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Nuclear twins: French-South African strategic cooperation (1964–79)

Anna Konieczna 

ABSTRACT

This article sheds light on the French strategic nuclear assistance to South Africa between 1964 and 1979 based on untapped primary sources from both countries. It documents a vast cooperation between France and South Africa from nuclear and military technology to tacit knowledge. It shows that, contrary to common assumptions, this nuclear cooperation was not unidirectional but benefited the nuclear programs of both countries. It also argues that French leaders were fully aware of the risks of proliferation. The article draws conclusions on how to redefine nuclear assistance and write global Cold War history so as not to keep such cooperations invisible.

KEYWORDS

France; South Africa; strategic assistance; uranium supplies; nuclear technology

What role did France play in South Africa's nuclear programme? And what does this case study reveal about France's nuclear history, its assistance to foreign countries, and its policy towards non-proliferation during the Cold War? Investigating these issues fills a gap in the diplomatic and transnational history of the nuclear age as well as nuclear security studies within the field of International Relations. This paper shows that France provided strategic nuclear assistance to the South African nuclear weapons programme by participating in the development of the South African nuclear fuel cycle and the early development of South African missile technology. In return, France secured the provisions of unsafeguarded uranium and received funding and technology necessary for the modernisation of its military and nuclear industry. The paper also argues that the French sensitive nuclear assistance was intentional.

To date, both sides of this cooperation have been understudied and underestimated. Scholarship on French nuclear history has been limited and has not focused on strategic nuclear assistance from and to foreign countries.¹ It started documenting US assistance to the French nuclear weapons programme, but did not envisage the connection between nuclear assistance for South Africa and the development of the French nuclear weapons programme.² The same scholarship overlooks French cooperation with South Africa and focuses only on Israel, India, Pakistan, Japan, Taiwan, and the denied pledges of

CONTACT Anna Konieczna  anna.konieczna@sciencespo.fr

¹See the critique on this very point by Jean Klein, "Dominique Mongin. La bombe atomique française. 1945–1958," *Politique étrangère* 62, no. 4 (1997): 666–7.

²Bruno Bourliaguet, "Les technocrates et les 'relations spéciales' franco-américaines, 1969–1973," *Relations Internationales* 165, no. 1 (2016): 117–34; Jacques Villain, *La force nucléaire française: l'aide des États-Unis* 35 (Paris: ISC, 2014); Maurice Vaisse, "Les Relations spéciales franco-américaines au temps de Richard Nixon et Georges Pompidou," *Relations Internationales* 119 (2004): 345–62; Maurice Vaisse, "Un dialogue de sourds: les relations nucléaires franco-américaines 1957–1960," *Relations Internationales* 68 (1991): 407–23; and Richard H. Ullman, "The Covert French Connection," *Foreign Policy* 75 (1989): 3–33.

assistance to South Korea.³ Similarly, scholarly literature on South African nuclear history neglects the role of France in the making of the country's nuclear programme.⁴

This article proposes modifying the approaches to proliferation and nuclear assistance in three ways to better account for the scope of this largely under-researched relationship in the nuclear field. First, analysis of the strategic nuclear assistance must focus on the process of acquiring nuclear weapons and not exclusively on the endpoints of proliferation. As a consequence, indicators of the direct weapons support should include more than the transfer of weapon design, fissionable material, and reprocessing or enrichment technology – three elements usually defined as sensitive in the scholarly literature.⁵ In addition, they have to consider the entire fuel-cycle technology and take into consideration either the plutonium generating heavy-water reactors or the uranium conversion technology. Moreover, a focus on the process rather than the outcome requires bringing to light what Michael Dennis calls the 'tacit knowledge', that is, the training and acquisition of skills necessary to the process of building the atomic bomb.⁶

Second, scholarly literature should not portray nuclear cooperation and assistance as a unidirectional relationship driven exclusively by Cold War alliances or strategy. Scholarly literature needs to look further at the complementarity of the nuclear programmes in terms of the security of supplies, technology, and cost-effectiveness. If we assume, following Meyer, Stoll, Jo, and Gartzke that the possession of fissionable materials such as uranium or market access to them is one of the indicators of a country's nuclear capability, we should consider the South African apartheid regime and not only the United States as a provider of nuclear assistance to the French nuclear weapons programme.⁷ This part of the paper draws on Edward Kołodziej's analysis of French arms sales and his claim that France's security since the early Cold War indeed relied on the economic model of its military industry.⁸ This article applies his analysis to the French nuclear programme.

³On French views about proliferation, see Benoît Pelopidas and Nick Ritchie, "European Nuclear Nationalism: UK and French Perspectives on Nuclear Disarmament," in *Global Nuclear Disarmament: Strategic, Political, and Regional Perspectives*, ed. Nik Hynek and Michal Smetana (London: Routledge, 2016), 225–50; Florent Pouponneau, *La politique française de non-prolifération nucléaire: de la division du travail diplomatique*, Enjeux internationaux 34 (Brussels: P.I.E. Peter Lang, 2015). On Israel see Frédérique Schillo, *La politique française à l'égard d'Israël, 1946–1959, Histoire* (Brussels: André Versaille, 2012). On India see the articles by Jayita Sarkar, for instance Jayita Sarkar, "Wean Them Away from French Tutelage: Franco-Indian Nuclear Relations and Anglo-American Anxieties during the Early Cold War, 1948–1952," *Cold War History* 15, no. 3 (2015): 375–94. On pledges to South Korea, Or Rabinowitz and Jayita Sarkar, "It Isn't over until the Fuel Cell Sings: A Reassessment of the US and French Pledges of Nuclear Assistance in the 1970s," *Journal of Strategic Studies* 41, nos 1–2 (2018): 275–300. On the cases of French sensitive assistance to foreign countries, Matthew Kroenig, "Exporting the Bomb: Why States Provide Sensitive Nuclear Assistance," *American Political Science Review* 103, no. 1 (2009): 113–33.

⁴Most recently, see Nic Von Wielligh and Lydia Von Wielligh-Steyn, *The Bomb: South Africa's Nuclear Weapons Programme*, translated edition (Pretoria: Litera Publications, 2016); David Albright and Adrea Stricker, *Revisiting South Africa's Nuclear Weapons Program: Its History, Dismantlement, and Lessons for Today* (Washington, DC: CreateSpace Independent Publishing Platform, 2016); Helen E. Purkitt and Stephen F. Burgess, *South Africa's Weapons of Mass Destruction* (Bloomington, IN: Indiana University Press, 2005); and Richardt Van Der Walt, Jan Van Loggerenberg, and Hannes Steyn, *Armament and Disarmament: South Africa's Nuclear Experience* (Pretoria: Network Publishers, 2003). [TQ8]

⁵For the focus on enrichment and reprocessing see Kroenig, "Exporting the Bomb"; Matthew Kroenig, *Exporting the Bomb: Technology Transfer and the Spread of Nuclear Weapons* (Ithaca, NY: Cornell University Press, 2010) [TQ9]; and Matthew Fuhrmann, *Atomic Assistance: How 'Atoms for Peace' Programs Cause Nuclear Insecurity* (Ithaca, NY: Cornell University Press, 2012).

⁶Michael Aaron Dennis, "The Less Apparent Component – Tacit Knowledge as a Factor in the Proliferation of WMD: The Example of Nuclear Weapons," *Studies in Intelligence* 57, no. 3 (2013): 1–9.

⁷For the overview of the indicators suggested by these authors see: Scott Sagan, "The Causes of Nuclear Weapons Proliferation," *Annual Review of Political Sciences* 14, no. 1 (2011): 225–45.

⁸Edward A. Kolodziej, *Making and Marketing Arms: The French Experience and Its Implications for the International System* (Princeton: Princeton University Press, 1987).

