

Despite protests from all parts of the world, France resumed underground nuclear testing on September 5, 1995,¹ for the ostensible reason of calibrating equipment to facilitate computer simulations designed to check the reliability of French nuclear warheads. France detonated a small nuclear device equivalent to about 8,000 tons of TNT² at its Mururoa test-site in the South Pacific (*Centre d'Expérimentations du Pacifique*). Some arms control experts, however, believe that the real reason for the series of tests is to certify a new nuclear warhead (TN-76/TN-100) for the M-45/M-5 submarine-launched ballistic missile³ (and also possibly for a new cruise missile, though this seems unlikely). Despite strong international opposition, France carried out a second nuclear test, in the current series, at Fangataufa on October 1.⁴

Announced on June 13, 1995, by the new President of France⁵ Jacques Chirac as his presidential debut on the international stage, this new series of up to eight tests, did not come as a surprise, though it was roundly criticized internationally. Only Colonel Mu'ammar al-Qadhafi, the Libyan leader, endorsed Chirac's plan.⁶ In his election campaign, Chirac noted the necessity of temporarily resuming testing, which had been suspended by his predecessor President François Mitterand in 1992, to maintain France's nuclear arsenal. Chirac's presidential announcement also noted that the new series of tests would be concluded by May 1996, and that France would then go on to sign a Comprehensive Test Ban Treaty (CTBT) in the fall of 1996.

The resumption of French nuclear weapon testing has evoked strong criticism internationally and has resulted in France being perceived as somewhat of a nuclear pariah, particularly by nations in the South Pacific. Australia and Chile recalled their envoys from Paris, while New Zealand, Japan, and South Pacific Forum nations issued condemnations,⁷ and peace groups set up protests ranging from Europe to the South Pacific. The inopportune political timing and insensitivity of France's testing program is only exceeded by that of China, which conducted a nuclear test in mid-May, barely three days

after the ending of the historic Non-Proliferation Treaty (NPT) 1995 Review and Extension Conference. Ironically, France played a constructive role at that conference by helping shape language on two key decisions

(i.e. "principles and objectives" and "strengthened review"⁸) to which it is a party.

In its efforts to justify its testing program, the French government has linked its international stature and influence to its nuclear weapon capabilities and has even offered to extend its nuclear umbrella to defend its European Union (E.U.)

partners.⁹ These blandishments, however, have not gone over well as several E.U. members have questioned French political wisdom and sincerity.¹⁰ Perhaps more significantly, the standing of both President Chirac and his government in domestic public opinion in France has markedly declined.¹¹ In order to properly assess France's position on the necessity of the current series of tests, it would be useful to briefly examine the history of the French nuclear testing program, its nuclear force posture, as well as France's stance toward nuclear arms control.

FRENCH NUCLEAR WEAPONS PROGRAM¹²

France was not a member of the wartime U.S.-led Manhattan Project which developed the world's first nuclear explosive device in 1945. While France probably contributed some information on special materials relevant to making nuclear explosives, it only indirectly

**VIEWPOINT:
FRENCH NUCLEAR
TESTING:
A FOOL'S ERRAND**
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contributed scientists¹³ through the Anglo-American team to the Manhattan Project. France entered the nuclear testing process relatively late and was excluded from early Anglo-American cooperation in nuclear matters. Hence, according to a formerly secret U.S. government report, French nuclear weapon capabilities were developed “at greater costs in resources and time than would have been the case if it had been able to secure assistance from allies. Moreover, because of its late start, France’s nuclear technology and its supporting systems lag behind those of the experienced nuclear powers.”¹⁴

The decision to embark on a nuclear weapon program was taken on December 26, 1954, by Prime Minister Pierre Mendès-France and his cabinet officials, following the prime minister’s unsuccessful attempt at the United Nations to persuade the United States and the Soviet Union to desist from atmospheric nuclear testing.¹⁵ In November 1956, the French atomic weapon program was finally given the signal to prepare for weaponization by the government of Prime Minister Guy Mollet, following the Anglo-French *débauche* at Suez (which incidentally also led to French nuclear assistance to Israel¹⁶). Prime Minister Félix Gaillard, the last government leader of the Fourth Republic, officially authorized the manufacture of a nuclear explosive device on April 11, 1958.¹⁷ In order to prepare for their first atomic detonation, French scientists participated in U.S. nuclear testing activities at the Nevada Test Site in 1957 to 1958. *Gerboise Bleue*, the first French nuclear test, was conducted on February 13, 1960, in Algeria, with a yield estimated at 60 to 70 kilotons (KT). This plutonium fission device was three times more powerful than the equivalent first tests by the United States or by the United Kingdom, thus demonstrating the relative technological backwardness of the French nuclear program as compared to those of these two countries (in terms of nuclear warhead design and miniaturization).

