

CHAPTER 2

A “NUCLEAR COUP”? FRANCE, THE ALGERIAN WAR, AND THE APRIL 1961 NUCLEAR TEST

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The strategic literature about the risk of nuclear proliferation and of nuclear terrorism sometimes mentions a little-known episode of French colonial history: a nuclear test that took place in April 1961 while four generals mounted a coup in Algiers against the nascent Fifth Republic. The first mention of this episode in publications devoted to international security issues appears to have been a 1968 short journal article by Donald Brennan and Leonard Spector’s pioneering book, *Going Nuclear* (1987). To the best of this author’s knowledge, no detailed analysis of the 1961 events has ever been published.¹

Conventional wisdom—various citations of the episode that appear in the literature, mostly based on the two aforementioned accounts—has it that France decided to detonate the nuclear device rather than run the risk of having it captured by the rebel forces. At the same time, one of the foremost experts in the field

of terrorism, Brian Jenkins, argued in a recent book—based on conversations with former French officials—that he became convinced that the story was bunk and that experts should cease mentioning it as an example of the risks of nuclear terror.²

This chapter seeks to reconstruct the 1961 events and the intentions of the various parties involved to the fullest possible extent. To that effect, it relies heavily on sources that have become available since the 1968 and 1987 studies were published. These include two well-documented books on the Algiers coup published in 2011, on the occasion of the 50th anniversary of the coup, one by historian Maurice Vaïsse and the other by journalist Pierre Abramovici. The sources also include two books on the history of the French nuclear program published a few years ago, one by analyst Jean-Damien Pô and the other by historian André Bendjebbar.³ This chapter also relies, crucially, on personal testimonies of key actors.⁴ Sources used in this chapter also include information about the history of French nuclear testing made public (through publication or leaks) in France at the occasion of the 1995-96 final series of tests and about recent controversies regarding the human and environmental effects of testing in Algeria. Finally, the sources include information provided to the author by the French Atomic Energy Commission (Commissariat à l'Énergie Atomique [CEA]).⁵

The chapter will in particular address two sets of questions. One is about the timing of the April 1961 test. Was it in any way affected by the ongoing political events in Algeria? If yes, what did the French authorities seek in altering that timing? The other set of questions relates to the assessment of the actual risks that existed during the coup. Was there ever a real risk of

the device passing under the control of the rebels? If yes, could they have used it in any way?

As will be seen, what happened during those days in Algeria is complex and supports a more subtle interpretation than either the traditional version of the story or the more recent Jenkins debunking of it—neither of which can be considered as an accurate summary of the events. Both Brennan and Jenkins relied on a small number of testimonies of unnamed former officials: a senior official of the French nuclear establishment (Brennan) and French intelligence officials (Jenkins).

The goal of this chapter is to draw lessons for possible future contingencies in which a nuclear-capable country is threatened from inside and the control of nuclear materials or weapons may be at risk. More broadly, the chapter passes judgment on whether or not this episode is worth giving as an example of the risk of nuclear terrorism.

THE CONTEXT

When General Charles de Gaulle arrived in power in May 1958, he inherited two legacies of the Fourth Republic (1945-58): One was the rebellion in the French departments of Algeria, which was worsening; the other was France's burgeoning nuclear program, which was coming to fruition. In the last days of the Fourth Republic (on April 11), a nuclear test had been scheduled for 1960 by Chairman of the Council [of Ministers] Félix Gaillard.

The two issues rapidly became connected. De Gaulle sought both to transform France's nominal nuclear capability into a full-fledged operational nuclear force, and to solve the Algerian question one

way or the other in order to pursue an ambitious foreign policy agenda: He knew that the only way to do that would be to change the territory's status. But these orientations put him on a collision course with a large segment of the French military. Many did not want France to withdraw from Algeria, and most were not interested in an independent nuclear deterrent.⁶

Of these two issues, Algeria in early-1961 was certainly the most important in the eyes of the French armed forces. About 480,000 French military personnel—mostly conscripts—were stationed there to take part in the campaign launched in 1957 to “pacify” the territory in light of growing unrest, rebellion, and terrorism.

In September 1958, 96 percent of Algerian voters had said “yes” to the adoption of the new French constitution. However, a call to boycott the vote had been issued by the Algerian National Liberation Front (Front de Libération Nationale). De Gaulle did not believe that the full integration of Arab and Berber populations into France was sustainable in the long run. In September 1959, he stated that three paths were open to Algeria: full independence, full integration, or—his obvious preference—an “association” with the French Republic.

Even though he had not declared support for independence, de Gaulle probably knew all too well that, having now made clear that he did not favor the status quo, he faced the possibility of a military action against him—by the same group of officers who had helped him return to power. In May 1958, a short-lived coup in Algiers (today often referred to as the “putsch d’Alger”) was partly manipulated by the Gaullists. They emphasized the possibility of a coup in Paris itself—a scenario that was indeed very much in

the cards and entitled Operation RESURRECTION— which led to the downfall of the Fourth Republic and to the return of de Gaulle to power. At that time, the military believed that he would ensure that France would hold on to its North African territories—not mistakenly, since de Gaulle had not come to power with a clear picture of the Algerian endgame.

In the months following his return to power, de Gaulle removed the leaders of the May 1958 movement—Generals Edmond Jouhaud and Edouard Salan—from their positions in Algiers. On September 16, 1959, he alluded for the first time to the possibility of “self-determination” for Algeria.⁷ In January 1960, a short-lived insurrection (*semaine des barricades*) led by opponents to de Gaulle’s policy, took place in Algiers and Paris.⁸ It was triggered by the recall to France of General Massu, another leader of the 1958 movement. In March, General Maurice Challe, who had been appointed by de Gaulle as the head of all French forces in Algeria in December 1958, was replaced. In December, massive demonstrations in favor of independence took place throughout Algeria. De Gaulle began referring to the hypothetical possibility of an “Algerian Republic.”⁹ On January 8, 1961, 75 percent of the French approved by referendum the self-determination of the Algerian territories. In April, De Gaulle mentioned for the first time the possibility of “a sovereign Algerian State.”¹⁰ This statement and others finally convinced those among the French military who sought to oppose Algerian independence that the dice were cast. General Challe took the leadership of a military conspiracy to stop the political process leading to Algerian independence.

Meanwhile, Algeria had been chosen as early as July 1957 as the location for the first French nuclear

tests, due to the existence of large inhabited regions in the south of the territory with geologically favorable conditions. A 108,000-square kilometers (km) inhabited zone was designated as military grounds and named the Sahara Center for Military Experiments (Centre Saharien d'Expérimentations Militaires, CSEM). Starting in October and throughout 1957, the CEA and the armed forces built the necessary facilities near Reggan, a small town of about 8,000 inhabitants (see Figure 2-1).¹¹ The base and testing grounds were placed under military command. Up to 10,000 civilian and military personnel were stationed in and around Reggan.¹²

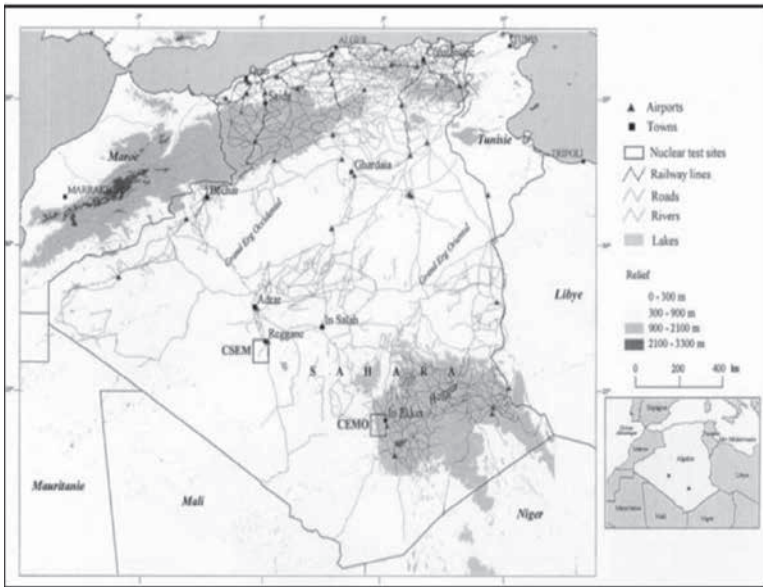


Figure 2-1. The Location of the Reggan Test Site (CSEM).

