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The forbidden cooperation: South Africa–Brazil nuclear relations at the turn of the 1970s

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Abstract

Contributing to a global nuclear history, this article discusses Brazil's refusal to accept sensitive nuclear assistance from South Africa in the late 1970s. Relying on primary sources and oral history interviews, this study argues that despite their similar positions in the global nuclear order, Brazil's decision was connected to political and technological reasons.

Keywords: Brazil; South Africa; nuclear energy; nuclear proliferation.

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Introduction

In May 1979, the South African Atomic Energy Board (SAEB) opened a secret communication channel with Brazil through the Brazilian Embassy in Bonn, with the aim to collaborate in a sensitive area in the nuclear field. In exchange for heavy components for its nuclear reactors, South Africa offered to share its knowledge of a nuclear enrichment method, not unlike assistance Brasília had been acquiring for four years from West Germany. Despite many similarities to this pre-existing arrangement, Brazil decided not to cooperate with South Africa. This paper will discuss this heretofore largely unknown episode in Brazilian–South African relations and, more generally, in the global history of cooperation in the nuclear field[1]. Relying on oral history interviews and recently released Brazilian, South African, German and American primary sources, this study will explore the Brazilian decision not to cooperate with South Africa at the end of the 1970s[2].

[1] For an overview of cases and determinants of nuclear cooperation see Fuhrmann (2012) and Kroenig (2010).

[2] Existing literature on Brazil–South African relations focuses more on the diplomatic and commercial aspects of the relationship. See, for instance, Penna Filho (2001; 2008; 2013). The present analysis of West German, South African and U.S. archives did not reveal new elements in relation to these areas of study.

During the 1970s, the two countries were treading parallel paths in the nuclear domain. Pretoria and Brasília both strongly opposed the Nuclear Non-Proliferation Treaty (NPT), had ambitious atomic programs, received cooperation from West Germany, had large reserves of uranium, and were targeted by the United States' nuclear non-proliferation policies[3]. Above all, new restrictive measures in the nuclear market were pushing the two countries to look for new partners outside NPT members. However, for political and technical reasons, any attempts to cooperate in sensitive nuclear technologies were halted. In fact, from 1974 on, Brasília radically modified its policy towards South Africa, which, until then, had been Brazil's main commercial partner in Africa. A strong interest in the Portuguese-speaking African countries and in expanding its presence in the Third World led Brazil to support the anti-apartheid and anti-colonial policies promoted by developing and oil-producing countries. Whilst Pretoria's troops were advancing into the territory of the former Portuguese colony, in November 1975, Brazil was one of the first countries to recognize the Marxist government in Angola[4].

Given that the end of the 1970s and the beginning of the 1980s were marked by Brazil's search for nuclear partners outside the NPT, and given that the government in power was a conservative military regime which purchased nuclear material from Communist China, collaborated with Iraq, and had attempted to gain Pakistani assistance to develop a homegrown uranium centrifuge enrichment method, the Brazilian decision not to cooperate with South Africa can appear illogical[5].

This study aims to contribute to the debate between scholars of nuclear proliferation and global historians, focusing on the interaction between two major countries of the so-called **Global South**, namely Brazil and South Africa, in the nuclear field. The national approach, which is traditionally taken when analyzing the history of nuclear programs, has not considered the importance of international assistance in setting up atomic activities. Recognition of external actors' contributions, whether state or non-state, has led to re-examination of specific nuclear histories as part of a "global nuclear history" (Abraham 2004). Even if, in the opinion of many nuclear historians, the "diminution of the role of the state" represents an obstacle for a "fruitful exchange of ideas" between global and nuclear historians (Nuti 2017), it still proves fruitful in and of itself. This study analyzes the period of global transformation in the nuclear order that took place in the 1970s and was permeated by a North–South clash over the expansion of nuclear energy, both for civilian and military ends.

In recent years, a new historiography of the evolution of the global nuclear order has emerged, which considers not only the nuclear superpowers but also other actors that contributed to altering the nuclear nonproliferation regime. As a contribution to these new narratives on nuclear proliferation, this article will explore a little-known episode between two countries that opposed

[3] On the Brazilian case, see Patti and Mallea (2018), Patti and Spektor (Unpublished), Gall (1976). On the South African case see van Wyk (2018).

[4] On Brazil's recognition of the Marxist government in Angola, see Dávila (2011) and Melo (2009). On the South African presence in Angola, see Gleijeses (2002).

[5] Brazil collaborated or sought to collaborate in the nuclear field with those countries between 1979 and 1984. See Nedal (2013a; 2013b) and Fuhrmann (2012).

the stricter rules imposed by the industrialized nuclear countries, following India's detonation of a nuclear device in 1974. India's action was an undesired effect of the peaceful cooperation that had been provided by Canada since the mid-1950s.

