Secret

Interagency Intelligence Memorandum

South Korean Capabilities for Nuclear Weapons Development

Secret
DCI/NIO 165-75
24 January 1975

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NATIONAL SECURITY INFORMATION
Unauthorized Disclosure Subject to Criminal Sanctions

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SOUTH KOREAN CAPABILITIES FOR NUCLEAR WEAPONS DEVELOPMENT*

KEY JUDGMENTS

1. South Korea's two research reactors and the enriched uranium fuel these reactors employ are US-supplied. Its one power reactor already under construction and a second contracted for are also enriched-uranium fueled and US-supplied. A third power reactor, to be built by Canada, will be fueled with natural uranium and, like the US reactors, will be under IAEA safeguards. We do not believe that Korean diversion of plutonium produced in the US-supplied reactors could go undetected for any significant period of time. It would be more difficult to detect such diversion from the Canadian reactor.

2. South Korea could conceivably build a safeguard-free natural uranium reactor of its own, secure the fuel it needs from domestic sources, and construct heavy water production, fuel fabrication, and chemical separation facilities. [redacted] 3.3(b)(6)

[redacted] We do not believe that the ROK could produce a nuclear device in less than ten years even if its program proceeded reasonably smoothly.

3. South Korea's F-4Ds constitute an adequate delivery system against which the present North Korean air defense system could not guarantee protection.

4. The Nike/Hercules could be a nuclear delivery system if the Koreans were able to develop a warhead weighing 1,100 pounds or less. By the time the Koreans are ready to fabricate their first device, it is conceivable that they will have been able to design one falling within this weight limit. Within this same period of time, they might be able to purchase or even manufacture a missile system capable of carrying a heavier payload.

** This study was prepared in response to a request from the Department of State for a review of South Korean capabilities with respect to the development of a nuclear weapon. It was produced under the auspices of the National Intelligence Officer for Japan/Pacific by representatives of CIA, which provided the basic draft, DIA, State/INR, the Energy Research and Development Administration, and the intelligence components of the Departments of the Army, Navy, and Air Force.*

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DISCUSSION

I. EXISTING FACILITIES AND RESOURCES

1. South Korea already has modest facilities for nuclear research and has taken the first steps in a nuclear power program.

2. The research program is under the Korean Atomic Energy Research Institute (KAERI), located on the outskirts of Seoul and established in 1959. From 1959 to 1973 its expenses totaled about $21 million. In 1973 it spent about $2 million. Research programs at the Institute include neutron diffraction studies, neutron beam research, and radioisotope production. [redacted] report that, with the exception of the two US-supplied research reactors, the laboratories are not very well equipped by US standards and the research in progress is not very advanced. KAERI planned nuclear power studies are reported to include power reactor systems, the nuclear fuel cycle, and fuel fabrication and reprocessing technology.

3. As of March 1974 KAERI had 217 professional staff members, 45 of whom have PhDs (eight in physics and nuclear engineering). Many of the Korean nuclear scientists have received their formal training in the US and are considered to be well qualified in their technical areas. [redacted]

4. KAERI has two TRIGA nuclear research reactors, a 250 KWt Mark II and a 2 MWt Mark III and is contemplating acquiring a third. The first went into operation in 1962 and the second in 1972. Both reactors were furnished by the US and are fueled with enriched uranium supplied by the US. Both are under IAEA safeguards and, in any case, neither is suitable for producing plutonium for nuclear explosives.

5. The ROK is seeking to purchase from Canada a 40 MWt heavy water moderated, natural uranium fueled research reactor. This is similar to the reactor Canada built for India at Trombay, the source of the plutonium used in the Indian nuclear test of May 1974.