France, in parallel with the United Kingdom, has never tested any nuclear explosive devices on its primary or indigenous home soil. All French nuclear explosions have been conducted on colonial territories, first in Algeria and then, following Algerian independence in 1962, in the Tuamotu Archipelago (which includes the uninhabited Mururoa and Fangataufa Atolls) in the South Pacific. France claims that all its tests have been conducted on “French” territory, whether on the mainland in Europe or elsewhere.

The first gravity bombs, plutonium implosion fission

weapons, were deployed on French strategic bombers in 1964. In the mid-1960s, warheads were developed based on boosted fission designs for intermediate-range ballistic missiles that were deployed in 1972. Thermonuclear warheads were deployed on submarine-launched ballistic missiles in 1977, and multiple-warhead ballistic missiles became operational in 1985. France has developed some nine classes of nuclear warheads and produced about 1,100 warheads, of which some 500 are currently in service on a mix of air-, land-, and sea-based delivery systems.¹⁸ The latest round of French tests is probably designed to certify the TN-76/TN-100 warhead for deployment on M-45/M-5 submarine-launched ballistic missiles on the latest model (third generation) fleet ballistic missile submarines (*Triomphant*-class).

French nuclear weapon designers, seeking to be independent of both the United States and the United Kingdom, have been relatively backward and slow, as compared to those in the four other declared nuclear weapon states. Thus, in general, the French nuclear weapon program has required about five times as many nuclear tests as its British and Chinese counterparts—the official number is 206,¹⁹ while an unofficial estimate is 212, tests and counting, as compared to 45 tests by the United Kingdom and 42 tests and counting by China. France accounts for nearly 10 percent, of all nuclear test explosions—2,039—to date.²⁰ Another indicator of the relative slowness of the French program is that it took France 102 months from its first fission weapon to its first multistage thermonuclear bomb (as compared to 32 by China, 66 by the United Kingdom, 75 by the Soviet Union, and 87 by the United States). France exploded 50 atmospheric tests (in contrast to 23 by China and 21 by the United Kingdom) as well as 161 and counting underground tests (as compared to 23 by the United Kingdom and 16 by China). A previously classified U.S. report noted that French nuclear forces suffered from several shortcomings, including problems in thermonuclear warhead design and supporting systems, unsophisticated penetration aids (for ballistic missile re-entry vehicles), and technical weaknesses in nuclear-powered submarine propulsion technology and undersea launch of missiles.²¹

This evidence of relative inferiority in nuclear weapon technology might lend credence to Paris’ claims that France needs to conduct additional tests for reliability and safety purposes and that the moratoria on testing by the Soviet Union, the United States, and the United

Kingdom, were only announced after these countries had essentially completed their nuclear testing requirements. Facts, however, suggest otherwise—both the United States and the Soviet Union had force modernization programs underway, but changing political and arms control events led their respective leaderships to stop further nuclear testing. The Soviet/Russian and U.S. moratoria were declared primarily for political and arms control reasons, as was President Mitterand's halt to French testing in 1992. By the same token, the present resumption of French testing seems mainly for political reasons. President Chirac, in what has been perceived by the South Pacific nations (in particular) as a remarkable demonstration of arrogance and political insensitivity,²² has pointed to France's status as a "great power" and as a permanent member of the Security Council as flowing from its possession of a powerful nuclear arsenal. He believes that France's resumption of nuclear explosions is both a demonstration and a reminder of its power and place in global affairs.²³

French officials also note the 15 percent reduction in their stockpile of deployed warheads—comprising a 75 percent reduction in production of *Hades* missiles and their non-deployment, the early retirement of the *Pluton* missile, and deactivation of the AN-52 (low-yield) gravity bomb—together with lower production limits on missile submarines and bombers, as evidence of their commitment to arms control and recognition of post-Cold War realities.²⁴

While this latter claim bears up under scrutiny, it is also important to note that some of the retired systems were already obsolete and due for deactivation and that economic considerations also played a significant role in reduced defense expenditures in France (leading to both cutbacks and cancellations). Further, continued deployment of intermediate-range ground-launched ballistic missiles, *Pluton* and *Hades*, became politically unacceptable as their range only extended to reach parts of unified Germany on the European continent. Similarly, the strategy of proportional deterrence against the former Soviet Union makes little sense in the context of the breakup of the former Soviet nuclear arsenal and START-mandated dismantlements. The more politically significant and telling point, however, is that despite French concurrence with the historic decisions of the 1995 NPT Conference that relate to reducing the role of nuclear weapons in global security, France continues to base to a large extent its legitimacy as a major player on the international stage on its nuclear arsenal. Even

France's European allies remain skeptical of French nuclear aspirations and rationalizations of its testing program.