This paper will shed light on the possibility, or impossibility, of collaboration between two countries with similar nuclear ambitions. It shows, above all, how one country rejected the offer of sensitive nuclear assistance. Unlike other cases of non-assistance (Kroenig 2010), where countries refuse to export dual-use technologies to possible nuclear weapons proliferators, this article discusses how a country with nuclear ambitions decided not to accept uranium enrichment technologies. This is, consequently, an unexplored form of non-assistance, in which a possible recipient refuses sensitive supplies for political reasons. The first two parts of the study will deal with the reasons in favor and those working against a possible nuclear cooperation, while the last part will focus on the specific 1979 South African proposal and the Brazilian reaction. Finally, it will examine the rationale behind Brazil's motivation not to cooperate with Pretoria.

Parallel paths towards nuclear energy: Brasília, Pretoria and the nuclear triangle with Bonn

Since the 1940s, South Africa (preeminently) and Brazil have been recognized as the holders of the largest reserves of atomic minerals. During the Second World War, the two countries supplied the Allies, especially the United States, with precious materials used both in the Manhattan Project and, later, the American atomic program (Helmreich 1986). At the beginning of the nuclear era, in discussions on the future of atomic energy within the United Nations, the two governments voted in the UN General Assembly against the internationalization of atomic minerals as proposed in the Baruch Plan (Helmreich 1986*;* Lima 2013). Nevertheless, the two countries continued to supply Washington with uranium (South Africa) and thorium (Brazil).

In the early 1950s, both started their own nuclear programs, each with different goals. During that period, South Africa's primary objectives were to expand its uranium production, to secure nuclear research capability, to train nuclear scientists in the United States and to acquire a research reactor under the "Atoms for Peace" Program (Spector 1990; Mazisa 1993). Brazil, on the other hand, designed a program in 1953 to master the nuclear fuel cycle in an attempt (following U.S. refusal) to obtain sensitive nuclear technologies from France and West Germany. Following a deep political crisis and President Getulio Vargas' suicide, the Brazilian government reviewed its nuclear ambitions and, similarly to South Africa, began to train its nuclear specialists in Western Europe and the United States, acquiring its first nuclear research reactor in 1957, after an agreement with Washington[6].

[6] On the origins of the Brazilian nuclear program, see Patti (2012; 2015), Camargo (2006), Oliveira (1999). For the guidelines of the first Brazilian nuclear program, see: Exposição de Motivos n. 32–12 October 1952, Secreto. Álvaro Alberto Personal Archive at the University of São Paulo (USP). On the training of nuclear scientists abroad see Patti (2014).

With these incipient nuclear activities, the two governments actively participated in the negotiations for establishing the International Atomic Energy Agency (IAEA) and were given a permanent seat on its board of governors, as the countries with the **most advanced** nuclear programs in their regions[7]. Until the mid-1960s, the two countries limited their nuclear activities predominantly to research, with a small exception in Brazil during the early 1950s. In those years (which coincided with the Nuclear Non-Proliferation Treaty's [NPT] first phase of negotiations), the Central Intelligence Agency (CIA) did not classify them as a direct threat to the nuclear order (Moeed 2009).

The year of 1965 represents a turning point for both Pretoria and Brasília. One year after the explosion of the first Third World nuclear device (Chinese), the two governments, for different reasons (security and prestige respectively), changed their attitude towards nuclear bombs. As a consequence of the Chinese nuclear test and rapid African decolonization, members of the South African cabinet and the South African Atomic Energy Board (SAEB) began to contemplate nuclear devices as a possible option for guaranteeing Pretoria's security against external threats (Spector 1990). Meanwhile, Brazil was at the beginning of a twenty-year period of military rule. During the discussions on the Latin America Nuclear Weapons Free Zone (NWFZ) and the NPT, Brazil defended its right to develop its own **peaceful nuclear devices indigenously**, and denied any weapons ambitions. The Treaty of Tlatelolco, which established the Latin America NWFZ, allowed Brazil to pursue that right. However, in the case of the Non-Proliferation Treaty, the superpowers' proposal to forbid non-nuclear countries to build peaceful nuclear devices, actually not distinguishable from atomic weapons, prevailed[8]. In 1968, Brazil and South Africa, for similar reasons, decided not to sign the NPT and continued to oppose the regime until 1991 and 1997 respectively. Both, in fact, aimed to produce peaceful nuclear explosives in the near future, and publicly declared the technology useful either to the mining industry or for engineering purposes.

Until the end of the Nixon administration, and above all up until India's peaceful nuclear explosion in 1974, South Africa and Brazil were still considered insignificant threats to the nuclear nonproliferation regime, even though the State Department was aware of the two countries' possible military plans[9]. Curbing the spread of nuclear weapons and sensitive technologies was not a priority in the foreign agenda for Nixon-Kissinger; they showed indifference towards Pretoria's and Brasília's nuclear ambitions[10].