Third, the intentions of the leaders of nuclear-capable states with regard to proliferation have to be carefully reassessed. Intentions, as Matthew Kroenig and Henrik Hiim emphasise, are one of the factors that helps us understand if sensitive nuclear assistance constituted direct nuclear weapons support.⁹ Scholarship argues that French decision-makers actively opposed any strategic nuclear assistance to foreign countries so that such assistance resulted from the independent activity of autonomous sub-state actors, or from conflicts within the French executive branch.¹⁰ This leads to a dispute within scholarly literature about France's attitude towards the non-proliferation regime during the Cold War. French scholarship focuses on the decision-making process and claims that after the period of de Gaulle's contestation of the superpower monopoly, French presidents willing to improve France's relations with the United States aligned themselves with the American policy of non-proliferation.¹¹ Recent English-language scholarship challenges such a linear reading of French nuclear history. It focuses on international negotiations, namely in the framework of the Nuclear Suppliers Group (NSG) set up in 1974, and reveals that France was reluctant to endorse a comprehensive system of safeguards for the export of sensitive nuclear technology.¹² To understand the intentions of the French leaders, this article uses the indicators of strategic nuclear assistance proposed by Henrik Hiim in his work on China and nuclear weapons proliferation.¹³

This paper makes these arguments based on newly declassified archives in France and South Africa. Sources include the documents produced by public institutions such as the French and South African Departments of Foreign Affairs, the South African and French Departments of Defence, the former South African Department of Mines, the French Ministry of Industry, the South African Embassy in Paris, and the French Embassy in Pretoria/Cape Town. Several documents come from the archives of private institutions or businesses, as well as the private papers of South African political or military leaders, and French policymakers. This paper also reinterprets some South African primary sources previously uncovered by Gabrielle Hecht in her work on French/South African nuclear relations.¹⁴

⁹Matthew Kroenig, "Exporting the Bomb," 113–33; Henrik Stålhane Hiim, *China and International Nuclear Weapons Proliferation: Strategic Assistance* (London: Routledge, 2018).

¹⁰This is visible in claims that de Gaulle did end French cooperation with Israel when he returned to power in 1958 and that he was not aware of further cooperation. See Maurice Vaisse, *La grandeur: politique étrangère du Général de Gaulle, 1958–1969* (Paris: Fayard, 1998); Georges-Henri Soutou, "La France et la non-prolifération nucléaire. Une histoire complexe," *Revue historique des armées* 262 (15 March 2011): 35–45; and Schillo, *La politique française à l'égard d'Israël, 1946–1959*, 879–98. On the autonomy of sub-state actors, see Pouponneau, *La politique française de non-prolifération nucléaire*; Florent Pouponneau and Frédéric Mérand, "Diplomatic Practices, Domestic Fields, and the International System: Explaining France's Shift on Nuclear Non-Proliferation," *International Studies Quarterly* 61, no. 1 (2017): 123–35; and Nicolas Blarel and Jayita Sarkar, "Substate Organisations as Foreign Policy Agents: New Evidence and Theory from India, Israel, and France," *Foreign Policy Analysis* 15, no. 3 (2019): 413–31.

¹¹Soutou, "La France et la non-prolifération", 35–45; Pouponneau, *La politique française de non-prolifération*

¹²James Cameron and Or Rabinowitz, "Eight Lost Years? Nixon, Ford, Kissinger and the Non-Proliferation Regime, 1969–1977," *Journal of Strategic Studies* 40, no. 6 (2017): 839–66; William Burr, "A Scheme of 'Control': The United States and the Origins of the Nuclear Suppliers' Group, 1974–1976," *The International History Review* 36, no. 2 (2014): 252–76; and Isabelle Anstey, "Negotiating Nuclear Control: The Zangger Committee and the Nuclear Suppliers Group in the 1970s," *The International History Review* 40, no. 5 (2018): 975–95.

¹³Hiim, *China and International Nuclear Weapons Proliferation*, 17–25.

¹⁴Gabrielle Hecht, *Being Nuclear: Africans and the Global Uranium Trade* (Cambridge, MA: MIT Press, 2012); Gabrielle Hecht, "On the fallacies of Cold War nostalgia: Capitalism, Colonialism, and South African Nuclear Geographies", in *Entangled geographies and Technolitics in the Global Cold War*, ed. Gabrielle Hecht (Cambridge, MA: MIT Press, 2011), 75–99.

Making French nuclear cooperation with South Africa visible

The classic definition of strategic nuclear assistance makes the role of France in the development of the South African nuclear military programme invisible. By moving attention away from the endpoints to the process of acquiring the nuclear weapons, we can see, however, that France played an active role in the development of the South African nuclear programme. Its assistance included the transfer of sensitive technology as well as ‘tacit knowledge’.

French strategic nuclear assistance to South Africa began in the context of the 1963 Security Council debates on sanctions against the apartheid regime. Between 1963 and 1964, France and South Africa passed what could be referred to as a ‘uranium for weapons and technology deal’. The deal was a set of six separate commercial or technical assistance agreements in the sectors defined as strategic by both partners: provision of uranium; guided weapons systems; electronic warfare; the aircraft industry; and the space programme.¹⁵ Several state research institutions (Commissariat à l’Energie atomique [CEA], Atomic Energy Board [AEB], Centre National des Etudes Spatiales [CNES], Council for Scientific and Industrial Research [CSIR]), public and private industrial companies (Société nationale des Poudres et explosives [SNPE], African Explosives and Chemical Industry [AECI], Thomson Huston, and Sud-Aviation) participated in the operation. The letters of intent exchanged by the CSIR and Thomson Huston in February and April 1964 were the most comprehensive. The French company undertook to provide the Council with assistance in the development and manufacture of a guided weapons system in South Africa. It included the training of South African engineers in France along with technical assistance in the development of a Guided Weapons Centre specialising in the research, development, assessment, and manufacture of these weapons, as well as the construction of a missile firing range.¹⁶

In pursuance of the ‘uranium for technology and weapons deal’, France laid the foundations of a South African nuclear weapons programme. The French Commissariat à l’Energie atomique and the French nuclear industry participated actively in the development of the South African nuclear fuel cycle. First, they played a key role in building the South African uranium conversion industry. Such an industry is an essential element of the nuclear fuel cycle. Before the yellow cake is transformed into enriched uranium metal, it has to be converted to uranium tetrafluoride (UF₄) and hexafluoride

¹⁵It included: exchange of letters between Francis Perrin and A. J. A. Roux on the training of South African engineers by the CEA, Roux to Perrin, 16 July 1963 and Perrin to Roux, 16 July 1963, BPA, 8, 18.25, vol. 2, South African National Archives (hereafter Pretoria, South Africa: SANA); exchange of letters for the provision of uranium, 31 January 1964, note, ‘South African uranium,’ Atomic Affairs Division to Georges Balay, the French Ambassador in South Africa, 15 June 1965, 8/QA, Box 54, Direction Afrique Levant (hereafter DAL), Afrique du Sud (1960–65), Archives Ministère des Affaires étrangères de France, (hereafter La Courneuve, France: AMAE); an agreement between the CSIR and the French CNES for the construction of the French satellite-tracking station in Paardefontein, near Pretoria, signed on 6 January 1964, Balay to Quai d’Orsay in Paris, 6 January 1964, Box 77, DAL, Afrique du Sud (1960–65), AMAE; exchange of letters for the cooperation between the SNPE and AECI in the field for the local production of propellants, H. R. Meintjes, South African military attaché to Secretary for Defence, 26 May 1964, File MAP 70/15/1/1, Military attaché in Paris (hereafter MAP), archives of South African National Defence Forces (hereafter Centurion, South Africa: SANDF); an agreement between the CSIR and Thomson Huston (see below); an agreement between the CSIR and Sud-Aviation for technical assistance in the construction of an aircraft industry.