The French testing site had complex command arrangements:

- The CSEM was in charge of the site itself, which comprised four locations: offices in Reggan; technical facilities, housing, and logistics at the “base-vie” 15 km from the town; the Hamoudia observation and command post some 35 km from the “base-vie”; and the “ground zero” area another 15 km away. The CSEM was headed by a colonel, and reported for operational purposes to the Paris-based Joint Special Weapons Command (Commandement Interarmées des Armes Spéciales [CIAS]), a ministry of defense structure.¹³ However, for territorial defense and law and order maintenance, the CSEM reported to the Sahara area command.¹⁴
- The tests themselves were the responsibility of a unit called the Operational Group of Nuclear Experiment (Groupement Opérationnel des Expérimentations Nucléaires, [GOEN]), which included both military and civilian experts. Led by a general who was also the head of the CIAS, this separate and temporary unit reported both to the ministry of defense and to the CEA. It included a joint dedicated military force, the 621st Special Weapons Group (Groupe d’Armes Spéciales), which regrouped all military personnel assigned to the GOEN. There was a dedicated communication link between the GOEN and the CIAS headquarters.

Neither of these two units reported directly to Algiers, upon which they depended only for their supplies.

THE EVENT

The Coup.

The rebellion began during the night of Friday-Saturday, April 21-22, 1961. The leaders were Challe and his predecessor in Algeria, General Raoul Salan, as well as Generals Edmond Jouhaud and André Zeller. They could count on the support from the onset of at least six regiments of the French armed forces.¹⁵ By Saturday, April 22, in the morning, Algiers was fully in the hands of the rebels, who made a radio proclamation announcing their success and sent the loyalist leaders to the south of the territory.¹⁶ By then, Challe and his acolytes could count on the support of about 25,000 military personnel.¹⁷ Paris became awash with rumors of an imminent military action against the metropolitan territory.¹⁸

This sequence of events happened just as the Reggan base was preparing for the fourth French nuclear test. Codenamed "Gerboise verte" ("Green Jerboa"), this explosion of a fourth plutonium fission device ("R1") was planned to be the last atmospheric test in the Sahara before the base moved on to subterranean tests in a different location in Algeria.

Evidence exists that the rebels were fully aware of the upcoming test and sought to exploit the circumstances to their benefit. But was the timing of Gerboise verte affected by the political events? And, if yes, what did the French authorities seek in altering the timing of the test?

There is no doubt that the detonation of the R1 device had been organized well in advance. One source mentions a March 3 press article that announced the fourth French nuclear test, "probably for April."¹⁹ At

the occasion of the test, an exercise had been planned as early as February.²⁰ The idea was to benefit from the test to study the conditions of fighting in a nuclear environment. (The previous test of December 27, 1960, had also involved such an exercise). According to the CEA, the "operation order" for the test had been given on March 30; it stipulated that the test would take place on or after April 24, but the date had later been changed to May 1, since the technical preparation of the device needed more time.²¹

The Events in Paris and Reggan (Saturday, April 22, to Monday, April 24).

De Gaulle learned of the coup in the early hours of Saturday, April 22. At 9:00 a.m., he met with Prime Minister Michel Debré, who left the Elysée at 11:20 a.m.²² It was during this meeting, or immediately afterward, that de Gaulle decided to move forward the date of the test, since a conversation with the Reggan authorities took place at 11:30 a.m.²³ De Gaulle believed that the coup would not last more than 3 days.²⁴ This is an important element: It means that he sought to influence the events through the test. At 5:00 p.m., a special meeting of the Council of Ministers decided to impose a state of emergency taking effect at midnight. On Sunday evening, a telegram was sent to the French ambassador in Morocco, requesting him to notify King Hassan of the imminence of the test, clearly referring implicitly to the ongoing coup.²⁵

News of the coup reached Reggan on Saturday, April 22, around 9:00 a.m.²⁶ However, two contradictory orders were received in the next 24 hours.²⁷ One was given by Paris, ordering that the device be tested. It was possibly a telegram signed by de Gaulle him-

self.²⁸ Standard procedure was that a green light was given by the Elysée, and that the Reggan authorities decided on the exact day of the test.²⁹ But another order was given by Challe from Algiers, requesting that the test be delayed.³⁰ The putsch leaders may have been warned of the impending test by the Notice to Airmen (NOTAM) delivered by Thiry.³¹ More precisely, according to a key witness—Professor Yves Rocard, one of the fathers of the French program—Challe called General Jean Thiry, the commander of the CIAS/GOEN, who knew him well (they were both fellow air force generals). Rocard told Thiry: “Refrain from detonating your little bomb, keep it for us, it will always be useful.”³²

The CSEM and GOEN personnel were culturally inclined to be faithful to de Gaulle, since their mission was the nuclear program.³³ But Thiry was hesitant about which party to support. His exact mindset is difficult to assess. Some claim that he initially decided to side with the rebels before changing his mind 24 hours later. Others state that he was impressed with Challe’s order but that, in his phone conversation with Challe, remained deliberately vague and uncommitted about his intentions.³⁴

There are differing accounts of the exact chronology of events:

- There is uncertainty about when the order to proceed with the test on (or after) Monday, April 24, was given by Paris. A key witness, Jean Bellec, who was then an officer stationed at Reggan, claims that on Saturday, April 22, at 11:30 a.m., after having conferred with Paris, the CSEM and GOEN made the decision to test on April 24.³⁵ However, a CEA document suggests that on April 22, “it was contemplated to

proceed with the test as soon as possible” but that it is only the next day, Sunday, April 23, that the formal order was given to detonate the device “on or after the 24th.”³⁶

- It is also uncertain when the final decision to proceed with the test on Tuesday, April 25, was given by Thiry. Bellec claims that the decision was made on April 23, because of unfavorable wind conditions expected for April 24.³⁷ However, another source based on the recollection of another key witness, Pierre Billaud, has Thiry, “probably in the morning of the 24th,” deciding to proceed with the test on April 25.³⁸

The weather was a nontrivial consideration in Thiry’s calculations and his final decision to test on April 25 at dawn:

- With each day, the temperature was rising on the site – this part of the Sahara is one of the hottest places in the world – and the measurement instruments were becoming unreliable. There was a risk that the test would be rendered scientifically useless, so it could not be postponed too long.³⁹ The DAM personnel on the site were “haunted by the deterioration of operational conditions due to excessive heat, and wanted to proceed with the detonation early.”⁴⁰
- To ensure the best optical measurements, and also because of the heat, French atmospheric tests in the Sahara had to be conducted at dawn (the four tests all took place between 6:00 a.m. and 7:00 a.m.), and technical preparations no doubt took at least several hours. So, in the absence of a decision the day before, another 24 hours would be lost.