The French nuclear deterrent (*force de frappe*) has always been characterized as being independent, i.e. not dependent technologically or militarily on any allied state, and also as being defensive to guard against any and all threats from any direction (*touts azimuts*). While France was a founding member of the North Atlantic Treaty Organization (NATO) in August 1949, it always has had reservations about integrating French military forces with those of NATO. Although France had contributed certain military assets to NATO's integrated forces and designated others for NATO commitments, in March 1966 President de Gaulle withdrew France from the NATO integrated force structure (and consequently, U.S. nonstrategic nuclear weapons based in France were withdrawn). Yet, despite French claims and assertions of nuclear independence, in reality, after strong initial opposition, France benefited in the 1970s and 1980s from highly-secret U.S. nuclear assistance. This included assistance in the development of advanced nuclear warhead and missile designs, as well as help in the development of France's first multiple-warhead submarine-launched ballistic missile (M4A).²⁵ The 1985 U.S.-France "Agreement for Cooperation on the Safety and Security of Nuclear Activities and Installations for Mutual Defense Purposes" authorizes transfer to France of U.S. restricted data on nuclear weapons, material, and equipment "to improve the recipient nation's atomic weapon design, development, or fabrication capability to optimize the safety and security of the recipient's nuclear activities or installations."²⁶ Recently, the United States even offered to share its computer simulation technology for nonexplosive reliability testing of warheads with France in an attempt to dissuade resumption of French testing, however, this offer was apparently refused.²⁷

In keeping with the testing practices of the other declared nuclear weapon states, France has traditionally tested nuclear explosives for six reasons: 1) to achieve a nuclear weapons capability; 2) to develop, certify, and modernize weapons; 3) to maintain stockpile reliability; 4) to determine and evaluate the effects of nuclear detonations; 5) to improve safety of existing warhead designs; and 6) to retain the technological infrastructure for nuclear armaments.

French (as well as other) nuclear weaponeers utilize three sources of data, other than nuclear detonations, to

study the dynamics of nuclear explosions. Hydrodynamic experiments are used to show warhead behavior from the point of triggering to the point at which a nuclear chain reaction occurs. Inertial-confinement fusion relies on high-intensity lasers to heat and compress beads of deuterium and tritium in order to study fusion (thermonuclear) characteristics. Hydronuclear experiments, or aborted bombs, use explosives with yields of kilograms (rather than kilotons) to test for reliability and safety of nuclear explosives.

France is also currently developing plans to build a new facility to conduct hydronuclear tests utilizing high-energy lasers and to develop a test simulation computer program. This facility called PALEN (*Préparation à la Limitation des Essais Nucleaires*) would be built outside Bordeaux at a cost of over \$2 billion over the next five years.²⁸ Thus, some in the arms control community remain skeptical of French government claims to join a CTBT, if and when such a treaty is signed.

Probably in an attempt to stanch international criticism of its resumed nuclear testing program, in August 1995, France published for the first time a complete and detailed list of all French nuclear tests conducted since 1960. This report listed 204 nuclear detonations, of which 12 were characterized as “safety tests.”²⁹ Between February 1960 and February 1966, France conducted 17 tests in the Sahara—four were air bursts and 13 were underground. In the South Pacific, between July 1966 and July 1991, 175 French nuclear detonations took place—41 air bursts, 78 underground (in shafts dug into the coral reef), and 56 underground (in shafts dug beneath the lagoon). Of the 175 tests explosions, 163 were at the Mururoa Atoll, and 12 at Fangataufa. In three of the atmospheric tests, a full-size atomic bomb was dropped from a bomber—a Mirage IV in July 1966, a Mirage III-E in August 1973, and a Jaguar in July 1974. The warheads tested were the 60 KT AN-22 and the 20 KT AN-52 gravity bombs. A breakdown of the explosive yields of the tests shows that: 63 detonations (comprising 18 air bursts and 45 underground) were between five to 20 KT; 56 tests (11 air bursts and 45 underground) were between 20 to 200 KT; and 54 explosions (10 air bursts and 44 underground) were between 150 to 1,000 KT. Two air bursts, one in May 1968 (at Fangataufa) and another in August 1968 (at Mururoa) were over one megaton each. The French admit that three nuclear tests resulted in radioactive contamination of the environment: an air burst in July 1966, code-named *Ganymede*, at Mururoa; *Riegel*, an