¹⁶Memorandum, ‘Technical assistance proposals for South Africa,’ South African Department of Defence to Thomson Huston, 20 February 1964; letter of intent, ‘“Cactus” system proposal,’ Gerald Cauvin, marketing manager of Thomson Houston, to J.P. de Villiers, Secretary for Defence, 22 April 1964; letter of intent, ‘Missile Firing Range and CSIR Guided Weapons system,’ Cauvin to de Villiers, 22 April 1964, Secretary of Defence (hereafter DC), 202.7.1 vol. 1, Group 1, SANDF.

(UF6) in the plants erected for this purpose. From 1966 onwards, the CEA's centres in Le Bouchet and, from 1968, the Pierrelatte installation carried out several test conversions of South African ore to UF4 and to UF6 in cooperation with the National Institute of Metallurgy (NIM) and the parastatal company Nuclear Fuels Corporation (NUFCOR). French companies such as Société d'Etudes et de Travaux pour l'Uranium (SETU), Société des Usines Chimiques de Pierrelatte (SUCP), Société de Raffinage d'Uranium (SRU), or UGINE Kuhlman provided technical details of various nuclear installations, market assessment, production costs, and adapted designs for the conversion plants for local production of UF4 and UF6 in South Africa.¹⁷ Full-scale industrial projects followed. French nuclear companies built two uranium conversion installations in South Africa: the UF4 plant (SETU) in 1968 at NUFCOR's central calcining works in Zuurbekom and the UF6 plant (Comurhex and Péchinay/UGINE) in 1975 for the Uranium Enrichment Corporation (UCOR) at Pelindaba.¹⁸

Second, the French CEA assisted South Africa with the development of the military enrichment installation at Valindaba under the cover of civil cooperation. The South African government approved the construction of uranium enrichment installations in April 1969. Driven by cost-effectiveness calculations, the project, coordinated by the newly created semi-private company UCOR, was to rely on two installations: the pilot plant (Y Plant) for the production of the highly enriched uranium (HEU) for military use and the full-scale enrichment plant (Z Plant) for the commercial production of low enriched uranium (LEU) for nuclear energy programmes.¹⁹

The French CEA and UCOR signed a cooperation agreement on the commercial production of enriched uranium based on the South African enrichment process on 26 February 1974. This agreement began with feasibility studies (codename: PUMA), which took place between May 1974 and February 1975 and consisted of several rounds of conversations between French and South African scientists. These feasibility studies included reciprocal visits of the French and South African scientific missions to the military enrichment installations in Valindaba and Pierrelatte. During this step, the CEA's teams prepared the economic and technological evaluations of the South African process, which included the assessment of the market, as well as the definition and evaluation of unresolved technical problems and development costs of the full-scale commercial plant.²⁰ Even though the cooperation agreement signified that the second step was optional, in May 1975, André Giraud, Administrator General of the CEA, was planning to offer a three-year secret consultancy in the construction of the prototype of the commercial enrichment plant (the mini Z project). The CEA and the AEB probably reached agreement one year later, in June 1976.²¹

The first operations of the Y Plant started in October 1974, which means that the CEA was involved in the initial or whole commissioning of the plant. The French missions who travelled to South Africa during this period provided the negative guidance with

¹⁷Records of the NUFCOR, Uranium Technical Advisory Committee, folders 1–174 (hereafter UTAC), Goldfields papers, Rhodes University, Grahamstown, South Africa (hereafter RU).

¹⁸Conversion of UF4 to UF6, Record of discussions held in Johannesburg amongst representatives of SUCP, CEA, NIM and NUFCOR on 7, 8, and 12 November 1968, UTAC, RU.

¹⁹Report, 'Summary of the negotiations that took place between the AEB and the CEA leading to the formal contract for the supply of a UF6 pilot plant, prepared by R.E. Robinson.' Undated, file BTS 137/11/23/2/5 Vol 2, Department of International Relations and Cooperation, South Africa (hereafter Pretoria, South Africa: DIRCO).

²⁰For the summaries of the feasibility studies see: BTS 137/11/23/2/5 Vol 2.

²¹The verbatims of conversations and official documents on the joint enrichment plant project are available in file BTS 137/11/23/2/5 Vol 2, DIRCO.

regard to the nuclear security of the Y Plant installations. The first feedstock of unsecured UF₆ for the enrichment installation was also reportedly imported from France.²² Moreover, both the Y Plant and the prototype of the Z Plant (mini Z Plant) were built in proximity to each other, which allowed – if secret consultancy continued – for the free circulation of technicians between these two installations.²³ The Y Plant became operational in 1979 and the construction of the Z Plant started the same year.

Hennie van Vuuren further suggests that South African scientists, together with their British and American counterparts, were invited by the French authorities to monitor the French nuclear tests in the Pacific Ocean that started in 1966.²⁴

In the framework of the military cooperation, French military research institutions and private companies offered expertise and technological assistance with the early development of the South African nuclear weapons programme. Since 1964, Thomson Huston and Matra had made an important contribution to the work of the National Institute of Defence Research (NIDR). The NIDR was set up in 1963 by the CSIR to undertake research on missile technology and electronic warfare.²⁵ Sixteen engineers from the NIDR were trained in the laboratories of Thomson Huston and Matra and participated in the research and development project of a ground-to-air missile for defence against low altitude objects, known as the ‘Cactus/Crotale’ missile. The first experimental test of the system took place in late November 1965 at the French Missile Centre in Colomb Béchar, Algeria.

The training of South African engineers focused initially on the fundamental characteristics of the missile design (electronics, mechanics, aerodynamics, proximity fuse, and propulsion). However, as the cooperation consolidated, its scope was extended to include fellowships in the French schools coordinated by the Direction ministérielle pour l’armement (DMA) – Ecole des Poudres and Ecole Nationale Supérieure de l’Armement. In early 1966, South African propulsion engineers applied for training in the French state or private laboratories specialising in ballistic technology for the French nuclear weapons programme: SNPE’s plants at St-Médard-en-Jalles; ballistic laboratories in Sevran and Le Bouchet; and the Ammonium Perchlorate Plant of Péchiney Saint Gobain.²⁶ In the 1970s, the NIDR in Somerset West worked closely with the AEB’s Research Development Division on the feasibility studies, and then the development of the Peaceful Nuclear Explosives (PNE) programme. The NIDR provided the space for the development and test facilities and brought to the project its expertise in the fields of ballistic technology, the manufacture of guns and propellants, and sophisticated measurements.²⁷

France played a key role in the early development of South African missile technology. In the early stage of cooperation, French companies provided the CSIR and South African Department of Defence with technical specifications or licences for the production of short-range missiles. In September 1964, following a secret request from the president of the CSIR, Thomson Huston handed over the secret preliminary study on the feasibility of the ‘Masurca’

²²Albright and Stricker, *Revisiting South Africa’s Nuclear Weapons Program*, 54.

²³David Albright and Mark Hibbs, “South Africa: The ANC and the Atom Bomb,” *Bulletin of the Atomic Scientists* 49, no. 3 (1993): 35.

²⁴Hennie van Vuuren, *Apartheid Guns and Money: A Tale of Profit* (London: Hurst, 2019), 225.

²⁵The CSIR initially created the National Institute for Rocket Research and Development and changed its name to the NIDR in 1965.

²⁶At least three collections in SANDF’s archives provide details on the ‘Cactus’ project, its different elements, and training of South African engineers. See: Chief of Staff/Commandant general (hereafter HVS) 202/7/1 vol. 1–7, Group 1; DC 17,850/324/13 vol. 1–2, Group 1 as well as MAP 70.26.2 vol. 1–5.

