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TO : DEPARTMENT OF STATE

INFO: SAO PAULO

FROM : Amembassy RIO DE JANEIRO

SUBJECT : Assessment of Brazilian Nuclear Device Capability

REF :

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ANALYSIS BRANCH
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DATE: May 23, 1968

SUMMARY AND CONCLUSIONS

1. Recent Brazilian foreign policy in the nuclear field and on NPT specifically places a premium on accurate knowledge concerning the Brazilian scientific and technological capability that could be utilized in any attempt to translate Brazil's currently political position into reality. This airgram summarizes the information currently available to the Embassy which supports the following conclusions:

- a. There is no visible evidence to indicate that Brazil has embarked on or is presently seriously contemplating embarking on a program to build a nuclear device.
- b. Brazil does have a significant base in the science and to a lesser degree the technology necessary to mount such a program should a political decision to do so ever be made.
- c. There are important gaps in this Brazilian base which would be both costly and time consuming for the country to overcome before a device could be built and tested.
- d. There is persuasive evidence to indicate that under previous regimes the Brazilian Nuclear Energy Commission (CNEN) was deliberately pursuing a development policy which would have resulted in a "safeguards-free" device capability had the effort been adequately staffed and supported. (Two routes were being pursued, production reactors including thorium cycle and centrifuge.)

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TECHNICAL CONSIDERATIONS

2. Visits by technically qualified Embassy officers to various Brazilian atomic energy installations and offices indicate that the Brazilian device capability, while far short of that necessary for a technically realistic program, is, nevertheless, substantial. Technical factors worthy of note in this connection are as follows:

a. The Administração da Produção da Monazita (APM) which is a quasi-autonomous part of the CNEN is actively engaged in the production of thorium, uranium, rare earths and lithium. Essentially, all of its production of rare earths and lithium are reported to have been sold, as produced, on the open market for normal scientific and commercial purposes as has been sizeable quantities of its thorium production. Some unknown but reportedly large portion of the thorium production has, however, been consistently turned over to the CNEN for stockpiling. As far as can be determined, the total uranium production has also been turned over to the CNEN, principally in the form of sodium uranate and the oxalate salts, although some oxide was apparently made in the early days. Current uranium production levels at the Sao Paulo APM plant are reported to be between three and four hundred kilograms per month. When added to the 29 metric tons of U_3O_8 on hand in January 1966, the CNEN should by now have about 40 metric tons, not counting recent purchases abroad. There is no evidence to indicate that any research work on the nuclear uses of lithium have been conducted although qualified personnel at APM are aware of its uses. In the research area the APM is currently conducting a small scale all-Brazilian research program into mixer settler technology. The responsible project officer has indicated that this research was not only being conducted with an eye to further expansion of APM's production capability but also because of its known suitability for hot processing.

b. The uranium and thorium bearing products of APM are normally delivered to the metallurgical division of the Instituto de Energia Atomica (IEA) which is a semi-autonomous part of the CNEN located on the campus of the University of Sao Paulo. The radiochemistry division has operated a small pilot plant for the production of reactor grade uranium and thorium salts and oxides for many years. The Chemical Technology Division is currently in the process of commissioning a small semi-works scale solvent extraction plant. The senior engineers at this plant, which will utilize the TBP process, are quick and proud to point out that the plant from stem to stern, including instrumentation, is of totally Brazilian manufacture and hence "free from international safeguards." They have also noted that in spite of superior pulse column pumps being available at more economical prices from United States suppliers, the pumps utilized in the plant were designed and built by Brazilian

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Sao Paulo industry. This metallurgical division has also done extensive research in the past into the techniques required for uranium and thorium metal production including vacuum casting and magnesium/^{reduction}principally of oxalate salts. All equipment being used appears to justify the engineers' claim of Brazilian manufacture. The oxalate reduction process appears to be substantially identical to that which has been used by the USAEC. On one visit, two old magnesium reduction bombs were noted in a storeroom gathering dust. One mold form closely resembled that for an enriched uranium button and the other was a small cup-shaped form. These forms had reportedly been used with natural uranium to practice for eventual use of enriched uranium and plutonium.