In the mid-1960s, both countries were engaged in designing their nuclear projects with the explicit purpose of creating a national nuclear industry, mastering the uranium enrichment technology and, if necessary, developing atomic devices. While the Brazilian government stated its

[7] It is important to observe that in the case of Latin America, after a compromise in 1962, Brazil shared the permanent seat with Argentina, which had as advanced a nuclear sector as Brazil. See International Atomic Energy Agency [IAEA] (1997) and Ornstein and Carasales (1998). On the Global South and the creation of the IAEA, see Roerlich (2016).

[8] Brazil's opposition to the NPT, see Rosenbaum and Cooper (1970), Wrobel (2017), Patti (2012).

[9] *National Security Study Memorandum 156: Indian Nuclear Developments* – 1 September 1972. Secret / Sensitive / Eyes Only. Digital National Security Archive (DNSA).

[10] On the Nixon-Kissinger attitude toward nuclear proliferation see Brenner (1981), Gavin (2008), Maddock (2010), Wrobel (1986).

primary goal as building nuclear power plants, South Africa mainly focused on the development of a uranium enrichment process for producing nuclear fuel and, if needed, accumulating fissile material for nuclear devices.

In 1970, the Brazilian military regime, after an international bidding process, contracted the U.S. company Westinghouse to build its first light water reactor, and the United States Atomic Energy Commission (USAEC) to provide the nuclear fuel. In fact, the Brazilian national nuclear energy commission (*Comissão Nacional de Energia Nuclear* (CNEN)) considered the acquisition of enrichment technologies unviable. At that moment, West Germany represented a central actor in both countries' atomic programs. The existing literature usually focuses on the 1975 Brazilian–German nuclear deal, and does not consider the transfer of nuclear technologies to South Africa. Above all, it does not mention the first West German attempts to transfer sensitive nuclear technologies to Brazil in the late 1960s and early 1970s[11].

South Africa played an important role in that stage of Brazilian nuclear history. At late March 1976, after eight years of negotiations, Brazil purchased from South Africa the first cargo of uranium to be used in the first nuclear plant, which was supposed to start commercial operations in 1978. Brazilian companies *Furnas* and *Nuclebrás* hired the South African Nuclear Fuel Corporation (Nufcor) for the supply of uranium and hexafluoride uranium to permit its enrichment in the United States[12].

At the turn of the 1970s, as emerging nuclear markets, both South Africa and Brazil were the object of commercial interest from the West German nuclear industry. Bonn's purpose was to export knowledge, materials, technologies and reactors, thereby expanding its share in a nuclear market dominated by the United States. In the middle of the decade, and during the negotiations of the NPT, the West Germans issued secret proposals to both South Africa and Brazil to cooperate in the development of two different uranium enrichment processes. While, in 1967 and 1971, Brazil refused to acquire the centrifuge enrichment technology, South Africa (which had already obtained the UF_6 production technology from Great Britain) started to cooperate with a West German company in the development of a new method of isotopic separation to enrich uranium[13].

In July 1970, the South African government publicly declared that it had mastered a uranium enrichment process called the **helikon-vortex**, **unique in concept**[14]. This was a variation of the jet-nozzle method developed by professor Erwin Becker in the laboratories of Karlsruhe, and obtained by South Africa through the secret assistance of the West German firm Steinkohlen-Elektrizitats (STEAG), partially owned by the Bonn government. In April 1975, a pilot-scale

[11] The most comprehensive study on the South Africa–West Germany nuclear collaboration is Červenka and Rogers (1978).

[12] "Aquisição de urânio da África do Sul.", O Estado de São Paulo, March 30, 1976 (South African Uranium Deal Confirmed 1976). Despacho com o Senhor Ministro de Estado (Paulo Nogueira Batista para Ueki). Nuclebrás. Paulo Nogueira Batista's Personal Archive at the Centro de Pesquisa e Documentação sobre a História Contemporânea do Brasil of the Fundação Getulio Vargas in Rio de Janeiro (PNB).

[13] On the German proposals see Nogueira Batista (2000). Between 1969 and 1973, more than eleven Brazilian nuclear engineers were trained at Julich. On South Africa, see Spector (1990).

[14] As noted by Spector (1990), both South Africa (in 1970) and Brazil (in 1987) announced they had mastered enrichment capability through domestic methods and technologies.

enrichment plant known as the **Y-Plant**, which was never placed under international safeguards, began operating in Valindaba; by 1978, it began providing Pretoria with highly enriched uranium (HEU) (Hibbs 1993).