²⁷Albright and Stricker, *Revisiting South Africa’s Nuclear Weapons Program*, 26–7.

system in South Africa along with its specifications, even though the company previously clearly stated that such cooperation had to be approved by the French president.²⁸ Accordingly, in 1965, South Africa purchased 164 air-to-air Matra R530 'missiles'.²⁹ Both types of weapons included short-range rockets powered by two-stage propulsion motors. The 'Cactus' R&D project itself was a development project for local missile design. In 1969, Thomson Huston, Matra, and the Munitions Production Board (MPB) (the future Armscor) jointly prepared the final prototype of the 'Cactus' system before agreeing on its joint commercialisation.³⁰

South African nuclear weapons design might have potentially drawn on earlier French assistance. From the 1970s, South Africa sought to develop tactical as well as long-range missiles.³¹ The Kentron Circle produced the first deliverable nuclear device in 1987. It was named Hamerskop ('Hammerhead' in English) and was to be integrated into a precision-guided glide bomb named 'Raptor'. As Albright and Stricker explain, 'Raptor' was 'developed as a smart weapon for conventional use' and its 'range was about 60 kilometers'.³² South African research institutions had also worked on the medium-range ballistic 'Husky' missile, which was based on the Israeli 'Jericho II'. However, this strategic missile and the corresponding warhead were still under construction when the South African nuclear weapons programme ended.³³

Finally, France's role proved to be influential in the circulation of concepts of nuclear strategy. Leading French strategists Pierre Gallois and André Beaufre, as well as their works, were known by the South African military leadership.³⁴ Gallois visited South Africa as early as 1957, on two commercial missions of the French parastatal company Office français d'exportation de matériel aéronautique (OFEMA).³⁵ The French officer who was then a member of the New Approach Group led by General Lauris Norstad promoted a new strategic thinking brought about by the nuclear revolution. This new strategy was to rely on the dispersion and mobility of troops supplemented by airborne (and missile) capability. In the 1960s, the French company Sud-Aviation, the future *Société nationale industrielle aérospatiale* (SNIAS), one of the members of OFEMA, participated in the promotion of Gallois' writings on nuclear strategy. In December 1967, following the visit of Sud-Aviation's president Maurice Papon to South Africa, Gallois sent the English translations of his books to the Chief of the Army (1966–67), Lieutenant-General Charles Alan 'Pop' Fraser. These included *Balance of Terror* (La stratégie de l'âge nucléaire, 1960) and the recently published *Paradoxes de la Paix* (1967).³⁶ Accordingly, the term 'total onslaught' – one of the justifications for the

²⁸Cauvin to S.M. Naudé (president of CSIR), 16 September 1964, MAP 70/5/8/5, SANDF.

²⁹Hugo Sada, "Les intérêts militaires et stratégiques en Afrique australe," in *La France et l'Afrique du Sud: histoire, mythes et enjeux contemporains*, ed. Daniel Bach (Paris: KARTHALA Editions, 1990), 287–8.

³⁰Signe Landgren, *Embargo Disimplemented: South Africa's Military Industry* (Oxford: Oxford University Press, 1989), 108; and Anna Konieczna, "L'histoire d'une relation spéciale: les relations entre la France et l'Afrique du Sud dans les années 1958–1974" (PhD diss., Paris, Sciences Po, 2013), 405.

³¹Purkitt, Helen E., and Stephen F. Burgess. "South Africa's Nuclear Strategy: Deterring 'Total Onslaught' and 'Nuclear Blackmail' in Three Stages." in *Strategy in the Second Nuclear Age. Power, Ambition, and the Ultimate Weapon*, ed. Toshi Yoshihara and James R. Holmes (Washington, DC: Georgetown University Press, 2012), 37–52.

³²Albright and Stricker, *Revisiting South Africa's Nuclear Weapons Program*, 102.

³³Wielligh and Wielligh-Steyn, *The Bomb*, 190.

³⁴For more on Gallois' role with Dassault and in the French nuclear doctrine, see Benoît Pelopidas and Sébastien Philippe's essay in this special section.

³⁵Office français d'Exportation de Matériel Aéronautique.

³⁶Letter, Gallois to Fraser, 26 December 1967, MAP 70.10, SANDF.

development of the *laager* (encirclement) strategy and the subsequent nuclear weapons programme – was the equivalent of the ‘*stratégie totale*’ (total strategy) developed by the French general André Beaufre in his classic essay, *An Introduction to Strategy* (1963).³⁷

French strategic nuclear assistance relied on a dense network of connections between French and South African research institutions and companies. Heads of South African research institutions – Stephen M. Naudé (CSIR), Ludwijk Le Roux (NIDR), Abraham Johannes Andries (Ampie) Roux (AEB), or Prof. Hendrik Samuels (MPB/Arm Scor) – visited Paris regularly. The most senior officials of the CEA visited South Africa at least once: Francis Perrin (High Commissioner) in 1965; Robert Hirsch (General Administrator) in 1966; and Bertrand Goldschmidt (Head of the External Relations Divisions) in 1966 and 1973. The CEA’s General Administrator, André Giraud (1970–78), supervised negotiations on the enrichment technology. Leading French nuclear scientists and engineers supervised the feasibility studies at each step of cooperation in the nuclear fuel cycle and visited South Africa at least once: Philippe Coste (fluoridisation of UF₄); Michel Pecquer (UF₆ technology); and Claude Frejacques (the French method of uranium enrichment). The lines between public and private, as well as between the political and technocratic dimensions of cooperation, were continuously blurred. As the First Secretary of the South African Embassy in Paris, I. F. A. de Villiers played a proactive role in setting up the ‘uranium for weapons and technology deal’. He was director of NUF COR (1965–69) when cooperation on uranium conversion started. Jean Crépin had been involved in the design and construction of French strategic ballistic missiles since the late 1950s. As a director of the military company SNIAS, he also supervised the development of French tactical nuclear weapons. In May 1970, he travelled to South Africa to promote the Exocet missile project and met the South African supreme command.³⁸

According to available sources, France never sold plutonium reprocessing or uranium enrichment installations to South Africa. Nor did it directly provide military-grade uranium or the design of nuclear weapons. By expanding the classical definition of strategic nuclear assistance, we can see that French research institutions, along with nuclear and military companies, played an active role in the development of the South African nuclear fuel-cycle industry and contributed to the early development of missile technology. French assistance was intended to be invisible.

Mutually beneficial cooperation

The scarce scholarly literature on French nuclear assistance portrays it as uni-directional. However, previously untapped primary sources show that the French nuclear programme also benefitted from this long-lasting cooperation with South Africa.

Although France defined the nuclear weapons programme as the pillar of its national independence, its fulfilment relied on international cooperation, both in terms of the security of the provision of fissionable materials and its funding. In order to lessen the financial burden of its nuclear programme, since the mid-1950s France had followed the

³⁷Jamie Miller, *African Volk: The Apartheid Regime and Its Search for Survival* (Oxford: Oxford University Press, 2017), 108.

³⁸Note ‘Oppebevel Vergadering,’ 2 June 1970, Box 5, C.A. Fraser papers, SANDF.

American precedent and tried to position itself as a leading international supplier of nuclear and military technology. This effort included the commercialisation of nuclear reactors, nuclear fuel elements, and the sale of arms. As Edward Kolodziej has shown, the extraversion of the French military industry resulted from its attempts to achieve economies of scale. The large-scale production of arms and their export reduced eventually the unit cost of the equipment offered to the French army.³⁹ However, international cooperation did not simply lower the cost of the French nuclear weapons programme. It also contributed to the modernisation of the French nuclear and military industries. In the early 1960s the nuclear weapons programme drained the French defence budget, which resulted in the freezing of several defence research programmes, such as the one on short-range missiles designed to protect troops and strategic points in the country.⁴⁰

From 1963 onwards, the South African nuclear research and weapons programme contributed to the development and modernisation of the French nuclear programme in both its military and civilian dimensions. First, during the 1960s and early 1970s, South African uranium played the key role in the French uranium procurement strategy.⁴¹ The CEA and the Transvaal and Orange Free State Chamber of Mines signed the first uranium contract on 31 January 1964 before extending it three times: in December 1964; in June 1965; and, probably, in December 1966. The CEA committed to buy up to 3600 tonnes of uranium in the years 1964–68. The French agency was planning to purchase 1000–2000 tonnes of uranium per year between 1969 and 1973 and 1500–3000 tonnes per year between 1974 and 1978.⁴² In 1966, Bertrand Goldschmidt admitted that the quantity of uranium that France committed to buy from South Africa between 1964 and 1973 (which he estimated at 6800 tonnes) accounted for 40% of total French consumption.⁴³

The South African contract was also an important source of unsafeguarded uranium. According to estimates by the French Ministry of Foreign Affairs made during the same period, annual imports of South African uranium (520 tonnes) exceeded the total annual production of two other French external suppliers: Madagascar (450 tonnes) and Gabon (20–30 tonnes).⁴⁴ The South African mining industry suspected that South African uranium fed the Pierrelatte plant. The latter started to operate in 1964 to produce military-grade enriched uranium for the French nuclear weapons programme. By the end of 1965, the Transvaal and Orange Free State Chamber of Mines decided to conceal all statistics about its uranium sales and uranium stockpiles. The agency explained that it introduced this measure to avoid speculation about French military consumption and the South African connection.⁴⁵

³⁹Kolodziej, *Making and Marketing Arms*.