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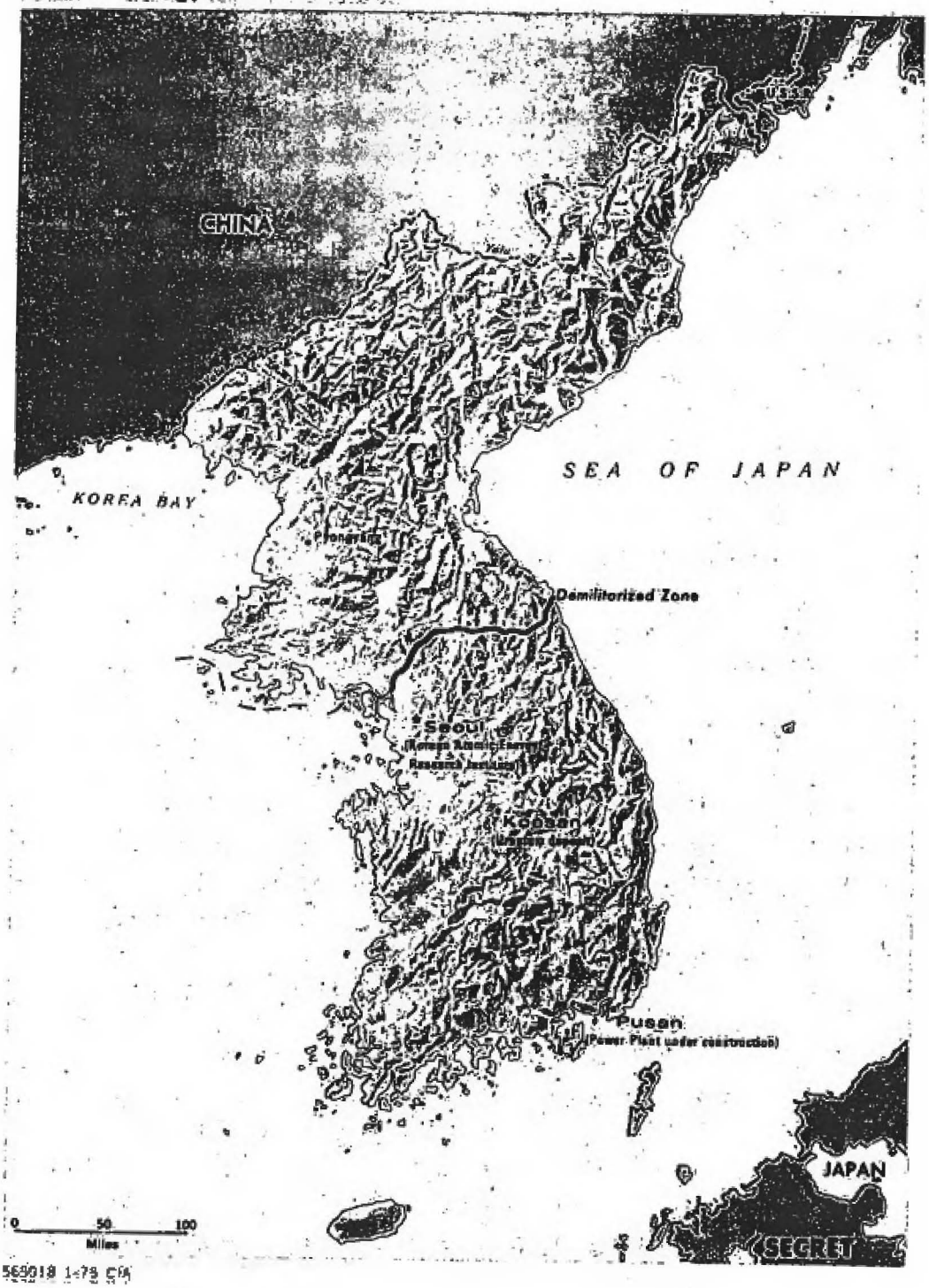
Atomic Energy In South Korea



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[redacted]

6. The ROK has an ambitious power program which calls for more than doubling installed electric power capacity by the end of 1981. According to present plans between 25 percent and 40 percent of total power will be nuclear generated. The cost of the program is projected to top $2 billion,* with about half the total going to nuclear expenditures. The government estimates that the nuclear plants will permit oil import savings of about $250 million annually.