The inauguration of South Africa's enrichment facility roughly corresponded to the conclusion of FRG–Brazil negotiations for a massive nuclear cooperation, which included the creation of joint ventures for the construction of nuclear reactors, the transfer of spent fuel reprocessing and uranium enrichment technologies, as well as the supply of nuclear fuel by the West German–Anglo–Dutch Uranium Enrichment Consortium (URENCO). The deal, signed in Bonn on June 27, 1975, represented significant industrial transfer from an industrialized to an industrializing country.

In the face of the 1973 oil crisis, Brasília, which was experiencing an economic boom, revised its energy plans and decided, with the active support of the new President Ernesto Geisel (1974–1979), to partially rely on nuclear power for its future energy needs. Unlike previous years, Brazil sought to acquire the nuclear fuel production capability in order not to depend on external providers (as in the case of oil). In early 1974, it was clear to many cabinet members that Brazil needed to master the uranium enrichment technology to gain autonomy in the atomic field. This was confirmed at the end of June 1974 when, for domestic reasons, the USAEC indefinitely suspended future supply of nuclear fuel to many recipients in the developing world. This gave receiving countries, such as Brazil, additional reasons to claim they needed an autonomous capability to enrich uranium. Meanwhile, South Africa was not hit by this measure.

Brazil, like South Africa, received the jet-nozzle technology from West Germany. After that, Bonn refused, citing domestic and external reasons, to transfer the ultracentrifuge method it had already ceded to Brazil in a rudimentary way twenty years earlier, and offered again in the late 1960s (Gray 2012). STEAG, the same company which **clandestinely** collaborated with Pretoria, created a joint venture with the Brazilian nuclear company *Nuclebrás* called *Nuclei* (*Nuclebrás Enriquecimento Isotópico)* to transfer the jet-nozzle technology, initially on a laboratory scale, to Brazil[15]. Unlike South African, complete cooperation was internationally safeguarded and, for fifteen years, the fruit of any activity resulting from the 1975 nuclear deal would be under the strict control of Bonn. The Becker method was and is believed not to be useful for producing fissile materials. This is why the literature on this method, unlike that on the centrifuge method, is not classified. However, as 1974 West German documents in possession of Brazilians demonstrate, the Becker jet-nozzle could enrich until 90%. The production of more than 400 kilos of HEU between 1978 and 1990 by the South African-derived helikon-vortex method confirmed that, theoretically, the Brazilian pilot plant, if necessary, could provide Brasília with a nuclear weapons option if it underwent proper adjustments. As confirmed by recently declassified records, in 1982, the Brazilian National Security Council explored the possibility of enriching 50 kilograms of

[15] It was not the first time that Brazilians were offered the jet-nozzle technology for uranium isotopic separation. In the mid-1950s, then chairman of the Brazilian research council (*Centro Nacional de Pesquisa* CNPq)), Álvaro Alberto da Motta e Silva, received detailed information on the method developed by Erwin Becker. On the Brazilian interest see: Letter from Wilhelm Groth to Álvaro Alberto, Bonn – September 10, 1956. AA/USP.

uranium through the demonstration plant at the rate of 90%[16]. Even though Brazil ultimately discarded that possibility, specifically after the Navy had successfully mastered the more viable ultracentrifuge enrichment process in the mid-1980s, it is important to note that *Nuclebrás* worked with the jet-nozzle method until 1990, publicly describing it as the primary source of fuel for the domestic civilian program and for Brazilian exports[17].

Even if jet-nozzle technology could give Brazil weapons capability, the military government did not have the clear ambition to develop a nuclear device in those years.

At the end of 1976, during the Ford–Carter transition, there were several doubts in Brazil on the future of the nuclear program and the deal with West Germany. The last period of the Ford administration was characterized by sharp criticism of the Brazilian nuclear program. At that time and for the following years, several analysts considered Brazil and Argentina to be engaged in a nuclear arms race (pers. comm. Robert Pastor. Interview with the author, [phone], June 20, 2010). During the campaign, in the last weeks before the elections, Jimmy Carter and Gerald Ford proposed new and stricter international nuclear safeguards and a possible adhesion by Brazil to the NPT as a condition for cooperation. With other nuclear aspirants, including South Africa, suffering the same pressures, Brazil perceived that its cooperation with Bonn was at risk. The nuclear fuel charges for the reactors provided by West Germany were to be supplied by the Anglo-West German-Dutch consortium URENCO. Parallel to new U.S. proposals, the Netherlands threatened to condition the supply of enriched uranium to Brazil's participation in the NPT and the acceptance of full-scope safeguards. After several months of further negotiations with The Hague, Brazil obtained Dutch consent. However, this demonstrated the West German – Brazilian agreement's weakness and the possibility of new threats in the future.

