candidate systems in the West: The US Lance and the French Pluton. They are more likely to acquire the Pluton since the French would probably be willing to sell it to them much sooner than the US would make the Lance available.

TAIWAN

Taiwan has a strong motivation to acquire a ballistic missile system and probably would require an IRBM in order to reach targets in China. It is unlikely, though, that they could acquire such a system from any outside source.

Taiwan has a very inadequate technological and industrial base to produce any type of ballistic missile. It does have a small research and development effort on small tactical solid-propellant rockets, but this effort could be expanded significantly only with outside assistance. Such assistance would be difficult to obtain

WEST GERMANY

If the West Germans were to develop a missile capability, they probably would want IRBMs with ranges of 1,500 to 2,500 nm

They probably would require at least 5 years to deploy a liquid-propellant system without outside aid.

The German industrial base is strong and diversified. Its aircraft, electronics, chemical, and metal-working industries are sophisticated and staffed with highly skilled technicians and engineers. The Germans pioneered missile development, and they have gained much experience from their role in the production of the Hawk missile and from their maintenance of US-supplied advanced tactical ballistic missile systems. A German subsidiary of a US firm is manufacturing an inertial navigation system for the F-104, and they probably are quite capable of developing a suitable guidance system for an IRBM.

German work on the third stage of the ELDO system has provided German scientists with first-hand experience in storable liquid-propelled rockets. There also have been some progress in solid-propellant technology. Experimental engines are under development with a thrust suitable for MRBM-range boosters. Copying of the Pershing missile would shorten the development time for a German missile. However, a test range for IRBMs from German territory, which could only be over the North Sea, would raise formidable political and practical problems.

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GUIDED MISSILES AND ASTRONAUTICS INTELLIGENCE COMMITTEE

Non-Sino-Soviet Working Group

Cy 1 of 5
28 June 1974

MEMORANDUM FOR: Chairman, Guided Missiles and Astronautics Intelligence Committee

SUBJECT : GMAIC Contribution to SNIE 4-1-74: Prospects for the Proliferation of Nuclear Capabilities

REFERENCE : Terms of Reference: SNIE 4-1-74, TS 186206/74, SP - 73/74, 18 June 1974, TS

1. Attached is the Non-Sino-Soviet Working Group's contribution to SNIE 4-1-74: Prospects for the Proliferation of Nuclear Capabilities. GMAIC's contribution is due to NIO by 12 July.

Alternate Chairman

Attachment as stated

ATTACHMENT

GUIDED MISSILE AND ASTRONAUTICS INTELLIGENCE COMMITTEE
CONTRIBUTION TO
SNIE 4-1-74: PROSPECTS FOR THE PROLIFERATION OF NUCLEAR CAPABILITIES

PROBLEM

To estimate the capability and intent of those countries which are deemed serious candidates for acquiring nuclear weapons, to acquire a nuclear-capable ballistic missile delivery system by 1980.

SUMMARY

Of the 15 countries considered, only one - Israel - has developed and probably deployed a nuclear-capable ballistic missile. Several other countries, however, have acquired ballistic missiles from foreign sources. One of these is West Germany, which has acquired the Sergeant and the Pershing systems (both SRBMs) from the US. It also is planning to purchase the US Lance (also an SRBM) to replace both the Honest (a FROG) and the Sergeant. In addition to West Germany, other NATO countries are planning to purchase the Lance.

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Of the remaining countries that are not judged capable of developing a system on their own without considerable outside assistance, India, Pakistan, and Taiwan are judged to have a high desire to acquire ballistic missiles. All probably would want IRBMs. None of these countries could develop their own missiles by 1980, and, if one were acquired by this time, it would have to be a foreign system.

India is attempting to establish the technology and industrial base necessary for a native program and is expected to seek outside assistance, chiefly from the West but perhaps from the USSR also. Pakistan also could approach the West but might be able to obtain assistance from China. It seems unlikely that Taiwan could obtain any assistance from any major Western country or the USSR

None of the other countries are expected to acquire ballistic missiles by 1980.