- At the same time, another meteorological element had to be taken into account when making the final decision: wind patterns. Sources converge to suggest that the forecast for April 24 was unfavorable, but more favorable for April 25.⁴¹

But there is little doubt that political considerations were a key factor. Jean Viard, the director of the technical team, feared that the device could have been used by Algiers as a bargaining chip against Paris.⁴² This is supported by the testimony of Bellec, who writes that concern existed that the rebels could use the device as an instrument of “blackmail, at least through the media.”⁴³

The atmosphere at the base during those days is described in various testimonies as “changing,” “uncertain,” or “turbulent.” On April 22, news reports gave the impression that most of Northern Algeria had passed under the control of the rebels.⁴⁴ A reflection of the uncertainty reigning on the site is that bulletins delivered to base personnel quoted both the statements provided by Algiers and those sent by Paris.⁴⁵ In the afternoon of April 23, it had been learned that General Gustave Mentré, commander of the French forces in the Sahara region, had sided with the rebels; he put additional pressure on Thiry to refrain from testing the device.⁴⁶ Mentré’s Algiers-based command issued orders to the effect that all units in the region—including the CSEM—obey Challe’s orders.⁴⁷ Thus, Thiry hesitated. Billaud suggests that, at this point, he may have used the unfavorable weather forecast as a pretext for waiting to see where, so to speak, the political winds were blowing.⁴⁸

Uncertainties about the Loyalties of On-site Troops.

Another element was in play. There were doubts about the loyalty of the on-site military units, and some of them “more or less openly advertised their sympathy with the rebellion.”⁴⁹ It was rumored on the base that some of the units had been relocated to the Sahara because of their sympathy for the cause of “Algérie française.”⁵⁰ A total of 424 soldiers had been sent to Reggan for a military exercise to take place during the test.⁵¹ Colonel Celerier, head of the CSEM, decided to have the armored forces stationed for a long duration under the desert sun in the disguise of an exercise. The uncertainty about the loyalty of some elements on the base played both ways: not proceeding with the test for fear of a fight on the base, or proceeding with the test as quickly as possible to get rid of the device.

Viard and other CEA personnel on the site urged Thiry to proceed with the test for both weather and security reasons.⁵² Billaud recounts that the Elysée intervened twice to hasten the test, obviously, according to him, for political reasons.⁵³ In normal times, only one “green light” was needed from the Elysée. It is unknown whether the Paris authorities, who had cracked the code used by the rebels for their radio communications, were aware of Challe’s call to Thiry.⁵⁴

On Monday, April 24, Celerier still feared an action by the armored units, who the night before had hailed the news of a possible coup in Paris itself.⁵⁵ According to Abramovici, this consideration was paramount in the decision to test as quickly as possible.⁵⁶ If one assumes that the decision to test on the morning of April 25 had not yet been confirmed, it is certain at that point (on April 24) that it was.

Early in the afternoon, soldiers participating in the exercise were ordered to take their positions near the ground zero site near Hamoudia.⁵⁷ In the evening, the base personnel were informed that the test would take place the next morning.⁵⁸

In an episode that seems more of a Mel Brooks parody than a James Bond movie, when it came to transporting the device to the tower some 50 km away, Jean Viard decided to have the heavily guarded official convoy leave without anything on board, while a CEA engineer, Pierre Thierry, transported the physics package in his modest 2CV (deux chevaux) car.⁵⁹ But the weather conditions then took a bad turn, with sand winds blowing all over the testing grounds.⁶⁰

The Test (Tuesday, April 25).

At 3:00 a.m. on April 25, communications with Algiers were cut off by Reggan in order to ensure that the news of the test would be announced by Paris and not by the rebels.⁶¹ At 6:05, the device was detonated. The test was immediately made public by Paris through a bland government communiqué that made no reference to the most particular circumstances under which it was done.⁶²

In Algiers, the Sahara command of General Mentré continued to send telexes to his troops, urging them to support the coup.⁶³ But that same morning, unknown to base personnel, Mentré met with Challe in Algiers and came out of the meeting convinced that the putsch was doomed. He flew to the base on the evening of the same day – not to seize control of it, but to hide himself from Paris.⁶⁴ Two hours later, at 11:00 p.m., it was announced at the base that the coup had failed.⁶⁵

Unknown to the Reggan loyalists, the coup had in fact failed the previous night, just as they were getting ready for the final countdown: In Algiers, around 2:00 a.m., the four generals had decided to give up and had separated.⁶⁶

Evidence Behind the “Political” Nature of the Timing.

There is little doubt that the timing of the test was at least partly political. In addition to de Gaulle’s orders, various testimonies mentioned above concur that concern was high among the military and civilian leadership at the site. One of the main figures of the French nuclear program, Yves Rocard, writes that the decision was meant to “clean the site of any atomic bomb and divert the rebellion’s attention away from it.”⁶⁷ Likewise, the CEA engineer in charge of the device, Pierre Billaud, says that “political circumstances” dictated of the decision to test on April 25.⁶⁸ Moreover, the change in weather conditions (the sand winds) did not deter Thiry from giving the final go-ahead.

The yield of the device provides another clue. Various official sources refer merely to a yield of less than five kilotons, the same vague characterization as that of the two previous tests (Gerboise blanche and Gerboise rouge).⁶⁹ It seems clear, however, that the test was a partial failure. But there is no evidence behind Brennan’s 1968 anonymous source’s assertion that the device had been “optimized” to ensure detonation even if it meant a lower yield.⁷⁰ The official report for the CEA activities of 1961 is unusually modest regarding the results of Gerboise verte, an indication of the fact that they were somewhat disappointing.⁷¹ An early account suggested a yield of less than one kilo-

ton.⁷² The unpublished memoirs of Pierre Billaud state that the delivered energy was 5 percent of what had been planned, and put the yield at 0.7 kiloton instead of the anticipated 15 kilotons.⁷³ There is, in fact, some uncertainty at the CEA itself about the yield delivered (probably due to the fact that weather conditions precluded a precise measurement). A classified report gives several different values, ranging from 0.7 to 1.2 kilotons – for an anticipated yield of 6 to 18 kilotons.⁷⁴

An additional element in support of the fact that Gerboise verte was a partial fizzle is the high residual activity of Pu239 and Pu240 on the site, which were estimated in 2005 as being much higher than the activity stemming from the two previous tests (which were also of low energy).⁷⁵

According to several testimonies, the reason behind this failure is that the neutron initiation of the fission reaction failed to take place properly.⁷⁶ One of the main goals of Gerboise verte was to test a new implosion architecture and a new architecture of the physics package, allowing for better safety.⁷⁷ Two different explanations exist about what exactly took place, but they complement each other and support, each in its own way, the hypothesis of a hasty – and thus political – decision to test. According to Pô, the final preparation of the device, as far as the neutron initiation was concerned, had not yet taken place in Reggan when the order to test was given by Paris.⁷⁸ As mentioned above, before the coup the CEA had moved the planned date of the test to May 1 because the device was not ready. According to Pierre Billaud – who was in charge of the test – the weather was the main culprit: Because of the heat and strong sand winds, the neutron flux was delivered 5 micro-seconds too early, which explains the low yield delivered.⁷⁹ As

stated above, the atmospheric conditions unexpectedly turned bad the day before or the night preceding the test. In normal circumstances, says Billaud, the test should have been postponed.⁸⁰ Thiry had the authority to stop the process, but he did not do it.