7. This long-range power development program is now in its initial stages. A 600 MWe power plant equipped with a Westinghouse pressurized water reactor has been under construction near Pusan since March 1971, and is scheduled for completion in 1976. The Koreans have recently ordered a second Westinghouse reactor-equipped power plant of the same size and for the same site; it is scheduled for operation in 1979. Both will be fueled with US-supplied enriched uranium, and will be under IAEA safeguards. After extensive negotiation, the Canadians recently agreed to provide Korea with a 600 MWe power plant equipped with natural uranium fueled, heavy water moderated, CANDU reactor. The cost of these plants may exceed $1 billion, provided largely by foreign loans.

[redacted]

Even if exploitation should prove to be uneconomic, determination to secure a source of unsafeguarded uranium could lead the ROK to proceed with mining operations.

All costs are in 1974 dollars.

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II. A NUCLEAR WEAPONS PROGRAM - PROBLEMS AND PROSPECTS

9. The US-supplied research reactors and the Westinghouse power reactors under construction, which use enriched uranium fuel and are under IAEA safeguards, are not well suited for production of fissionable material for nuclear explosives. Reactor-grade plutonium produced in the Westinghouse pressurized water reactors could be used in a nuclear explosive device, but this plutonium would require special handling because of its high radioactivity. If weapons-grade plutonium (high-purity plutonium-239) is desired, more frequent nuclear fuel changes would be required than for normal reactor operation. Because the enriched uranium fuel must be imported, the higher fuel consumption would quickly be noted by fuel suppliers and safeguard inspectors. 3.3(b)(6)

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10. The CANDU reactor will also be covered by IAEA and bilateral safeguard agreements. Both agreements are expected to prohibit the use of reactor products in any nuclear explosive device. However, the CANDU reactor, with its on-line refueling capability, is more easily adaptable than the American-supplied reactors to the production of weapons grade plutonium and diversion of plutonium from the CANDU fuel cycle is somewhat more difficult to detect.

11. In order to have a safeguard-free CANDU type reactor, the Koreans might attempt to build their own, an effort upon which the Indians are already embarked.* Canada began to construct the first CANDU power reactor at Rajasthan at the end of 1965. India began to build a similar reactor at Madras in 1969 without Canadian help and thus free of safeguards. This reactor is scheduled for operation in 1977. A similar scenario -- which would be in violation of the Canadian-Korean agreement -- would be as follows:

a. Mid-1975 -- construction begins on a Canadian-built CANDU power reactor.

b. Mid-1979 -- Koreans begin construction on an indigenous copy of the CANDU.

c. Mid-1987 -- Korean-built CANDU ready for operation.

**The Indians' effort does not violate their agreement with Canada nor do we know that it is being undertaken in support of a weapons program.*

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[redacted]

12. In addition to building the reactor, the Koreans would also have to obtain natural uranium to fuel it. This might be obtained from some outside sources without safeguards [redacted] 3.3(b)(1) 6.2(d)

[redacted] Korea would also have to obtain unsafeguarded heavy water for use in the reactors. Construction of domestic heavy water production facilities would be necessary unless new suppliers emerged willing to sell heavy water without safeguards. In addition, Korea would need chemical facilities to separate the plutonium from the irradiated fuel elements. [redacted] Finally, before they could fabricate a device the Koreans would have to conduct research and development in high explosive technology and weapon design. 3.3(b)(1) 6.2(d)