As primary and journalistic sources have confirmed, the Brazilian government began discussing the future of its nuclear program internally. If Brasília's objectives included achieving the capacity to produce nuclear devices and to obtain the nuclear fuel cycle technology, should the government rely exclusively on the cooperation with West Germany? The problem seemed more evident in 1978, when U.S. Congress passed the Non-Proliferation Act, halting nuclear exports to countries that did not accept full-scope safeguards on their nuclear activities. This severely limited Brazil's possibility to purchase enriched uranium and to acquire technologies from West Germany and other industrialized countries. Brazil was in a deadlock. There were three options. The first was to continue to cooperate with West Germany exclusively, implementing an agreement under continuous threat. Secondly, Brasília could find a new partner among the countries opposing the NPT. The third option consisted of developing its own enrichment technology.

At the end of the debate, in March 1979, the **autonomous** option prevailed. Brazil set up a secret nuclear program, parallel to the civilian one, and in a few years developed, with a

[16] "Enriquecimento" – Coelho Dias to Paulo Nogueira Batista (*Nuclebrás* internal document) – June 16, 1982. PNBpn/c 1969.12.01.

[17] The jet-nozzle facility was officially closed by *Indústrias Nucleares Brasileiras* (INB)) in the early 1990s. After more than 15 years of work, the demonstration laboratory in Resende, close to Rio de Janeiro, and nuclear research center in Karlsruhe were still unable to produce enriched uranium. At that moment, the Brazilian government decided to apply the centrifuge method to the Brazilian nuclear industry (Patti 2015).

joint effort by civilian and military agencies, its own centrifuge enrichment process. Once the superiority of that latter method was demonstrated, in the early 1980s, Brazil reduced its efforts in the jet-nozzle technology, which was abandoned in 1990.

Despite this success, it should be remembered that Brazil had been focusing its efforts on the jet-nozzle during the 1970s. The similarities and particularities of the South African and Brazilian enrichment methods made the two countries possible partners. Although several authors have suggested that the uranium enrichment technology transferred in 1975 to Brazil was the fruit of the South African–German cooperation of previous years, according to new oral history interviews, one of the key members of the Brazilian nuclear program denied the existence of a nuclear triangle Brazil–West Germany–South Africa for developing a nuclear bomb (pers. comm. 2010)[18].

As one of the largest Brazilian newspapers, *O Estado de São Paulo,* has asked, "why did Brazil not search for enriched uranium [...] in South Africa, in spite of its cold attitude towards the Pretoria government?"[19]. The question seemed pertinent. After billions of dollars of investments in the nuclear deal with West Germany, and a consolidated relationship with Pretoria for the acquisition of uranium, what were the reasons that stopped the two possible partners from cooperating in such an important area for the future of nuclear Brazil?

Brasília's divergence with Pretoria

Despite the acquisition of uranium, the South African–Brazilian relationship during the second half of the 20th century was not and had never been excellent. Since the end of the Second World War, in fact, Brazil only kept low-level political relations with South Africa, continuously criticized the occupation of Namibia by South African forces, and was one of the most active voices at the UN for the independence of the former German colony (Penna Filho 2001).

Until the late 1950s, Africa had not been a priority for Brazil's diplomatic action. Since Brazil's independence, the continent had been substantially ignored by the government of Rio de Janeiro. Despite the important historical relationship between the two sides of South Atlantic, dating back to the colonial period, and despite the presence of a vast Afro-Brazilian community, Brazil's diplomatic action was more oriented towards Western Europe, South America and the United States. In that context, as the recipient of 90% of exports to the continent, South Africa represented Brazil's main commercial partner in Africa. The situation gradually changed at the beginning of the 1960s, when the last democratic governments (1961–1964) before the military coup adopted a new foreign policy – the so-called **independent foreign policy** – supporting decolonization in multilateral *fora* and a new relationship with Africa, albeit the position towards the independence of Portuguese colonies in the continent remained ambiguous almost until the end of Salazar's regime in Lisbon.

[18] Rex Nazaré Alves. Interview to CPDOC/FGV, April 27, 2010.

[19] The Dutch Decision and Nuclear Policy 1976.

Brazilian policymakers and intellectuals aimed to open up new space for political alliances and markets by revitalizing its relationship with Africa. The wave of African decolonization from the late 1950s to the early 1960s was the occasion to promote such action free from the ideological constraints of the Cold War. Brazil's President Goulart planned to visit Africa, but the 1964 *coup d'état* led to a reorientation of foreign policy. The military regime did not abandon the African policy but resumed the Cold War logic that supported Portugal, and engaged in designing possible defence alliances with African countries in the South Atlantic, in order to avoid the advance of communism in the area. In this sense, Pretoria and Brasília's political goals were similar, even if Brasília mildly criticized South Africa's apartheid and the illegal occupation of Namibia. Brazil did not adhere to the international campaign promoted by Third World countries against Pretoria, but rather adopted a "conscious pragmatism" in the troublesome relationship with the pariah state (Penna Filho 2013).