⁴⁰Béatrice Faillès, "Non-prolifération et coopération nucléaire de la France: les débuts de la Ve République," in *Armement et ve République: Fin des années 1950 – fin des années 1960*, ed. Maurice Vaïsse, Histoire (Paris: CNRS Éditions, 2013), 305–17.

⁴¹For more on France's uranium procurement strategy in the world, see Matthew Adamson's essay in this special section. See also: Hecht, *Being Nuclear: Africans and the Global Uranium Trade*.

⁴²Konieczna, "L'histoire d'une relation spéciale," 214–15.

⁴³Hand-written record of discussions held at Matignon, 'Uranium supplies,' 20 May 1966; Note, 'Note à l'attention du général de Gaulle sur la demande de livraison d'uranium enrichi par l'Afrique du Sud,' Paris, 21 May 1966, Box 90, Sébastien Loste papers (hereafter 640AP), National Archives of France (hereafter Pierrefitte-sur-Seine, France: AN).

⁴⁴Note, unsigned, Paris, 9 May 1966. In Ministère des affaires étrangères, Commission des Archives diplomatiques, *Documents diplomatiques français: 1966*, vol. 1 (Brussels: P.I.E. Peter Lang, 2006).

⁴⁵Note, 'Letter received from the Transvaal and Orange Free State Chamber of Mines dated 4 November 1965. Stockpiling of uranium.' Atomic Energy Board of South Africa, MAC 5/56, File M3/7, Private Secretary of the Minister of Mines (hereafter MMY), SANA.

Second, strategic nuclear assistance decreased the cost of the French nuclear weapons programme. South Africa contributed to fulfilling the CEA's long-term commercial strategy in the field of nuclear fuel elements.⁴⁶ The uranium contract was modelled in line with forecasts about the future international demand for nuclear energy. South African uranium exports to France were to increase by the end of the 1960s when the market of uranium and of nuclear fuel elements was supposed to become viable. French industry gained privileged access to South African uranium deposits. The price that France was to pay (\$3.62/pound) between 1964 and 1968 was below the market price for uranium. This dumping reflected exploitation of Black labour brought by the apartheid system. Moreover, according to the available data, in the early 1970s the South African mines produced about 4000 tonnes of uranium per year, which means that the French contracts at that time – if they were executed – amounted to up to half of all South African production.⁴⁷

Technological and technical assistance for South Africa contributed to the national and international expansion of the French uranium conversion industry. All French companies involved in the French nuclear fuel cycle were active in South Africa. Cooperation with South African agencies and research institutions brought profits and long-term benefits to them in the form of royalties for technology or fees for the training of South African engineers. The French research institutions and companies also received access to new technologies, such as new uranium conversion methods or new uranium enrichment processes, and parts in the South African production of uranium derivatives.

Third, cooperation in the strategic field created commercial opportunities for the French military and nuclear industries. It is estimated that in the 1960s France supplied between 45% and 55% of South Africa's conventional military needs.⁴⁸ The sales of arms created the space for the provision of licences, blueprints, and the training of South African military engineers. For instance, in 1965, the Commandant General of the South African army, Pieter Grobbelaar, three Chiefs of Staff, and the Minister of Defence, Jacobus Fouché, visited Paris where they held conversations with the French Minister of Defence, Pierre Messmer and the French Chief of Staff.⁴⁹ These visits resulted in substantial arms orders and, as we have seen, in the extension of strategic cooperation.

The commercial opportunities for its nuclear technology dictated the CEA's involvement in the South African uranium conversion and enrichment industry as well. Test conversions of South African ore to UF₄ and subsequent negotiations on uranium conversion technology began shortly after Prime Minister Hendrik Verwoerd revealed – at the opening of the SAFARI-I reactor in 1965 – that his government was planning to build two nuclear power plants near Cape Town in the Western Cape.⁵⁰ The

⁴⁶On the CEA's commercial strategy in the field of nuclear fuel elements see Gabrielle Hecht, *Being Nuclear: Africans and the Global Uranium Trade* (Cambridge, MA: The MIT Press, 2012).

⁴⁷Scientific and Technical Intelligence Report, 'Atomic Energy Activities in the Republic of South Africa,' Directorate of Science and Technology, March 1971; cited by Jeffrey T. Richelson, "U.S. Intelligence and the South African Bomb," The National Security Archive, <https://nsarchive2.gwu.edu/NSAEBB/NSAEBB181/index.htm> (accessed May 6, 2020).

⁴⁸Frank Blackaby et al., *The Arms Trade with the Third World*, Stockholm International Peace Research Institute (Stockholm: Almqvist & Wiksell Humanities Press, 1971), 253; Landgren, *Embargo Disimplemented*, 42.

⁴⁹For summaries and programmes of the visits, see: 'Visites des personnalités sud-africaines en France,' file A.I. 2^E 11,200, 2e Bureau de l'Etat-major de l'armée de l'Air (hereafter 2^E), Département Air (hereafter A.I.), Service Historique de la Défense, Vincennes (hereafter SHD).

⁵⁰Compte-rendu de la réunion du 14 octobre 1965 au siège du CEA avec M. Roux, Directeur de l'Atomic Energy Board d'Afrique du Sud, Box 67, DAL, Afrique du Sud (1960–65), AMAE.

announcement opened a window of opportunity for the CEA, which had been looking to sell its natural uranium reactors abroad for a decade.

The promotion of the French nuclear industry seems to be one of the elements that informed French involvement in the South African uranium enrichment project. South African archives suggest that the CEA linked its offer of secret consultancy in the construction of the LEU prototype plant with the attribution of the tender for the construction of two Pressurized water reactors (PWR) in Koeberg, near Cape Town, to the French consortium Framatome. French participation in the mini Z Project was the subject of six hours of conversations on 11 May 1976 between Ampie Roux and the French nuclear officials André Giraud, Bertrand Goldschmidt, Michel Pecqueur, and Philippe Coates.⁵¹ The South African company ESCOM initially awarded the Koeberg contract to an American-Swiss-Dutch consortium. However, it withdrew from the decision in early June 1976 under the pretext that the Dutch government had failed to provide the necessary political and financial guarantees by a specified date. ESCOM and Framatome signed the final agreement on 31 July 1976, despite the wave of police repression that followed the uprising of Black high school students in Soweto.⁵²

Finally, cooperation in the strategic field contributed to the modernisation of the French military industry. The 'Cactus' project was the most notable example of such a relationship. The South African Department of Defence funded the research and development of the French project (134.2 million FF) and brought a substantial financial contribution for its industrial application (185 million FF). The French company Thomson Houston allocated 325 million FF for the second phase, of which the French government contributed 50 million FF in the form of services, such as the use of testing ranges in France and the provision of targets during the evaluation of the weapons system.⁵³ Over the years, 'Cactus' thereby became a 50/50 joint project. Thomson Huston and Armscor shared ownership of the licence. The French company was in charge of the production and commercialisation of the system.⁵⁴ The system itself was adopted by the French army under the name *Crotale* to protect static vulnerable points in the country against low-altitude threats. Signe Landgren has also suggested that South Africa might have funded other missile projects developed in France either in cooperation with European partners – the Franco-German ground-to-air missile projects 'Hot' and 'Roland' and the anti-tank missile 'Milan' – or individually – the air-to-air 'Matra R530' and 'R550 Magic', as well as the ship-to-ship 'Nord Aviation' Exocet.⁵⁵

However, in its dealings with South Africa, France sought to preserve its commercial and strategic advantage over the South African uranium and arms industries. French military companies rarely transferred their most sophisticated technology, to the frequent disappointment of CSIR's leaders. The French technology that was transferred to South Africa was either out-dated (the U4 power reactor) or downgraded (the UF6 pilot

⁵¹Memorandum, 'Last Phase of the Negotiations on French Cooperation with South Africa in the Field of Uranium Enrichment – May 1976.