ARGENTINA and BRAZIL

Both Argentina and Brazil already are attempting to purchase tactical missiles from both the US and Western Europe. Neither country has the industrial capability to produce ballistic missiles on their own without significant outside help. It appears likely, though, that for prestige reasons both eventually with want to acquire ballistic missiles. It is doubtful, though, that they will acquire any ballistic missile system before the end of the period of this estimate.

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and development were conducted on two missiles: the 75 nm Victor and the 170-nm Conqueror. None of the missile programs was completed, and by late-1967 all were cancelled. The UAR's entire missile program was abandoned after an expenditure of over 50 million dollars. It is extremely unlikely that the Egyptians will renue a native ballistic missile development program.

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this purpose, they would require an IRBM capable of delivering a nuclear warhead to a range of about 2,000 NM. Such a weapon system, if deployed in the northern part of India, could provide coverage of a large percentage of China's population and industrial centers, including Peking. The Indians probably would consider such a missile of only marginal value against Pakistan.

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Thus, the only likely way the Indians can acquire such a system is for them to develop one on their own, with outside technical assistance. The experience gained from the planned Indian space program could be a very significant factor in a strategic missile effort. Although this program is still quite modest, the Indians have committed themselves to a major expansion over the next decade.

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modern polybutadiene and/or polyurethane and ammonimum perchlorate propellants. The first two stages are to employ a metal motor case, stage 3 a fiberglass one. This vehicle should be capable of ranges in excess of 1,500 nm

So far, the most elaborate guidance the Indians have devised is an autopilot. But eventually they intend to imploy an inertial monitoring unit and rate gyros in the guidance system for the SLV-3, which are most of the constitute parts of an inertial guidance system. A precision facility has been set up to support the development and prototype production of gyros, accelerometers, and hydraulic control components. Furthermore, the Indians have acquired a sophisticated inertial guidance test system and have built a special facility for accomodating this equipment.

By the time an IRBM could be ready for flight testing, the Indians might reasonably be expected to develop their own inertial guidance system The missile's accuracy could be improved if they could obtain foreign technical assistance.

IRAN

There is no evidence of any Iranian interest in obtaining a nuclear-capable missile delivery system. With the exception of Israel, Iran probably has the best industrial potential in the Middle East for developing and producing their own ballistic missile systems. However, should they decide to acquire such a system, they probably would attempt to purchase one from the US.

IRAQ

In addition to Egypt, it appears that the USSR has supplied Scud-B missiles to Iraq. Because of distances from Iraq to major foreign propulation centers, this missile would have less strategic value than those deployed in Egypt. Its strategic value, however, would be greatly enhanced if the missile were moved into adjacent countries. This Iraqi option for mobility would allow a reduction in range requirement, thus permitting a heavier nuclear warhead weight.

Iraq does not have the capability to develop or produce a missile on their own, nor is there any evidence of an intent to establish such a capability. Furthermore, it is unlikely that Iraq would obtain ballistic missiles from any souce other than the USSR.

ISRAEL

Of the countries under consideration, Israel is the only one that has developed a nuclear-capable ballistic missile of

strategic importance. Development of the missile, called the MD-620 and Jericho, probably was completed about 1970.

The Jericho is a mobile, two-stage, solid-propellant short-range ballistic missile system that has both tactical and strategic importance in the Middle East. The missile is about 43 ft long, weighs almost 15,000 pounds Its maximum range is about 260 nautical miles

Initially, the Israelis seemed to postpone deployment of the Jericho deliberately, but the October 1973 war apparently forced them to begin deployment prematurely.