Due to Brazil's economic miracle in the early 1970s, the government decided to broaden its foreign policy and expand its market in Africa. In 1973, Brazil's minister of foreign relations, Mario Gibson Barboza, resumed the goals of the **independent foreign policy** and went on an extended tour of many sub-Saharan countries, which did not include South Africa. It was the first sign of Brazil's new African policy. Ernesto Geisel's administration (1974–1979) followed his predecessor's policy to raise Africa's profile in Brazil's new foreign policy. Unlike previous years, Brazil embraced an anti-colonial position and promptly recognized the independence of all the former Portuguese territories, where Brazil desired to expand its commercial, economic and cultural influence (Dávila 2011). In a pragmatic approach, Brazil's conservative military government was one of the first countries to establish formal diplomatic ties with the Marxist MPLA (People's Movement for the Liberation of Angola – *Movimento Popular de Libertação da Angola*) government of Angola, in November 1975. In the meantime, South Africa supported the invasion of Angola and continued to support UNITA (National Union for the Total Independence of Angola – *União Nacional para a Independência Total de Angola*). Besides the diminished commercial relevance of Pretoria, the situation in the former Portuguese colonies contributed to further deterioration of South Africa–Brazil relations and to a possible clash between the respective zones of influence.

Despite South Africa's desire to strengthen its ties with Brazil, as noted by Brazilian historian Pio Penna Filho (2001; 2013), Brasília took measures to reduce the relations in commercial, cultural, military, scientific, technological and diplomatic fields. When the first international sanctions were imposed on Pretoria, Brazil banned military sales, with the evident purpose, as in the nuclear sector, to avoid any possible association between the two governments. Within the United Nations, Brasília eventually joined the developing countries, intensifying its criticism against both apartheid and the illegal occupation of Namibia. For similar reasons, in 1976, the Brazilian cabinet opposed a South African proposal for naval cooperation in the South Atlantic. It would have been the first step for a military and political alliance in the South Atlantic, the South Atlantic Treaty Organization (SATO), which South Africa proposed again at the beginning of the 1980s, and Brasília continued to refuse it, as it does to the present date. Although the Brazilian navy and its strategists were initially interested in possible cooperation with the Vorster

government, the Brazilian ministry of foreign affairs (known as *Itamaraty*) had a different point of view, and it neutralized South Africa's action. Diplomats opposed the South African proposal, although Navy officials began negotiations on the Simonstown naval base.

In January 1978, while President Geisel forbade any kind of cooperation with Pretoria, the South African nuclear program became a matter of concern for Brazil[20]. After the Soviet, and later the French test, and the announcement, in July 1977, of a possible South African nuclear test in the Kalahari Desert, which was promptly denied by Pretoria, *Itamaraty* perceived three kinds of implications for Brazil. The first was connected with potential U.S. pressure on Pretoria to sign the NPT. Brazilian diplomacy was frightened by a new wave of American pressure on Brasília and other NPT opponents to join the international regime. In Brazil's perspective, a South African **precedent** could be perilous; with similar ambitions and similar technologies, South African adhesion to the treaty could weaken the anti-NPT front. It became clear that, while South Africa was developing its own nuclear arsenal, all Pretoria's declarations about joining the NPT were a move to appease the nuclear powers. However, the common West German origin of the Brazilian and South African enrichment methods could put West Germany's cooperation with Brazil under suspicion, thereby leading the international community to demand Brazil's inclusion in the regime. The Brazilian foreign ministry was also alert to possible nuclear tests in the Kalahari, as they might prove unsafe for Brazil, since the nuclear fallout could easily reach the Brazilian coast[21].

In conversations with U.S. officials, Brazil's foreign minister, Antônio Azeredo da Silveira (1978), expressed Brazil's distance from South Africa by:

> […] [considering] the South African case as dangerous for the safeguarded international nuclear trade; underlining the autochthone character of the South African nuclear development, evaluating the German participation in it as "small and unofficial"; stating that the "autonomous research" is done with no safeguards; adding that the South African adhesion to the NPT would not represent a guarantee in terms of security, since Pretoria can denounce it in three months."[22]

Minister Silveira reminded President Geisel that "Brazil does not cooperate with South Africa – directly or indirectly – in the nuclear field. We observe with extreme preoccupation the possibility of a South African development of nuclear devices."[23]

[20] Arquivos CPDOC ([n.d.], pr 1974.03.00/2).

[21] Arquivos CPDOC ([n.d.], pr 1974.03.00/2).