To sum up, orders from Paris, uncertain political conditions on the base, and the increasing heat in the region pushed for a test as soon as possible. These factors prevailed against orders from Algiers. Unexpected sand winds, which endangered the scientific value of the test, were not enough for Thiry to reverse his decision.

What Did the Loyalists Seek?

What did de Gaulle seek in moving forward the date of the test? Was it really to avoid the capture of the weapon, as stated in the Brennan article?

In fact, available evidence overwhelmingly suggests that moving the date was to make a symbolic show of authority in the eyes of the French population, the armed forces, and the world. Several sources converge in this regard. One is an early and well-informed account of the coup.⁸¹ The others are three key witnesses who were close to de Gaulle and were interviewed by Abramovici in the 1990s for his book. According to then-Defense Minister Pierre Messmer, de Gaulle sought to “give a lesson to the rebels” and “send a message to the rest of the world.” Colonel Pierre Dabezies, who was then an assistant to Messmer, said that de Gaulle’s purpose was to “show who the boss was.” Bernard Tricot, then an assistant to the president, remembers that de Gaulle “wanted to send a message to Algiers. He requested the shot to be made earlier than planned so that it was made clear that

France never abdicated.”⁸² Logic also supports this thesis. Had de Gaulle feared a capture of the weapon, he would have ordered the device to be scuttled and the test to take place immediately.⁸³ The fact that the military exercises scheduled during the test, as well as simultaneous “cold” nuclear experiments, took place as originally planned, is another clue that the process was hasty but not hurried.⁸⁴

However, Thiry’s “tactical” decision to test on Tuesday, April 25, and maintain it despite last-minute unfavorable wind conditions was at least partly driven by on-site security considerations (the fear of a capture), though increasing heat on the site was also a factor. If so, one question remains: If security was uncertain and the weather was getting hotter and hotter, why did Thiry decide that the test would take place only on Tuesday, April 25, and not on Monday, April 24, since he apparently had the authority to do so, and was requested to test as early as possible, on or after April 24? There are two possible explanations. First, the winds were not expected to be favorable in the early hours of April 24 (an explanation consistent with the CEA document and Bellec’s testimony). Second, Thiry may still have been uncertain about his political loyalties during the whole day of Sunday, April 23 (an explanation consistent with Bendjebbar’s account, based on Billaud’s testimony).⁸⁵ These two explanations are not incompatible.

Whatever the reality, what Paris had sought to convey is that it was business as usual that day, Tuesday 25, 1961, at the Reggan test site.⁸⁶

The Aftermath.

The coup ended rather quickly. In the evening of April 23, de Gaulle made a major speech on television, and the government mobilized the population in support of the Paris authorities. He resorted to Article 16 of the new constitution, giving him full powers—in effect, a form of legal counter-coup.⁸⁷ Faced with limited support in Algeria and even less in the metropolitan territory, the generals gave up during the night of April 24-25. De Gaulle had been right: The coup had lasted 3 days. In the end, the nuclear event of 1961 appears as the perfect symbol of de Gaulle's consolidation of power. For beyond its security and diplomatic value, the nuclear program was also, to some extent, an instrument to control the armed forces.⁸⁸

It is interesting to note, in this regard, that two of the leaders of the 1961 coup, Generals Salan and Jouhaud, were vocal opponents to the nuclear program.⁸⁹ While they might not have guessed that nuclear weapons were going to consolidate the primacy of the politicians over the military, they perfectly understood that de Gaulle's priorities—building an independent deterrent and withdrawing from the NATO integrated military command—conflicted with an enduring, politically and financially costly “pacification” operation in Algeria.⁹⁰ De Gaulle's historical speech of November 3, 1959, to the armed forces had heralded the withdrawal from the NATO integrated command and drawn the contours of a new defense policy, without once mentioning Algeria; what he had hoped for that day was to stir patriotism and encourage French soldiers to think beyond their obsession with what was then called the “pacification” of Algeria.⁹¹ It was, as a historian put it, “either Algeria or the Bomb.”⁹²

The choice, for de Gaulle, was “trading Algiers for Mururoa,” as another one writes.⁹³

The 1961 event is also connected in several respects to the decision taken less than a year later to propose the popular election of the President of the Republic (who was until then elected by a college of 81,000 elected officials). First, a direct election would shelter de Gaulle against another attempted military coup—or any other form of sudden eviction from power. Second, one of the reasons behind the 1962 reform was the legitimacy de Gaulle believed he needed to have the sole authority over the employment of nuclear weapons.⁹⁴

The Evian Agreements for the independence of Algeria were signed in March 1962. They stipulated that France would continue to use the Sahara as a nuclear testing ground for 5 years.

QUESTIONS

So, was there ever an actual risk of the device being put under the control of the rebels? If yes, could they have used it in any way?

Was the Device Ever at Risk?

The way the events unfolded, it seems that the device was never really at risk of being controlled by the rebels.⁹⁵ For sure, Thiry hesitated for 24 hours, but had he refused to test (he could have, and may have argued that weather conditions were not appropriate), would it have been enough for Algiers to claim control of the bomb? Moreover, this would not have changed anything to the outcome of the coup 1 day later. As far as the insider threat is concerned, there is no evidence that some of the units present in Reggan

had the willingness to seize the device, whatever their personal inclinations regarding the coup. Finally, the fact that the test took place in the early hours of the morning, which was standard procedure for technical reasons, is another indication that there was no clear and present danger to the security of the device. Had Thiry's prime objective been to scuttle it in order to prevent its capture, and thus disregard the scientific aspects of the experiment, the test could have taken place at any time.

There is no evidence either that the Algiers generals ever intended to devote the resources needed for a capture of the device. The control of the Sahara, with its vast oil riches and the presence of a nuclear testing and missile proving grounds, would have been an important strategic objective for any power seeking to establish itself in the French Algerian territories. However, nothing indicates that the timing of the coup depended on the planned test or that the control of the testing site was a key objective of the rebels. The question of the fate of the R1 device was probably discussed by Algiers as an afterthought, an opportunity to be seized.⁹⁶ In this respect, the 1961 event is very different from the 1991 attempted Soviet coup, when control of nuclear weapons was a central point.⁹⁷

Would It Have Been Possible for the Generals to Take Control of the Device by Force?

If the generals had decided that the device was a key objective, an option would have been for them to ask some of the military forces in Reggan to capture it. As stated, some of the on-site military personnel were clearly sympathetic to the cause of the generals.⁹⁸ However, this could have meant a bloody and uncertain battle at the base itself. Moreover, one would

have to assume that these units had direct means of communication with Algiers.

Another option would have been for Algiers to organize a dedicated operation to seize the whole testing grounds by force. As stated, the Reggan base was operationally under the control of Paris but organically depended on Algiers for its supplies, which came by air.⁹⁹ However, the success of such a move would have meant a significant diversion of rare military resources by the rebels, flying forces—say, one regiment of 1,000-1,500 men—about 1,000 miles south of the coast. (The six regiments that the rebels could count on were needed to control the main coastal cities.) Security at the base was not heavy: Dedicated forces apparently included only a company of soldiers and one platoon of gendarmes (as well as another company in Adrar, some 50 km away from Reggan).¹⁰⁰ The security culture was said to be rather lax (probably because the isolation of the site was its first line of defense).¹⁰¹ But here, too, such an attack would have meant the risk of fighting at the base itself.¹⁰²

Moreover, the rebels would not necessarily have known whether the elements of the device were stored in Reggan or already transported to the testing grounds. In Reggan, the physics package and the conventional explosives were stored in different locations, at a distance of 200 to 300 meters from each other. The operation would not have been a simple one.¹⁰³ Thus, even if the control of the base had been a key objective, by far the best option for the rebels would have been to wait for the coup to succeed and have most of the French forces present in Algeria—including those at the testing site—be under their command.¹⁰⁴ There is not much the CEA experts could have done against that, except, maybe, to sabotage elements of the device to render it inoperable.