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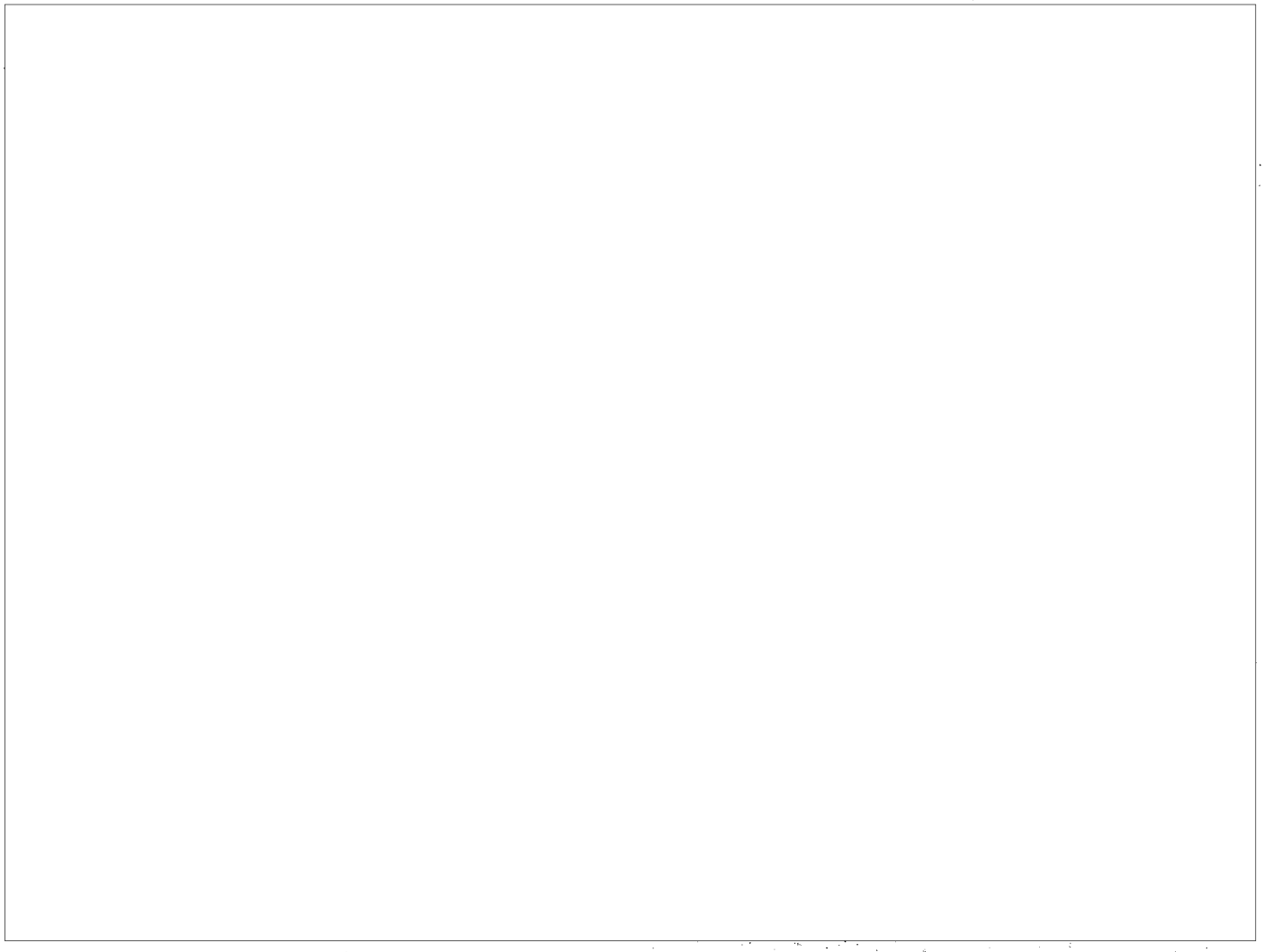

ITALY

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technology, which would be helpful in missile development programs. Italy has a good solid-propellant technology and has produced motors of up to about two ft in diameter for space applications. They probably have a good capability for the development of RVs. Italy's overall competence in missilery probably will continue to increase slowly. It is unlikely that they would undertake a major missile development program unless there were a breakup of NATO

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missile, it probably could deliver to a range of approximately 1,375 nm. The main problems in the conversion would be the development of guidance, control and the reentry vehicle. Improved and more powerful versions of the MU (MU-4SH and MU-4SS) are scheduled to be tested over the next few years. If successful, these efforts would increase the payload and/or range capability of any military version of the Mu.

The Japanese can probably convert the MU-3C or improved versions into a MRBM/IRBM without any major input of foreign technology. The most difficult and time-consuming task would be the development of a suitable guidance and control system.

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operational point of view. But US-Japanese cooperation will lead to a substantial improvement in the overall level of Japanese space technology and will enhance their missile development capabilities.