[22] Arquivos CPDOC pr 1974.03.00/2. Specifically, see "Desenvolvimento nuclear da África do Sul". pp. 15–16. On the possible South African adhesion to the NPT see also "Itamaraty still opposes the Non-Proliferation Treaty", Buenos Aires TELAM, August 26, 1977 in FBIS-LAT-77-167 on August 29, 1977. Page D2. In the article the Itamaraty spokesman and future foreign minister, Luiz Felipe Lampreia, "queried South African Prime Minister Vorster's statement that South Africa will sign the nonproliferation treaty if other countries like Brazil, India, and Argentina do so as well […], indicated that if the South Africans have decided to establish conditions for signing the agreement, that was their problem."

[23] Arquivos CPDOC EGpr 1974.03.00/2 (1710, 1718–3144.

In March 1978, Brazilians were preparing for a visit from U.S. President Jimmy Carter, in a moment of tension with Washington over nuclear issues. Brasília did not want to reinforce the U.S.' perception of possible nuclear weapons ambitions, as it was the case in South Africa. It is not clear why Silveira showed such concern about a possible South African bomb. Was he only concerned about further expansion of the nuclear club, or did Brazil perceive South Africa as a possible threat in the South Atlantic?

The available Brazilian documentation is clear on this point, but the oral history interviews with Brazilian diplomats refute the hypothesis of a South African–Brazilian nuclear rivalry. Despite these problematic relations in 1979, some weeks after the inauguration of President João Batista Figueiredo, South Africans presented an intriguing proposal for nuclear cooperation between the two countries.

The forbidden cooperation

In May 1979, the South African government opened a secret communication channel with Brazil through the Brazilian Embassy in Bonn[24].

In the initial talks, South African diplomats informed Brazil that their enrichment method, derived from the West German jet-nozzle, had been producing enriched uranium since 1975. They suggested starting a "fruitful exchange of information and experiences" between the two countries[25].

Negotiations were established under the initiative of the South African Atomic Energy Board, not the government, because of the **cold relations between Brazil and South Africa in the past few years**.

SAEB suggested that, although politically the relationship seemed problematic, the obstacles could be overcome through technical cooperation. The scientific *attaché* at the South African Embassy in Bonn confirmed the rumors that South Africa had been cooperating since 1974 with Professor Becker, the creator of the jet-nozzle enrichment method[26]. According to the South African scientist, a feasibility study demonstrated the superiority of the South African enrichment method – Helikon, also derived from the Becker system.

In 1977, political problems such as the international sanctions against the South African government and its international partners led West Germany to suspend nuclear cooperation with Pretoria. Despite having to reduce its ambitions regarding the size of the uranium enrichment program due to financial reasons, the South African diplomat who approached Brazilians confirmed that the Pretoria government maintained its secret program with the **collaboration of unknown partners**.

[24] Arquivo AHMRE (1979, Maço 664.2 (XX)); Arquivo AHMRE (1977, Caixa 307).

[25] October 29, 1979. Top secret cable from Brazilian Embassy in Bonn to Brasília, Nuclear energy, South Africa, uranium enrichment. AHMRE. Brazil–South Africa Nuclear Relations. Wilson Center, https://www.wilsoncenter.org/publication/brazil-south-africa-nuclear-relations (accessed July 31, 2018).

[26] See also West German Comments on Nuclear Ties with South Africa – 9 October 1975 – Limited Official Use – From AmEmbassy Bonn to SecState. AAD.

South Africa was interested in the Brazilian industrial capability to build heavy equipment for their nuclear reactors, which Pretoria could not acquire in the international nuclear market because of the restrictions against countries opposing the international nonproliferation regime.

While the proposal would appear very interesting for the further development of the Brazilian nuclear program, some interviewees confirmed that cooperation between Brasília and Pretoria was not established due to the problematic relations between the two countries, and due to the strong opposition of the foreign ministry. As a diplomat, then member of the Brazilian National Security Council, confirmed in a recent interview, the proposal was taken into consideration but was declined, in line with Brazilian foreign policy (pers. comm. Luiz Augusto de Castro Neves, the author, Rio de Janeiro, January 15, 2012)[27].

It was not the first time that Brasília refused to cooperate with Pretoria in the nuclear field, with the critical exception of the purchase of uranium from Nufcor. A few years after the deal with West Germany, both *Itamaraty* and the Presidency forbade any kind of contact with Pretoria's nuclear authorities. In 1977, Maurício Grinberg, director of *Nuclebrás*' nuclear fuel division, planned to visit the South African nuclear enrichment plant. As the scientist recently revealed, a possible collaboration with the South Africans could have been highly fruitful for Brazil. Brazilians were unsatisfied with the Becker method and with cooperation with West Germans. The recently imported jet-nozzle demonstration laboratory that was supposed to enrich the first grams of uranium did not work. Moreover, the joint research group at the laboratories in Karlsruhe had not obtained relevant results. This only augmented *Nuclebrás* personnel's frustration, who perceived cooperation with South Africa as a possibility to improve their enrichment technology. According to key members of *Nuclebrás*, the jet-nozzle-derived enrichment method used by South Africa could be adapted to Brazil's needs. Grinberg and the Brazilian company established contact with SAEB, which was willing to receive the visit, and the scientist was ready to fly to South Africa. On the eve of his trip, however, *Itamaraty* denied authorization to fly to South Africa (pres. comm. Mauricio Grinberg, the author, February 16, 2012)[28]. Political reasons prevailed over the possible acquisition of new knowledge and technology crucial for Brazil's nuclear future.