If They Had, Could They Have Used the Device?

Even if the rebels had been able to get hold of a functional device, either physically by force or legally by succeeding in their enterprise, they would hardly have been able to use it as a weapon had they wanted to.¹⁰⁵ Assembly was planned to be made by an automated process; a new mechanism would have had to be designed. This automated assembly mechanism was located in the testing tower itself near Hamoudia, some 50 km away from the storage areas (see Figure 2-2). The key to initiate the mechanism was under military control.¹⁰⁶ Also, R1 was a device, not a weapon: Even if assembled, it was not meant to be transported and detonated at will.¹⁰⁷ Thus, the rebels would also have had to design a new mechanism for its remote detonation.



Figure 2-2. The Location of the Four French Tests in Reggan.

More realistically, the control by the rebels of the elements of the device would have been an instrument of political blackmail – as many on the base feared – or more simply and more likely, a testimony of their control over the most potent symbol of French power.¹⁰⁸ According to Pierre Billaud, General Challe’s counter-order to Thiry was probably meant to “affirm his control over the Sahara.”¹⁰⁹ Just imagine the Paris media announcing, “The rebels have the Bomb!” It would have been, in a sense, poetic justice: the ultimate revenge of the generals against de Gaulle.¹¹⁰ Whether this would have affected the outcome of the coup in any way remains open to speculation.¹¹¹

LESSONS

How much and how far is this episode worth using in support of the idea that nuclear terrorism is a real danger? Can any parallels be drawn with the foreseeable evolution of contemporary nuclear-capable states?

Lessons that can be learned from this episode include the following:

- The possibility of a nuclear device falling into unauthorized hands (either physically or legally) is not a far-fetched scenario. The very case of France presents other interesting hypotheses. If de Gaulle had not come to power, and the previous regime had completely collapsed in the years 1958 to 1960, control of the first French device by the armed forces, for instance, could have been an important political stake. Also, given that the 1962 Evian Agreements allowed France to continue nuclear testing on its Algerian territory for 5 years, which it did

until 1966, tensions with Paris could have led the Algerian authorities to attempt to seize a device as a bargaining tool (or even perhaps as a short cut to nuclear status).¹¹²

- The control of nonweaponized devices can become a key political objective for competing armed factions in a situation of political instability. This could happen in countries such as Iran, North Korea, Pakistan, and China. Indeed, particularly interesting scenarios include a secessionist movement in the restless regions of Baluchistan or Turkestan, which respectively host Pakistan and China's testing sites.
- At the same time, a scenario such as the one in 1961 is more likely to happen in an emerging nuclear-capable state with a nascent program and rudimentary means than in a mature nuclear power such as China. Hypothetical future nuclear-armed countries such as Iran, Egypt, and Saudi Arabia could also present risks of dangerous scenarios in case of domestic political turmoil. Iran and Egypt, in particular, would deserve special attention, given the importance of armed forces in their respective political systems.
- An interesting question is whether and how much the technical context would make a difference. Technology diffusion (as well as a greater global sensitivity to nuclear surety concerns) suggests that security of devices and installations such as testing sites, as well as communications between authorities and nuclear installations, could be much better in, say, Iran in 2021 than what they were in France in 1961. For the same reason, contrary to what

happened in 1961, several countries would be able to follow the events in real time by satellite means, and possibly influence the crisis.

- Complex command arrangements for military nuclear activities can prove to be problematic in crisis situations, creating legitimacy conflicts or uncertainties about who controls various nuclear commands and institutions.¹¹³ The personal role of key leaders can make a difference (in this case, that of de Gaulle in Paris and Thiry in Reggan).
- Nuclear weapons can become instrumental in the consolidation of the primacy of civilian power over the military, the primacy of the executive over the legislative branch, and the popular legitimacy of the head of the state. What happened in France was, in a sense, the reverse of what happened later in Pakistan, where control of nuclear weapons reinforced the armed forces' primacy over the civilians.

ENDNOTES - CHAPTER 2

1. Donald G. Brennan, "The Risks of Spreading Weapons: A Historical Case," *Arms Control and Disarmament*, Vol. 1, 1968; and Leonard S. Spector, *Going Nuclear*, Cambridge, MA: Ballinger Publishing Company, 1987, pp. 25-33.

2. "The rumor survived for decades, and I myself was guilty of repeating it until further inquiries with French officials, who had knowledge of these events, put the story in the category of 'never happened.'" Brian Jenkins, *Will Terrorists Go Nuclear?* New York: Prometheus Books, 2008, p. 144.

3. Maurice Vaisse, *Comment de Gaulle fit échouer le putsch d'Alger (How de Gaulle Foiled the Coup in Algiers)*, Paris, France: André Versaille, 2011; Pierre Abramovici, *Le putsch des généraux: De Gaulle*

contre l'armée, 1958-1961 (The Generals' Coup: De Gaulle Against the Army, 1958-1961), Paris, France: Fayard, 2011; Jean-Damien Pö, *Les moyens de la puissance: Les activités militaires du CEA, 1945-2000 (The Means of Power: The Military Activities of the CEA, 1945-2000)*, Paris, France: Ellipses, 2001; André Bendjebbar, *Histoire secrète de la bombe atomique (Secret History of the Atomic Bomb)*, Paris, France: Le Cherche Midi, 2000.

4. These include, in particular, Yves Rocard, *Mémoires sans concessions (Memories without Concessions)*, Paris, France: Grasset, 1988; Jean Bellec, "Vie au Sahara" ("Life in the Sahara"), *Site Personnel de Jean Bellec (Personal Site of Jean Bellec)*, available from www.kerleo.net (undated); personal testimony to Pierre Abramovici provided to the author; Pierre Billaud, "Souvenirs d'un pionnier de l'armement nucléaire français" ("Recollections of a Pioneer of French Nuclear Weapons"), available from pbillaud.fr, 2009; personal communications between Pierre Billaud and the author; personal testimony to Pierre Abramovici provided to the author. Rocard was in charge of the CEA's scientific programs. Bellec was a civilian engineer and an officer at the base. Billaud was a CEA military engineer in charge of coordinating the conception of the French device. He was adjoint technique (technical deputy) at the Département des techniques nouvelles (Department of New Techniques); on the day of the test, he was the chief CEA representative in Reggan.

5. Available French presidential archives do not provide any detail on the episode.

6. See Bruno Tertrais, "'Destruction Assurée': The Origins and Development of French Nuclear Strategy, 1958-1981," in Henry D. Sokolski, ed., *Getting MAD: Nuclear Mutual Assured Destruction, Its Origins and Practice*, Carlisle, PA: Strategic Studies Institute, U.S. Army War College, 2004, p. 62.

7. Allocution by General de Gaulle, Paris, France, September 16, 1959.

8. During this episode, one of de Gaulle's ministers suggested, half-jokingly, it seems, to use the first French device, which was to be tested in Reggan a few days later, against the insurgents in Algiers. Alistair Horne, *A Savage War of Peace: Algeria 1954-1962*, Revised Ed., London, UK: Papermac, 1987, pp. 365-366.