13. A nuclear weapons program based on a domestically-produced, safeguard-free CANDU-type reactor would not put an inordinate strain on Korean financial resources. Moreover, as long as it appeared that their efforts were directed toward power production, outside financing might be obtained. The necessary capital investment for reactor, heavy water plant, fuel fabrication facilities, and a chemical reprocessing plant would approach a billion dollars. Additional expenditures would be required to procure uranium without safeguards, operate the facilities to produce plutonium, and conduct the necessary weapons R&D. The total program would run to about $100 million annually, representing 3 to 4 percent of total projected government spending for 1975. Much of the equipment would also contribute to the further development of electric power generating capacity beyond that now planned for 1981 and to other non-explosive uses of nuclear energy. That portion required exclusively to produce nuclear explosives would be relatively small. [redacted]

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14. A smaller program, producing one or two weapons per year, would probably cost around $200 million before the testing of an initial device. This figure would include capital investment on the order of $50 million for research, production, and testing facilities and some $150 million in operating expenses. A small nuclear reactor using natural uranium fuel could perhaps be designed and constructed without going first to Canada for a prototype. Other facilities required would also be on a smaller scale. The required $200 million in outlays spread over a decade would be extremely small compared to Seoul's projected 1975 defense spending of about $1 billion and total government spending of $2.7 billion in 1975. However, although a program of this type would be considerably less expensive than the program described in Para. 11, it would present the Koreans with similar technical problems [redacted] 3.3(b)(1)

15. Even assuming some foreign assistance, technological problems would be the most serious constraint on a nuclear weapons program. [redacted] 3.3(b)(6)

[redacted] In addition their overall industrial/technological base, although it has developed rapidly in the last ten years, would have to be significantly strengthened.

III. DELIVERY CAPABILITIES

16. South Korea's two squadrons of F-4D fighter bombers already constitute an adequate system to deliver a nuclear weapon to any target in North Korea. Although North Korean targets are well protected by an integrated defensive system of SAMs, AAA, and fighter aircraft, a well executed ROK air strike could neutralize the defenses long enough to allow at least one F-4D to deliver its nuclear weapon to a pre-determined target.

17. A missile system, if attainable, would have obvious advantages. The Nike/Hercules missiles, of which the South Koreans have 72, can be employed in a surface-to-surface mode with a range of about 100 nm with a 1,100 pound warhead. It is probable that the weight of a first-generation South Korean nuclear warhead would severely reduce the missile's surface-to-surface range and cause structural and control problems. By the time the Koreans are ready to fabricate their first device it is conceivable that they will have been able to design one falling within the 1,100 pound weight limit. 3.3(b)(1) 6.2(d)

18. Rather than confront miniaturization problems, the Koreans might try to purchase a delivery system that could carry a heavier warhead. They have already raised the question of whether the Nike/Hercules could be modified to carry a 2,000 pound warhead.

19. To develop a system in their own country, the South Koreans would require extensive foreign assistance in all but one field. They probably have adequate metal fabricating and precision machining facilities to produce missile airframes and ground support equipment. They might, however, lack adequate skills and equipment to fabricate missile components from high-strength materials.

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21. South Korea would have no difficulty in securing a propellant production facility and the technology for its operation from some foreign country.

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22. The South Koreans would require significant outside assistance to develop a missile with an inertial guidance system, but they probably could develop a radio controlled system on their own fairly easily. Nike/Ajax and Hercules surface-to-air missile guidance equipment in their possession could be modified for use with a new missile. Other types of tracking equipment, either radar or interferometer, can easily be acquired as could the necessary computer technology.

23. In addition, a test range would have to be established. Again, the necessary equipment could be bought easily. If the missile were radio controlled, the associated tracking equipment could also serve the test range.

24. The five years or so that President Pak envisions for the development and deployment of a missile system probably is based on something like the following schedule:

a. Two years to acquire the equipment and to construct the necessary facilities.

b. Six months to place the facilities in operation and to learn how to use them properly.

c. One year for the development and static testing of rocket motors.

d. One year for flight testing.

e. An additional six months for missile production, check-out, troop training, and deployment.

While this schedule might be possible with good management and if everything goes correctly, it is highly unlikely that the South Koreans could manage it. They might be able to develop a radio-guided missile of simple design within eight years; ten years, however, is probably a more realistic estimate.