c. Information on the Brazilian centrifuge program has been reported separately in Sao Paulo's 1706. Nothing additional of a substantive nature is known to the Embassy concerning the present status of this program.

d. The research work being carried out at Brazilian reactor sites appears to be normal work and no evidence indicates specific orientation to weaponry at the present time. It is reliably understood, however, that about six or eight years ago a program was started but never completed to measure fast neutron cross sections of uranium and plutonium. Current cross section work appears to be focused on reactor structural materials.

3. There appear to be several gaps in the Brazilian program which would have to be filled if a serious effort were made to produce a nuclear device. These include electronics, especially micro-circuitry, test instrumentation and high speed photography. Expertise in these fields is certainly lacking within the CNEN organization and it is doubtful whether it could be provided by other Brazilian government organizations such as the Navy which does possess some capability particularly in electronics. There is no known computer capacity in Brazil adequate to handle significant problems in device design and simulation. The largest gap, of course, is the lack of fissionable material, with the production via gas centrifuges being apparently a long way away.

POLITICAL CONSIDERATIONS

4. Recent contacts by an Embassy officer with Professor Marcelo Damy de Sousa Santos, a former president of the CNEN, and other Institute of Atomic Energy officials have shed considerable light on the past policy and present potential of the CNEN as follows:

a. Professor Damy continues to hold strong nationalistic views which coincide quite closely with Brazil's avowed foreign policy in the nuclear field. Clearly, Professor Damy aspired to be a Brazilian

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Bhabha. In private conversations he admits quite frankly to having designed and pursued a development policy which had it been adequately staffed and supported would almost certainly have provided Brazil with a rudimentary device capability. That his plan failed can in no way be attributed to a lack of basic knowledge or intention on the part of the CNEN from the time that he assumed command until approximately the date of the revolution. When Castello Branco came to power, major changes were made in the top structure of the CNEN and systematic progress toward creating a scientific and technological base from which a device program could be launched seems to have been dropped. At the working level within the CNEN and particularly at the IEA, Professor Damy made a determined effort to staff the organization with people who were both qualified and shared his nationalistic point of view and determination. This organizational level was not greatly disturbed by the changes made at the time of the revolution. Consequently, with independent verification, it must be noted that a considerable reservoir of working level scientific and technological talent continues to exist within the CNEN which could provide a nucleus for a device program. One well-placed pro-American source in the IEA has characterized to an Embassy officer the IEA organization as being "a hot bed of silly nationalists who want a prestige bomb although they would never admit it publicly." While probably overdrawn there is undoubtedly more than a grain of truth in this characterization.

b. There has been some speculation that the difficulties being encountered by the CNEN in obtaining funds for its operations might have arisen from the publicly known difference of opinion on nuclear policy between the Foreign Minister and the Minister of Mines and Energy. Information available to the Embassy would tend to discount this speculation.

TECHNICAL ASSESSMENT

5. In the view of the Embassy the following technical assessment appears reasonable:

a. Largely due to the efforts of Professor Damy while he was in charge of the CNEN, Brazil has a small but reasonable scientific base upon which it could erect a nuclear device program if the political decisions to do so were made and the government were prepared to and capable of following through with the necessary funds and sustained effort.

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b. Because of the smaller existing staff resources and large technological gaps, the cost and effort to mount a realistic device program in Brazil would be considerably larger than would be the case in certain other countries, e.g., Canada, Israel and India.

c. The Brazilian technological base would not seem sufficient to support a production reactor program of reasonable size in anything like the near future, especially if such a program were to be domestically based and hence "safeguards-free."

d. The Embassy is inclined to doubt on the basis of information currently available the Brazilian claim (reported in Sao Paulo's 1706) to have the capability of building domestically modified centrifuges sufficient for a cascade capable of producing weapons-grade enriched uranium in significant quantities.

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