9. Speech by General de Gaulle, Paris, France, November 4, 1960.

10. Press conference by General de Gaulle, Paris, France, April 11, 1961.

11. The base command and the command of the 11th regiment of military engineers were located in the town of Reggan.

12. Ministère de la défense (Ministry of Defense), Délégation à l'Information et à la Communication de la Défense, Dossier de présentation des essais nucléaires et leur suivi au Sahara (Delegation Information and the Communication of the Defense: Presentation File of Nuclear Testing and Monitoring in the Sahara), Paris, France: January 2007, p. 1.

13. The Joint Special Weapons Command had been created in 1951 by General Charles Ailleret to oversee the development of the French nuclear program.

14. Pierre Denis, *L'armée française au Sahara (The French Army in the Sahara)*, Paris, France: L'Harmattan, 1991, p. 236.

15. Abramovici, *Le putsch des généraux*, p. 196; Vaïsse, *Comment de Gaulle fit échouer le putsch d'Alger*, p. 151.

16. The Algiers officials were sent under guard to In Salah, about 300 km from Reggan.

17. Vaïsse, *Comment de Gaulle fit échouer le putsch d'Alger*, p. 72.

18. Direct action against Paris was indeed planned, but this part of the coup had been neutralized by French authorities as early as April 22 in the morning.

19. Quoted in Bendjebbar, *Histoire secrète de la bombe atomique*, p. 326. This is consistent with Vaïsse's book, which states that the test had been "planned for a long time." Vaïsse, *Comment de Gaulle fit échouer le putsch d'Alger*, p. 78.

20. Various testimonies refer to the name of the exercise as “Hippocampe vert” (Green seahorse). Official documents do not use this name and mention two distinct operations: the “Gargliano” offensive maneuver and the “Bir-Hakeim” defensive maneuver. One armored squadron (reinforced by one armored platoon), one reconnaissance squadron, and one mechanized company were to participate. See *Rapport sur les essais nucléaires français 1960-1996*, Tome I, *La genèse de l'organisation et les expérimentations au Sahara*, (Report on the French Nuclear Test, 1960-1996, Vol. I, *The Genesis of the Organization and the Experiments in the Sahara*), CSEM et CEMO, p. 229-235. (This text is a classified report leaked in 2010.) This “Groupement des essais tactiques” (Tactical Tests Group) had been formed on February 15 and represented a total of 424 soldiers. See Denis, *L'armée française au Sahara*, p. 238. At least 195 soldiers from the 12th armored regiment, with five Patton M47 tanks, had been called from Germany to participate in the event. The date of February is also given by a soldier who participated in the exercise. See Christophe Labbé and Olivia Recasens, “Le secret des irradiés du Sahara” (“The Secret of the Irradiated of the Sahara”), *Le Point*, August 2, 2002. The episode has given rise to a controversy about the possible exposure of French troops to dangerous levels of radiation. The story was first been made public by Vincent Jauvert, “Sahara: les cobayes de ‘Gerboise verte’” (“Sahara: Guinea Pigs of ‘Green Jerboa’”), *Le Nouvel Observateur* (*The New Observer*), February 5-11, 1998.

21. CEA document communicated to the author.

22. The minutes of de Gaulle’s agenda are reproduced in Vaisse, *Comment de Gaulle fit échouer le putsch d’Alger*, pp. 48-49.

23. Personal testimony of Bellec to Abramovici. See also Abramovici, *Le putsch des généraux*, p. 307. (Abramovici mistakenly mentions the date as April 21 instead of April 22.) Another version has Pierre Messmer, the then-defense minister, ordering to “maintain the planned date,” without asking for de Gaulle’s authorization. This rather self-serving testimony does not match with the evidence presented in this text, unless Messmer referred to the date of April 24 as originally planned before the putsch. See the personal testimony of Messmer in the report of a round-table held in June 1992, Groupe d’études français d’histoire de l’armement nucléaire (French Study Group of the History of

Nuclear Weapons), *Les expérimentations nucléaires françaises (The French Nuclear Experiments)*, Paris, France: Institut d'histoire des relations internationales contemporaines (Institute of the History of Contemporary International Relations), Institut de France, 1993, p. 110.

24. De Gaulle's belief that the coup would last no more than 3 days was conveyed to his advisor Jacques Foccart: "It's a matter of three days." Quoted in Yves Courrière, *La guerre d'Algérie, Tome 4, Les feux du désespoir, (The War in Algeria, Vol. 4, The Fires of Despair)* Paris, France: Fayard, 1971, p. 308.

25. Text quoted in Vaïsse, *Comment de Gaulle fit échouer le putsch d'Alger*, p. 178.

26. Personal testimony of Bellec to Abramovici.

27. Pô, *Les moyens de la puissance*, pp. 139-140.

28. Bendjebbar, *Histoire secrète de la bombe atomique*, p. 329.

29. Personal communication by Pierre Billaud to the author, September 16, 2011.

30. Jacques Fauvet and Jean Planchais, *La fronde des généraux (The Revolt of the Generals)*, Paris, France: Arthaud, 1961, p. 145.

31. The NOTAM explanation is given by Pierre Billaud. See Billaud, "Souvenirs d'un pionnier de l'armement nucléaire français," and personal testimony of Billaud to Abramovici.

32. Rocard, *Mémoires sans concessions*, p. 322.

33. Jean Bellec, "Vie au Sahara."

34. According to Rocard, he told Challe: "Yes, yes, we'll see." Rocard, *Mémoires sans concessions*, p. 232.

35. Abramovici, *Le putsch des généraux*, pp. 307-308. The book mentions April 21, but the rest of the paragraph suggests that he means April 22.

36. CEA document communicated to the author. Standard procedure was that Thiry had the authority to determine the time of the test, not its date, but he could postpone it. See *Rapport sur les essais nucléaires français 1960-1996*.

37. Personal testimony of Bellec to Abramovici.

38. Bendjebbar, *Histoire secrète de la bombe atomique*, p. 329. Billaud's own account is that he and Viard went to see Thiry "around the 23rd" in order to convince him to go ahead. See Billaud, "Souvenirs d'un pionnier de l'armement nucléaire français."

39. Bendjebbar, *Histoire secrète de la bombe atomique*, p. 328. Billaud's account mentions the risk of a "complete paralysis of the instruments." Billaud, "Souvenirs d'un pionnier de l'armement nucléaire français."

40. Personal testimony of Billaud to Abramovici.

41. CEA document communicated to the author; and Bellec, personal testimony.

42. Pierre Billaud's testimony quoted in Bendjebbar, *Histoire secrète de la bombe atomique*, p. 329; Billaud, "Souvenirs d'un pionnier de l'armement nucléaire français."

43. Bellec, "Vie au Sahara."

44. Abramovici, *Le putsch des généraux*, p. 308.

45. Bellec, "Vie au Sahara."

46. Personal testimony of Bellec to Abramovici.

47. In January 1961, the Sahara Joint Command (Commandement Interarmées au Sahara) had been relocated from Algiers to Reggan, but the decision had not yet been implemented.

48. Personal testimony of Billaud to Abramovici.

49. Abramovici, *Le putsch des généraux*, pp. 307-308; and Billaud, "Souvenirs d'un pionnier de l'armement nucléaire français."