Brazilian government maintained a hostile position towards the South African atomic program until the end of apartheid. Attempts at cooperating or connecting the Brazilian and South African programs were also refused during the 1980s. This is clear in at least three occasions. In August 1980, the chairman of the South African Commission of Inquiry on the reform of the atomic program, Abraham Johannes Roux, sent Hervásio de Carvalho, chairman of CNEN, a letter requesting information on the Brazilian nuclear program. The Brazilian foreign minister Ramiro Saraiva Guerreiro instructed Carvalho to provide no details about the Brazilian atomic projects.

[27] Luiz Augusto de Castro Neves, Interview with the author, Rio de Janeiro. January 15, 2012. Arquivo AHMRE, Maço 664.2 (XX). Arquivo AHMRE, Caixa 307.

[28] Mauricio Grinberg, interview with the author, February 16, 2012.

Unlike previous years, the two nuclear energy commissions could not keep an open channel of communication (pers. comm. Sérgio Corrêa da Costa) [29].

Two years later, in 1982, the chairman of the South Africa Atomic Energy Board, De Villiers, discussed with the Brazilian *chargé d'affaires* in Pretoria about the difficulty South African scientists faced in obtaining visas for research missions to Chile. De Villiers reminded the Brazilian diplomat that "Ten years earlier it would have been easier to receive a visa, since the two countries were close to setting up a collaboration in the nuclear field" (pers. comm from embaixada do Brasil em Pretória)[30].

Conclusion

The history of nuclear programs is usually seen from a national perspective, without consideration for the crucial role of international cooperation in establishing an atomic program, be it for civilian or military ends. A global nuclear history allows us, consequently, to analyze how a country is benefitted or constrained by external factors. This article explores an episode of possible cooperation between two states that could have been mutually advantageous, at a moment in which international nuclear nonproliferation norms limited their quests for nuclear autonomy. The similarities between the two countries – both rich in nuclear minerals, both opposing the NPT, and with the ambition to master the production of atomic energy – could have led to fruitful cooperation at the industrial and technological levels. The sole difference was that of their different security threats. While South Africa eventually built its nuclear deterrent, Brazil never took the same path.

Even if Brazilian and South African scientists favoured a possible exchange in the nuclear field, political and probably also technical reasons impeded it. From the mid-1970s onwards, the Latin American country participated in the international anti-apartheid campaign that led to South African diplomatic isolation. Unlike previous years, economic reasons could no longer justify a different approach. At a moment in which Brazil was building new relations with the former Portuguese territories in Africa, it would be hard to cooperate with a country that was threatening the stability of the Angolan and Mozambican governments. The price to pay would be too high.

Finally, technical reasons, such as the decision taken in 1979 to **autonomously** develop centrifuges for uranium enrichment, also go some way towards explaining the reason for Brazil's refusal. This study demonstrates how high politics, such as the international anti-apartheid campaign or the possibility of retaliation by other Third World countries, determined the Brazilian refusal to accept sensitive nuclear technologies. Despite its nuclear ambitions, which did not rule out the possibility to construct a nuclear device, Brazil discarded the South African offer.

[29] Arquivo AHMRE (1967, Maço, 1967).

[30] *África do Sul. Energia nuclear*. Telegrama recebido. Da embaixada do Brasil em Pretória para Brasília. 26 September 1982. Secreto. AHMRE -B.

Brazil's decision impeded its national nuclear program to improve its uranium enrichment method, and prevented it from achieving goals such as producing either nuclear fuel or fissile material. As shown in this article, the jet-nozzle enrichment process and the South African-derived method could produce highly enriched uranium. It represented a technological and strategic loss that Brazil finally overcame when it mastered the uranium ultracentrifuge technology in the mid-1980s.

Even though Brazil did eventually decide not to produce nuclear weapons, during the late 1970s, it declared no intention to abandon the ambition to develop atomic devices. This piece shows, for the first time, a case of sensitive non-assistance caused by the recipient's refusal of an offer made from a provider of sensitive nuclear technologies. This article contributes not only to the literature about nuclear assistance, but also to a new wave of historiography about the evolution of the nuclear order in the 1970s, at a time of great transformation, in a field thus far dominated by the main nuclear powers. In that period, the global South emerged as a new voice, claiming for nuclear autonomy and fairer norms on the nuclear nonproliferation regime.

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