⁵²Laurence Badel, "L'État français face au risque politique dans les années 1970: les cas polonais, sud-africain et iranien," *Les cahiers Irice* 6, no. 2 (November 17, 2010): 123–40.

⁵³Landgren, *Embargo Disimplemented*, 108; Konieczna, "L'histoire d'une relation spéciale," 405; L.J. Van der Westhuizen and J.H. Le Roux, *ARMSCOR: The Leading Edge*, Unpublished book (Bloemfontein: Institute for Contemporary History, University of Free State, 1997), 225.

⁵⁴See file 'Navorsing: Cactus,' 58.2, Box 132, Minister of Defence (MV), Group 4, SANDF.

⁵⁵Landgren, *Embargo Disimplemented*, 103–4.

plant).⁵⁶ For instance, during the negotiations on the contract for the UF₆ pilot plant, the Comurhex and Pêcheiney/Ugine companies escalated the cost of the plant to such a degree that several items of equipment had to be removed from the specifications. The impurity of the UF₆ ultimately created numerous problems for the operability of the enrichment installation. The Y Plant never achieved its design output and was, according to David Albright, a 'plant struggling to operate'.⁵⁷

As we have seen, French-South African nuclear cooperation was never unidirectional. As the leading producer of uranium in the non-Communist world, South Africa occupied the key position in the French security of provision of uranium for its nuclear weapons and civil programme. It therefore provided sensitive nuclear assistance to the French project. The sensitive nuclear assistance to South Africa sustained the cost-effectiveness of the French nuclear weapons programme as it responded to the CEA's long-term commercial strategy in the field of nuclear fuel elements, as well as created new commercial opportunities for the French nuclear and arms industries. Finally, South Africa contributed to the modernisation of the French military industry by participating in the funding of its research and development programmes. However, this mutually beneficial cooperation was never an equal relationship.

Proliferation by design and secrecy by agreement

The intentions of the leaders of nuclear weapons states are the ultimate factor that helps us to understand if strategic nuclear assistance to one country indeed constituted direct nuclear weapons support. Henrik Hiim rightly notes that proving intent remains particularly difficult. Official statements of support or handwritten documents are the most unequivocal evidence of intentions, but they remain ephemeral or unavailable. Hiim argues that in the absence of official statements there are two indicators available: the lack of International Atomic Energy Agency (IAEA) safeguards and secrecy surrounding transfers of nuclear technology.⁵⁸ This article suggests adding a third indicator. It seems important to analyse as well what leaders know about strategic nuclear assistance to a foreign country and how they react to this knowledge. These three elements – IAEA safeguards, secrecy, and knowledge – will be analysed in this part of the paper.

The French and South African archives reveal that the French president and his government's members were not only aware of different aspects of the strategic cooperation with South Africa, but also instigated it in the early years. In December 1960, Charles de Gaulle and his German counterpart Konrad Adenauer jointly invited Prime Minister Hendrik Verwoerd to visit their respective countries in the aftermath of the Commonwealth conference that was due to take place in early March 1961. According to the official South African communiqué, the programme of the visit in France and in Germany was to include discussions on uranium sales, defence, and nuclear matters.⁵⁹ Ultimately, Verwoerd cancelled the visit after the Commonwealth compelled South

⁵⁶A.R. Newby-Fraser, *Twenty Years of Nuclear Research and Development in South Africa* (Pelindaba: Atomic Energy Board, 1979), 80; John D.L. Moore, *South Africa and Nuclear Proliferation: South Africa's Nuclear Capabilities and Intentions in the Context of International Non-Proliferation Policies* (New York: Palgrave Macmillan, 1987), 94.

⁵⁷David Albright, "South Africa and the Affordable Bomb," *The Bulletin of the Atomic Scientists* 50, no. 4 (1994): 37–47.

⁵⁸Hiim, *China and International Nuclear Weapons Proliferation*, 20.

⁵⁹Press release by the Department of External Affairs, 3 March 1961, Box 138, the French Embassy in Pretoria (551PO/2), Archives Ministère des Affaires étrangères à Nantes (hereafter AMAE, Nantes).

Africa to leave its ranks. Instead, in September 1961, de Gaulle met with the South African Minister of Foreign Affairs, Eric Louw. Even though nuclear matters were not mentioned in the official verbatim report as a topic of conversation, shortly after the meeting, the French army invited the director of military planning and the former military attaché in Paris, Jan Robbertze, to tour military schools in Southern France.⁶⁰ Robbertze was ‘incidentally’ driven to the viewpoint of the plutonium-producing installations in Marcoule, where the public relations officer gave him a ‘talk of about two hours on the various aspects of the centre’, namely the French natural-uranium reactors.⁶¹ De Gaulle’s initiatives stood against those of the French CEA. In 1961, the French agency appeared to be reluctant towards any official commitments with South Africa.⁶²

Charles de Gaulle eventually received information about several aspects of the French/South African strategic cooperation. The ‘Cactus’ project was brought to his attention at least once during his visit to the Airshow in Le Bourget. De Gaulle was equally aware of France’s dependence on South African uranium. In May 1966, he approved the French government’s decision to guarantee supplies of LEU for the South African SAFARI-I reactor, should the United States withdraw from cooperation with South Africa. Earlier that year, Washington threatened Pretoria that it would end the provision of fuel for the research reactor unless South Africa revealed all the details about the uranium contract with France and applied effective safeguards. The memo that reached the French president’s office began by pointing out the importance of the uranium contract in France’s nuclear planning. De Gaulle’s handwritten annotation is further proof that he did read the document: ‘*Vu. Aucun inconvénient à fournir à l’Afrique du Sud de l’uranium enrichi*’ (Consulted. No objection to providing South Africa with enriched uranium).⁶³

Some military projects were supervised by Charles de Gaulle himself. In February 1968, Victor Verster and Hendrik Samuels, respectively General Manager and Chairman of the Munitions Production Board, came to Paris to study organisational methods for the control and supervision of defence production. Verster later reported that the mission ‘was given the open sesame everywhere’, including at centres with the ‘highest security classification’ and ‘the highest quarters in the Government’. In his view, instructions came directly from de Gaulle, who ‘passed down the word that no information in which the mission was interested was to be denied’. He drew this conclusion from the fact that the French president’s son, Philippe de Gaulle accompanied the mission during one part of its travel.⁶⁴ The monthly report of the South African military attaché for this period mentions only a few elements of the programme. It shows, however, that Verster’s mission visited the DMA’s military centres in Southern France, including the missile testing centre in Landes (Centre d’essai de Landes, CEL).⁶⁵ Since 1964, the CEL had been

⁶⁰Record of conversation between Charles de Gaulle and Eric Louw held in Paris on 11 September 1961, Box 207, Archives of the presidency of Charles de Gaulle (hereafter AG5/1), AN.

⁶¹Report, ‘Tour of information, 16–20 October 1961. Centre for energy: Marcoule,’ by Jan Robbertze, 31 October 1961, file KG/GPR/6/2 ‘Atomic Research/Atomnavorsing,’ Group 1, Kommandant General (hereafter KG), SANDF.