50. Bellec, "Vie au Sahara."

51. Denis, *L'armée française au Sahara*, p. 238.

52. Pierre Billaud's testimony quoted in Bendjebbar, *Histoire secrète de la bombe atomique*, p. 329; Billaud, "Souvenirs d'un pionnier de l'armement nucléaire français"; personal communication of Pierre Billaud to the author, September 15, 2011; personal testimony of Billaud to Abramovici.

53. Personal communication to the author, September 16, 2011.

54. The information about Paris having cracked the code used by the rebels was given to Brian Jenkins by Constantin Melnik, the prime minister's intelligence coordinator. Personal communication of Brian Jenkins to the author, March 15, 2012.

55. Personal testimony of Bellec to Abramovici.

56. Abramovici, *Le putsch des généraux*. pp. 307-308.

57. Testimony of Jean-Françis Rommès, "Le peloton Patton sous Gerboise verte" (The Patton Platoon under Green Jerboa), *Moruroa Mémorial Des Essais Nucléaires Français (Moruroa Memorial of French Nuclear Tests)*, available from www.moruroa.org.

58. Testimony of a soldier quoted in the television documentary *L'Algérie, de Gaulle, et la Bombe* (Algeria, de Gaulle, and the Bomb), directed by Larbi Benchiha, Aligal Production, and France Télévision, 2010.

59. This version is mentioned in the testimony of a CEA engineer, Claude Ayçoberry quoted in Pô, *Les moyens de la puissance*, pp. 139-140. The 2CV was a popular Citroën car, initially produced in 1948 with a view to encourage the transition of the French peasantry to modern vehicles. There are varying accounts of the episode. One states that the package was delivered in one of the utility 2CVs that belonged to the military; see Abramovici, *Le putsch des généraux*, p. 308. Another suggests that the 2CV was indeed driven by CEA personnel, but that choice of the transportation mode was simply dictated by the legendary suspension

mechanism of the car, which had been designed to fit the rocky roads of the French countryside, and thus provided guarantees of safety given the delicate nature of the package (personal testimony of Bellec to Abramovici).

60. An official 2001 report blandly states that the weather conditions “were not conducive to a proper exploitation of the data.” Office parlementaire d’évaluation des choix scientifiques et technologiques (Parliamentary Office of Science and Technology Options), *Rapport sur les incidences environnementales et sanitaires des essais nucléaires effectués par la France entre 1960 et 1996 et éléments de comparaison avec les essais des autres puissances nucléaires* (Report on Environmental and Health impacts of Nuclear Testing by France between 1960 and 1996 and a Comparison with Tests of Other Nuclear Powers), Assemblée nationale (National Assembly), February 5, 2001, p. 27.

61. Personal testimony of Bellec to Abramovici.

62. Bendjebbar, *Histoire secrète de la bombe atomique*, p. 326.

63. Bellec, “Vie au Sahara.”

64. Abramovici, *Le putsch des généraux*, p. 308. Vaïsse seems to imply that Mentré’s choice was made on the 24th; see Vaïsse, *Comment de Gaulle fit échouer le putsch d’Alger*, p. 73. However, Mentré himself later reportedly claimed, during his trial, that he had switched his allegiance back to Paris on April 25. Incidentally, he also claimed at that occasion that he had been instrumental in ensuring that the test was conducted. See Spector, *Going Nuclear*, p. 30.

65. Personal testimony of Bellec to Abramovici.

66. Vaïsse, *Comment de Gaulle fit échouer le putsch d’Alger*, p. 83.

67. Rocard, *Mémoires sans concessions*, p. 232.

68. Personal communication with the author, September 15, 2011.

69. There is little official, unclassified information available about French test yields. A comprehensive parliamentary study published in 2001 gives less than five kilotons for the second, third, and fourth tests. Office parlementaire, *Rapport sur les incidences environnementales et sanitaires des essais nucléaires effectués par la France*, p. 26. The same data are given in Ministère de la défense, *Délégation à l'information et à la Communication de la Défense*, p. 1. The government communiqué of April 24, 1961, stated that the explosion was of a "low energy," but this did not mean anything in itself: Five kilotons could be considered "low energy" as compared with the first French test (70 kilotons).

70. Brennan, "The Risks of Spreading Weapons," p. 60. Nor is it clear that this means anything from the technical standpoint.

71. It says that it "allowed the [Military Applications Division of the CEA] and the armed forces to build on the lessons learned at the occasion of the previous explosions, in particular regarding the functioning of the device, its overall effects. . . ." See CEA, *Rapport annuel 1961* (Annual Report, 1961), quoted in Bendjebbar, *Histoire secrète de la bombe atomique*, p. 330. This was not a lie, since the CEA team discovered, at this occasion, unanticipated and valuable information about the behavior of the plutonium sphere during the implosion. Billaud, "Souvenirs d'un pionnier de l'armement nucléaire français," and personal communication with the author, September 15, 2011. In addition, Gerboise verte included progress in the instrumentation of the tests. See, *Rapport sur les essais nucléaires français 1960-1996*, p. 242. The 1961 report also mentioned lessons learned about the "essential characteristics that military equipments and materials must have to ensure an efficient protection of personnel," an obvious reference to the live exercise. Contemporary presentations of the test are balanced. The CEA claims that "the experiment was conducted in a quasi-nominal fashion and almost all the scheduled measurements were acquired" (CEA document communicated to the author). A 1998 official documentary simply mentions Gerboise verte as having been "disappointing" (*Histoire des essais nucléaires français, Etablissement de communication et de production audiovisuelle des armées*, 1998).

72. Brennan, "The Risks of Spreading Weapons," p. 59.

73. Billaud, "Souvenirs d'un pionnier de l'armement nucléaire français." The author gives slightly different—but not inconsistent—data about the yields in another chapter of his memoirs (0.5-1 kiloton delivered for 10-15 kilotons anticipated).

74. *Rapport sur les essais nucléaires français 1960-1996*, pp. 118, 229, 231.

75. International Atomic Energy Agency, *Radiological Conditions at the Former French Nuclear Test Sites in Algeria: Preliminary Assessment and Recommendations*, 2005, pp. 11-12.

76. Pô, *Les moyens de la puissance*, p. 139; Billaud, "Souvenirs d'un pionnier de l'armement nucléaire français"; and Bellec, "Vie au Sahara."

77. Billaud, "Souvenirs d'un pionnier de l'armement nucléaire français."

78. Pô, *Les moyens de la puissance*, p. 139.

79. Personal communication with the author, September 15, 2011. The same design ended up being successfully tested in 1963. Billaud, "Souvenirs d'un pionnier de l'armement nucléaire français."

80. Personal communication with the author, September 15, 2011.

81. Fauvet and Planchais, *La fronde des généraux*, pp. 231-232.

82. E-mail conversation with Pierre Abramovici, April 9-10, 2012.

83. Historians of the Algerian war have called the test "an extraordinary demonstration of the realities of Gaullist power" (Horne, *A Savage War of Peace*, p. 459), one that "showed the whole world that the Government's authority extended to the far ends of the Sahara," (Fauvet and Planchet, *La fronde des généraux*, p. 232).

84. Two cold experiments involving small amounts of plutonium were separately conducted that day under the code

name "Augias 2." *Rapport sur les essais nucléaires français 1960-1996*, p. 118.

85. A third explanation, that the engineers were requesting more time to prepare the device, would be inconsistent with Billaud's testimony, according to which they were arguing for an early detonation because of heat and security concerns.