Japan already has the basic test facilities required for missile development and these are scheduled to be upgraded over the next few years. The Kagoshima Space Center on the southern tip of Kyushu, from which the Mu-3C and earlier versions has been fired, is a relatively modern launch facility. It would be well-suited, with appropriate modifications and expansion, for use in any missile development program the Japanese might embark upon. A larger satellite launch complex is also under construction some 50 nm to the south on Tanegashima Island which will support the Thor program. Either site would provide adequate firing ranges to the east or southeast for a MRBM/IRBM flight test program. Downrange facilities would have to be established and would probably involve the use of instrumented ships.

PAKISTAN

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assistance or purchase of a complete missile system from an outside source would be required. The only possible countries from which such assistance appears possible and China, with China being the more likely. An intermediate range ballistic missile probably is what Pakistan would most desire, but they could have use for a shorter-range tactical ballistic missile.

SOUTH AFRICA

South Africa does not have the capability to produce a ballistic missile on their own. If they should decide to acquire one, they would have to either develop their own industrial base, which appears unlikely, or pruchase a system from a foreign country The South Africans, however, are known to be chiefly interested in air and coastal defense and do not appear to have a requirement for a surface-to-surface ballistic missile.

SWEDEN

Should Sweden decide to develop and deploy a nuclear-capable ballistic missile force, they would need substantial outside aid. Although Swedish industry is sophisticated and they are producing small tactical missiles, no work has been done on ballistic missiles. For such a program, the Swedes probably would be forced to import technology and components on a fairly large scale.

a more probable course would be for them to purchase a complete missile system or to manufacture under license a system developed and tested elsewhere.

In order not to provoke the USSR, any nuclear-capable missile system that the Swedes might attempt to acquire probably would be restricted in range to less then 100 nm and be designed for defensive use only. There are only two candidate systems in the West: The US Lance and the French Pluton. Of these, acquisition of the Pluton is more likely, since the French probably would be willing to sell it to them.

TAIWAN

Taiwan has a strong motivation to acquire a ballistic missile system and probably would require an IRBM in order to reach targets in China. It is unlikely, though, that they could acquire such a system from any outside source.

Taiwan has a very inadequate technological and industrial base to produce any type of ballistic missile. It does have a small research and development effort on small tactical solid-propellant rockets, but this effort could be expanded significantly only with outside assistance. Such assistance would be difficult to obtain

WEST GERMANY

If the West Germans were to develop a missile capability, they probably would want IRBMs

They probably would require at least five years to deploy a liquid-propellant system without outside aid.

The German industrial base is strong and diversified. Its aircraft, electronics, chemical, and metal-working industries are sophisticated and staffed with highly skilled technicians and engineers. The Germans pioneered missile development, and they have gained much experience from their role in the production of the Hawk missile and from their maintenance of US-supplied advanced tactical ballistic missile systems. A German subsidiary of a US firm is manufacturing an inertial navigation system for the F-104, and they probably are quite capable of developing a suitable guidance system for an IRBM.

German work on the third stage of the ELDO system has provided German scientists with first-hand experience in storable liquid-propelled rockets. There also has been some progress in solid-propellant technology. Experimental engines are under development with a thrust suitable for MRBM-range boosters. Reverse engineering of the Pershing Missile would shorten the development time for a German missile. A test range for IRBMs from German territory, which could only be over the North Sea, would raise formidable political and practical problems.

Detection of Missile Programs

We do not believe that any nation undertaking the development production of nuclear-capable ballistic missiles could long keep its intentions secret. Those nations heavily dependent upon outside

aid would be likely to reveal their plans through their interest in the purchase of components or the employment of foreign technicians. Although Germany and Japan are probably capable of producing missiles without extensive aid, both nations are relatively open to outside observation. It is unlikely that any substantial reallocation of men and material to a missile program would go undetected. Both these nations, and perhaps others, could make major progress toward the development of an operational missile under the guise of space research. However, a program which involved heavy investments for tooling and production, construction of instrumented test ranges, and periodic test firings would indicate that a missile program was under way. On the other hand, should a nation find it possible to purchase a complete operational missile system, the transaction might remain secret until the purchaser chose to rattle its new acquisitions for political gain. If a nation obtained an operational missile system from a foreign country, it is unlikely that its possession could remain undetected for any significant period.