⁶²Note. B. Goldschmidt to François de Rose (Atomic Affairs Division), 30 March 1961, Gaston Palewski papers (hereafter 547AP), AN.

⁶³Note, ‘Note à l’attention du général de Gaulle sur la demande de livraison d’uranium enrichi par l’Afrique du Sud,’ Paris, 21 May 1966, Box 90, 640AP, AN.

⁶⁴Report, record of conversation with Victor Verster (Munitions Production Board), ‘Mission of Mr Victor Verster and Professor Samuels to Europe,’ 21 February 1968, unsigned, BTS 9/56/9 vol. 2, DIRCO.

⁶⁵Report for the period 1 December 1967–29 February 1968. Office of armed forces attaché, Paris, HVS 212/3/3 vol. 1, Group 1, SANDF.

used by the French army to test tactical and ballistic missiles for the French nuclear weapons programme. The Secretary-General of the Quai d'Orsay, Hervé Alphand, shared Verster's opinion. He claimed in his conversation with the South African ambassador in February 1968 that 'South Africa was getting whatever it wanted from France', but 'should always take the greatest care to "play things quietly"'.⁶⁶

The French ministers in charge of atomic and military affairs knew about the cooperation in the strategic field and were aware of the risk of proliferation. Several documents in the French National Archives reveal that Gaston Palewski, Alain Peyrefitte, and François-Xavier Ortoli received reports from Robert Hirsch or Bertrand Goldschmidt about the CEA's relations with South Africa. In 1963, Goldschmidt's report on his visit to South Africa might have alerted Gaston Palewski about the future orientation of the South African nuclear programme. Goldschmidt described the programme and pointed out South Africa's ambitions to develop the full nuclear fuel cycle. He also mentioned that Pieter Grobbelaar attended his lecture on nuclear energy at the University of Cape Town in the company of the French Ambassador Georges Balaÿ.⁶⁷ The presence of the Commandant General clearly indicated that the South African military leadership was interested in nuclear energy.

In August 1968, the conversation between France's Minister of Atomic Affairs, Robert Galley, and the South African Ambassador, Willem Dirkse van Schalkwyk, provides the most explicit example of French disdain for the non-proliferation regime. At the end of the conversation, the ambassador stated that his government did not approve the Non-Proliferation Treaty (NPT), but was planning to send representation to the Geneva conference. To which Galley replied – 'laughingly' – 'I am going to the Pacific next week'.⁶⁸ With few exceptions, until 1976, French presidents nominated the Ministers of Atomic Affairs and, later, Ministers of Industry and Scientific Research, from among their close collaborators, personal friends, or political protégés. It means that they were able to control the transfer of sensitive nuclear technology to foreign countries.

The long-serving Minister of Defence (1960–69), then Prime Minister (1972–74), Pierre Messmer, was the most proactive member of the French government in its strategic cooperation with South Africa. South Africa's Ambassador to Paris believed that Messmer was the leading supporter of his country in the French government and that he was the one who had persuaded his fellow ministers to agree to export the 'ultra-sensitive materials' to South Africa, despite the pressures of the United Nations and the North Atlantic Treaty Organization (NATO).⁶⁹ From 1963 onwards, Messmer's cabinet sought to centralise all decisions concerning arms sales and military contacts with South Africa.⁷⁰ The minister also supervised the industrialisation phase of the 'Cactus' project. He held a series of conversations and kept up personal correspondence on the financial

⁶⁶Note, Dirkse van Schalkwyk, South African Ambassador in Paris, to Secretary of Foreign Affairs (hereafter SFA), 22 February 1968, BTS 9/56/9 vol. 2, DIRCO.

⁶⁷Report, 'Visit in South Africa,' submitted by Bertrand Goldschmidt, to the CEA's General-Administrator, 26 March 1963, Box 166, 547AP, AN.

⁶⁸Note, 'Courtesy Call on M. Galley, Minister of Scientific Research, and Atomic Energy and Space Matter,' Dirkse van Schalkwyk to SFA, 9 August 1968, BTS 137.11.4 vol. 5, AN.

⁶⁹Telegram, SA Embassy in Paris to SFA, 8 August 1964, 35, Top secret, BTS 9/56/9 vol. 1A, DIRCO.

⁷⁰Note pour le Délégué Ministériel pour l'Armement, chef d'EMA, chef d'EMAT, chef d'EMM, chef d'EMAA. Correspondance avec les Affaires étrangères concernant Israël, l'Union Sud-Africaine, Portugal, Paris, le 22 juillet 1963, 2^E1864, SHD.

plans of the project with his South African counterpart, Pieter Botha.⁷¹ Messmer continued to play an active role in French-South African relations even after he left the office of Minister of Defence. In October 1970, he spent two weeks in South Africa as a personal guest of Pieter Botha. Besides sightseeing and sailing with the Chief of Navy, Admiral Hugo Biermann, he met Prime Minister John Vorster and the South African Chiefs of Staff (General Rudolph Hiemstra, Admiral Hugo Biermann, General Jacobus Verster, and General Willem Louw). He had lunch with the AEB's president, Ampie Roux, before visiting the Nuclear Physics Centre in Pelindaba.⁷²

During Messmer's premiership, the CEA lifted its opposition to the sale of the UF₆ plant to South Africa. The issue of uranium hexafluoride technology had arisen since the start of negotiations on cooperation in uranium enrichment. From May 30 to June 5, 1970, Ampie Roux held a series of conversations with Robert Hirsch and Bertrand Goldschmidt during which he offered two-step cooperation on the commercial enrichment plant in South Africa. One week later, prime ministers John Vorster and Jacques Chaban-Delmas discussed the project during a meeting in Paris. Even though the South African and French enrichment processes were technologically different, the AEB sought France's assistance for political and strategic reasons. Roux revealed only a few elements about the South African process. Instead, he linked further access to technological secrets to two conditions. First, the AEB and the CEA would sign an inter-agency agreement supplemented by an inter-governmental agreement, which would be made public. Secondly, the AEB would receive technological assistance for the production of hexafluoride of uranium in South Africa on a large scale.⁷³ The decision to supply South Africa with the UF₆ plant removed an important obstacle to the negotiations and paved the way for the cooperation agreement between the CEA and UCOR on the commercialisation of the enrichment process.

De Gaulle's successors continued the policy of tacit approval of the South African nuclear programme. Georges Pompidou (1969–74) and Valéry Giscard d'Estaing (1974–81) did not prevent or interrupt the cooperation on uranium enrichment when they learnt about the project. In June 1970, Pompidou called an emergency meeting when François-Xavier Ortoli brought Roux's offer to his attention.⁷⁴ The proposed deal constituted a high risk of proliferation, given that South Africa needed the UF₆ technology to feed its future enrichment plants. The French president refused to sign any formal commitment but agreed to entrust the CEA with a mission to enquire secretly about the South African enrichment process. In this way, he left the door open for future negotiations. Pompidou was determined to protect France's international image and the commercial advantage of French technology. In 1970, France came under intense international pressure over its cooperation with the apartheid regime and the environmental consequences of its nuclear tests in the Pacific. In parallel, France had been developing its project of a commercial enrichment plant (the future Eurodif project) based on its own enrichment technology and was unwilling to precipitate the realisation of the South African project.

⁷¹There are several letters exchanged between Pierre Messmer and Pieter W. Botha in the following files: BTS 9/56/9 vol. 2 (Botha to Messmer, 9 December 1967, 30 April 1968); MAP 70/26/2 vol. 2 (Messmer to Botha, 30 October 1967; Botha to Messmer, November 1967; Messmer to Botha, November 1967), and 1R233 (Minister of Defence cabinet).

⁷²Programme of the visit of Mr and Mrs Messmer in the Republic of South Africa, 11–25 October 1970, Box 51, the French Embassy in Pretoria (551PO/B), AMAE, Nantes.