86. Pierre Messmer, who was defense minister at that time, claimed in a seminar held in 1992 that, to the best of his knowledge, there had been no pressure from the rebels for the test to not take place. See *Les expérimentations nucléaires françaises*, p. 110. See also above the quotation of former French officials by Brian Jenkins (although contrary to Messmer, the officials in question had perhaps not had access to the relevant information).

87. France remained under Article 16 until October 1961.

88. See for instance Tertrais, "'Destruction Assurée': The Origins and Development of French Nuclear Strategy, 1958-1981."

89. On Salan and the nuclear program see Abramovici, *Le putsch des généraux*, pp. 130-131. Zeller too was against the Bomb, but more for ethical reasons (personal communication by Bernard Zeller, September 13, 2011).

90. "How is the atom bomb going to help us pacify Algeria?" wondered Jouhaud in 1958. "L'heure d'un choix," *L'Air*, December 15, 1958, quoted in Samy Cohen, "France, Civil-Military Relations, and Nuclear Weapons," *Security Studies*, Vol. 4, No. 1, Autumn 1994, p. 163.

91. Jean Lacouture, *De Gaulle*, Tome 3, *Le Souverain (De Gaulle, Vol. 3, The Sovereign)*, Paris, France: Seuil, 1986, p. 80.

92. Vaïsse, *Comment de Gaulle fit échouer le putsch d'Alger*, p. 110.

93. Lacouture, *De Gaulle*, p. 469. Mururoa is the location chosen later for most of the French nuclear tests in the Pacific.

94. On this, see, Tertrais, “‘Destruction Assurée’: The Origins and Development of French Nuclear Strategy, 1958-1981.”

95. The base was never under the control of the rebels, contrary to what Spector hypothesized in 1987. See Spector, *Going Nuclear*, pp. 25, 30. The misuse of some French sources in this part of the Spector book was noted by political scientist Samy Cohen in “France, Civil-Military Relations, and Nuclear Weapons,” pp. 177-178.

96. Pierre Billaud recounts that his flight to Reggan was particularly unusual. Flying over the Mediterranean, the plane received an order from Paris to return to its base. Then it received another order, this time to land in Algiers instead of going straight to the test site. Billaud and his colleague George Tirole (who were the only two passengers) had their identities checked by a rebel unit, which then let them go to Reggan. Whether or not this was a cumbersome attempt to stop or delay the test is unclear. See the testimony of Pierre Billaud in Bendjebbar, *Histoire secrète de la bombe atomique*, pp. 327-328; and Billaud’s own account. No mention of the date of the flight is given, but Bellec mentions Billaud’s arrival on Sunday 23.

97. The author is grateful to Samy Cohen for this suggested comparison.

98. It is unclear whether specific units were actually clearly siding with the rebels. As stated above, several sources state that armored units were sympathetic to the generals’ cause. See for instance Pô, *Les moyens de la puissance*, p. 139; and Abramovici, *Le putsch des généraux*, p. 307. The testimony quoted by Pô refers specifically to a unit that was present for the exercise planned during the test; however, these troops had no contact with the base personnel and were probably largely unaware of what was going on. See Rommès, “Le peloton Patton sous Gerboise verte.” Abramovici mentions armored units and Legion étrangère units.

99. Pô, *Les moyens de la puissance*, p. 139.

100. Yves Rocard goes as far as saying that the site “did not even have a single machine gun to defend it” — a dubious assertion. Rocard, *Mémoires sans concessions*, p. 232.

101. Bellec, "Vie au Sahara."

102. Whether or not French forces would have gone as far as spilling "blood for the bomb" is dubious. Vaïsse notes the prevailing culture of the French military included a strong repugnance to the idea against fighting against one another (*Comment de Gaulle fit échouer le putsch d'Alger*, pp. 292-294). More likely, a confrontation on the site would have had one side ceding to the other before actual fighting could have taken place.

103. Antoine Schwerer, "Auprès de ma bombe," unpublished manuscript, March 1990, p. 49.

104. Another possibility would have been to seize the device before it reached Reggan, assuming it was not yet on the site.

105. This is a theoretical discussion. It is hard to conceive a scenario in which such use would have made sense, apart from proceeding with the test at a moment of their choice to demonstrate their control of the Sahara.

106. Schwerer, "Auprès de ma bombe," pp. 49, 65. The "final 35 minutes" of the assembly process were automated, according to a CEA engineer interviewed by the French public radio, broadcasted on March 17, 1960, Archives of the Institut National de l'Audiovisuel (National Audiovisual Institute).

107. One account suggests that the core of the device had not yet been delivered to the Reggan base when the coup took place. The head of Radio-Alger, André Rossfelder (appointed by the rebels in the first hours of the coup) claims that he was informed in the evening of April 22 that the device—without its detonator—which was due to be transferred to Reggan, was in a military warehouse in the port of Algiers. When he sought to have the story confirmed, he was told by a military official that this was a mistake and the device had already been delivered to Reggan. While Rossfelder does not hypothesize about the veracity of the events, he seems to suggest implicitly that the Algiers generals had deliberately allowed the core to be transferred to Reggan. André Rossfelder, *Le onzième commandement (The Eleventh Commandment)*, Paris, France: Gallimard, 2000, pp. 497-499.

108. According to the testimony of Zeller's grandson, the idea of nuclear blackmail did not square well with the mentality of the four generals. Personal communication of Bernard Zeller to the author, September 13, 2011.

109. Personal communication to the author, September 15, 2011.

110. The notion of poetic justice is suggested by Rossfelder (*Le onzième commandement*, p. 498). One thing the rebels could have done is proceed with the test according to their own timetable, to demonstrate their control of the site, but this would have meant acquiring the cooperation of the CEA personnel.

111. The details of the Reggan events remained secret for several weeks, and there is no evidence that the United States, for instance, was aware in real time of what was going on at Reggan in April 1961. No mention of the episode is made in the studies of U.S. archives done by French experts. See Vincent Nouzille, *Des secrets si bien gardés: Les dossiers de la Maison-Blanche et de la CIA sur la France et ses présidents 1958-1981 (The Secret So Well Kept: Records of the White House and CIA on France and Its Presidents 1958-1981)*, Paris, France: Fayard, 2010; and Vaïsse, *Comment de Gaulle fit échouer le putsch d'Alger*. No U.S. official analysis of the events has been found by this author. A declassified 1964 CIA study contained comments on each French test, but the description is excised in the declassified version. See, Central Intelligence Agency, *The French Nuclear Weapon Program*, OSI-SR/64-10, March 27, 1964, available from www.foia.cia.gov/docs/DOC_0001522915/DOC_0001522915.pdf. Brian Jenkins had access to other previously classified documents and confirms that no mention of the test appears in any of them. Personal communication with the author, March 2012.

112. A report drafted by Professor Thomas Schelling for the Kennedy administration in October 1962, recounting delivery possibilities for new nuclear powers, states that "a fishing boat or a cheap airplane might have been an adequate means of delivery for, say, the Algerian Nationalists against Marseilles, or Castro's Cuba against Baltimore and Miami," quoted in Francis J. Gavin, "Same As It Ever Was: Nuclear Alarmism, Proliferation, and the

Cold War," *International Security*, Vol. 34, No. 3, Winter 2009-10, p. 22; perhaps this scenario was inspired by the April 1961 events and the subsequent Evian Agreements.

113. As stated above, the CSEM reported both to Paris (Joint Staff) and Algiers (Sahara Command), and the GOEN reported both to the Ministry of Defense and the CEA.