⁷³Memo, 'Conversation with A.J.A Roux, Robert Hirsch to François-Xavier Ortoli,' 5 June 1970, Box 1025, Archives of President Georges Pompidou (hereafter AN: AG5/2).

⁷⁴Ibid.

Valéry Giscard d'Estaing learned about the cooperation project only three months after he took office in May 1974. He did not ask for the interruption of the feasibility studies on uranium enrichment, nor did he oppose the CEA's plans for secret assistance to UCOR's commercial plant. Giscard was determined to improve French-American relations. In September 1974, when he learned about the project, he 'considered it significant that UCOR had been approached by the American companies interested in participation'.⁷⁵ A few months later, Bertrand Goldschmidt explained the secrecy imposed by the CEA by the fact that France had become 'a little more sensitive to American criticism and did not wish to help another country to make the bomb or to be seen as or thought as helping in this direction'. He continued: 'However, if another country, completely of its own, found ways of making a bomb, that was another matter [...] [The Y] pilot plant could in fact produce sufficiently enriched uranium to do just that.'⁷⁶ Giscard was aware of France's intermediate position in the global circulation of technology. Since the early 1960s, the United States had retained the final say in French-South African strategic relations. The Americans produced highly sophisticated electronic components for the French sensitive technology. The United States was also expected to supply the fuel for the nuclear plants in Koeberg, which would allow Framatome to fulfil its contract with ESCOM.

France applied the non-proliferation safeguards to the most visible elements of strategic assistance. When Framatome and ESCOM concluded the Koeberg contract, France and South Africa signed an intergovernmental agreement (29 October 1976) and then entered into a tripartite agreement with the IAEA (5 January 1977). These documents listed the responsibilities of both countries concerning non-proliferation and extended the IAEA's safeguards system to Koeberg installations. Two years later, in September 1979, the French Minister of Foreign Affairs, Jean François-Poncet, suggested during the conversation with his South African counterpart, Pik Botha, that South Africa sign the NPT.⁷⁷ The French initiative intended first of all to lift American opposition to the supply of fuel elements for Koeberg.⁷⁸ By that time, as we have seen, the Y Plant had become operational; it started to produce military-grade uranium a few years later.

In fact, France has never applied a comprehensive safeguards system. Between 1971 and 1977, French presidents initiated several consultations on the French arms sales to South Africa. The missile technology fell outside the scope of restrictive measures, although French diplomacy officially claimed that the limitation of such technology would contain the spread of nuclear weapons.⁷⁹ The Koeberg contract was a further example of French reluctance to follow stricter rules of non-proliferation. Its letter of acceptance mentioned two areas of cooperation between ESCOM and Framatome. In addition to the provision of the two-units nuclear plant, Framatome was to assist ESCOM

⁷⁵Report, summary report covering the fourth round of discussions between the CEA and UCOR feasibility study teams held in France from 21 to 24 August 1974. Prepared by R. A. Barbour, 5 September 1974, BTS 137/11/23/2/5 Vol 2, DIRCO.

⁷⁶Telegram, South African Embassy in Paris to SFA, 9 April 1975, file BTS 137/11/23/2/5 Vol 2, DIRCO.

⁷⁷Record of conversation between François-Poncet and Botha in Paris, 18 October 1979. Prepared by the African Affairs Division in Paris, Box 53, 551PO/B, AMAE, Nantes.

⁷⁸Note, 'Relations nucléaires franco-sud-africaines – centrale de Koeberg,' Atomic Affairs Division for the minister of Foreign Affairs, Paris, 12 November 1980, Box 1406, Archives of the President Valéry Giscard d'Estaing (AG5/3).

⁷⁹See for instance the official records of the First Committee of the U.N. General Assembly, 'UNODA Documents Library,' United Nations Office for Disarmament, n.d., <https://www.un.org/disarmament/publications/library>. (October 12, 2020).

in the establishment of a fuel manufacturing plant for Koeberg.⁸⁰ The bilateral and trilateral agreements signed between France, South Africa, and the IAEA did not mention the Nuclear Fuel contract that was to be signed separately. The fuel element manufacturing plant (the Beva plant) opened in 1986 and was based, according to Nic von Wielligh, on French expertise.⁸¹ Along with the Z enrichment plant and the U (uranium conversion) plant, Beva made South Africa's fuel cycle independent from external supplies and its nuclear weapons programme immune to international pressure.

The French and South African archives demonstrate three key aspects of France's intentional weapons support for South Africa: the French political leaders' awareness of cooperation; their quest for secrecy; and the lack of a comprehensive system of safeguards. The available sources show that French political leaders were not only aware of several aspects of the cooperation, but also supported it actively or supervised it in the early years of its development. The cooperation continued unchallenged under the presidencies of Georges Pompidou and Valéry Giscard d'Estaing, despite growing awareness of South African intentions. French political leaders were eager to approve the strategic nuclear assistance as long as it remained secret and did not challenge the commercial and competitive positions of French technology providers. However, they did nothing to reduce the risk of proliferation. France applied the safeguards system selectively to protect its international position, but its initiatives were neither comprehensive nor timely.

Conclusion

Starting in 1964, France provided strategic nuclear assistance for the South African nuclear weapons programme. French research institutions, nuclear and military private companies, or consortiums played an active role in the development of the South African nuclear fuel-cycle industry. They also contributed to the early development of missile technology. French assistance included the transfer of sensitive technology in the form of licences for arms production, blueprints, designs for nuclear installations, and construction of nuclear installations. It proved to be even more decisive in the development of South African 'tacit knowledge', that is, the set of technical skills and expertise necessary for the subsequent construction of nuclear weapons. It made French assistance invisible and therefore immune to international pressures.

This article has also shown that scholarly literature should not see nuclear assistance as a unidirectional relationship. The South African apartheid regime did assist the French nuclear programme by granting market access to fissionable materials and by providing financial resources to its development. It confirms Itty Abraham's insight that there is no such thing as an indigenous nuclear weapons programme.⁸²

Finally, the case of South Africa seems to indicate that the French nuclear weapons support was intentional, contrary to the general silence on this case in the scholarly literature and the memoirs of French officials. The available primary sources do not reveal any official statement of support by the French decision-makers for the strategic nuclear assistance to South Africa. These documents show, however, that the French

⁸⁰Letter of acceptance for Koeberg Nuclear Power, 28 May 1976, signed by R.C. Appel (ESCOM) and L. Abouardham (Framatome), Box 889,788, Archives of Electricité de France (Paris, France: EDF).

⁸¹Wielligh and Wielligh-Steyn, *The Bomb*, 204.

⁸²Itty Abraham, "The Ambivalence of Nuclear Histories," *Osiris* 21, no. 1 (2006): 56.

leaders were aware of different aspects of the cooperation, supervised it, or supported it tacitly. The French intentions of support are further evidenced by the secrecy surrounding all aspects of the cooperation, as well as by the inconsistent application of the IAEA safeguards. France applied safeguards to the most visible technological transfers, such as nuclear power plants, but failed to extend them to more sensitive technology. Even though the French decision-makers, military, and nuclear industry actively protected French commercial and technological advantage in its relations with South Africa, they left a door open for proliferation. Our case study has implications for the future writing of global nuclear history. Nuclear security studies need to move beyond a presentist tendency of assuming retrospectively that non-proliferation was the concern and priority of nuclear weapons states during the Cold War. Furthermore, this research highlights the danger that methodological nationalism, focused on policy and diplomatic elites with a mutual interest in concealing past cooperation, can only keep such historical collaboration invisible.

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Notes on contributor

Anna Konieczna is teaching associate at Sciences Po and at Institut catholique de Paris. Her research interest includes foreign policy analysis with a specific emphasis on the French foreign policy in Africa and diplomacy of non-state actors. She co-edited *A global history of anti-apartheid. 'Forward to Freedom' in South Africa* (Palgrave Macmillan, 2019).

ORCID

Anna Konieczna  <http://orcid.org/0000-0002-8856-4518>