air burst in September 1966 at Fangataufa; and *Parthenope*, an air burst in August 1973, at Mururoa. This listing shows that France has conducted an extensive program of testing for both warhead development and reliability purposes.

The French government claims that it needs the current series of nuclear weapon tests in order to ensure the safety and reliability of its nuclear arsenal, as well as to develop computer simulation techniques to certify nuclear weapons in a laboratory environment.³⁰ In reality, France already maintains nuclear warheads of proven and mature designs in its arsenal, and the new TN-75 warhead was certified before President Mitterrand ordered a cessation of French testing. It seems highly probable that the current round of tests commissioned by the Chirac government is for the development and certification of the TN-76/TN-100 warhead—the latest French design—even though the new M-45/M-5 submarine-launched ballistic missiles could be fitted with the fully tested TN-75 warhead (whose design was optimized in 1991). French officials have also claimed that their TN-70, TN-71, and TN-75 warheads require reliability checks (through explosive testing) because these designs are highly optimized,³¹ i.e. they have a very precisely computed shape to present a very low radar cross-section. They note that previously it has taken France up to 13 or more tests to certify new designs, hence they claim that the planned eight tests are too few to certify a new warhead. However, with sophisticated computer technology, the United States can certify new designs with only four tests.³² Some arms controllers therefore believe that up to eight tests might now be sufficient for France to certify the new TN-76/TN-100 warhead.

FRENCH NUCLEAR STRATEGY

French nuclear strategy underwent significant change since the ending of the Cold War. Under the Mitterrand government, while nuclear forces remained the “pivot” of French strategic policy,³³ they nevertheless were restructured, alert levels were cut back, and procurement and deployment plans somewhat reduced in the period following 1990 to 1991. Ground-based ballistic missiles (*sol-sol ballistique stratégique*) were reduced with the withdrawal from service of *Pluton* short-range missiles and placement in storage of 30 medium-range *Hadès* missiles,³⁴ leaving 18 S-3D intermediate-range (3,500 km) missiles in service.³⁵

During the 1980s, French nuclear strategy was based

on the notion of “proportional deterrence”—i.e. that France, as a medium power, could effectively deter a superpower, the Soviet Union, as long as France maintained the capability to damage or destroy a certain number of Soviet population centers that would exceed Soviet gains in overrunning or destroying France. Thus, “proportional deterrence” translated into deterrence of the powerful by the weak—*la dissuasion du faible au fort*.³⁶

With the advent of Mikhail Gorbachev’s policies of *perestroika* and *glasnost*, from 1987 on, and the ensuing arms reduction agreements, France moved away from its strategy of “proportional deterrence” against the former Soviet Union to earlier Gaullist formulations of existential deterrence. A 1990 French Ministry of Defence press release characterized the French nuclear deterrent as “not directed against anyone in particular. France has no designated enemy. Our deterrent is at the service of our independence.”³⁷ Later, in February 1992, in response to Russian President Boris Yeltsin’s announcement on Russian detargeting of French cities, President Mitterand stated: “French strategic forces are intended to assure France’s security and not to attack anyone. This has been their purpose from the beginning and for long years it has been a deterrent and defensive force.”³⁸

Just two months later, in April 1992, Prime Minister Pierre Bérégovoy announced a suspension in French nuclear testing for the remainder of that year,³⁹ thus following the Russian Federation’s announcement to extend its moratorium on testing—initially announced by President Gorbachev in late 1990—for the rest of 1992. The declared purpose, according to Bérégovoy, was to halt the “over-armament and above all the accumulation without end of atomic weapons.”⁴⁰ France later extended its moratorium until mid-1993 and then-President Mitterand declared a continued halt on testing until the United States or Russia resumed its nuclear test program. And, in response to the United States’ decision in July 1993 to stop further testing and to actively seek a CTBT, France threw in its support behind a CTBT provided that such a ban would be both universal and verifiable. Mitterand’s decision on a moratorium was taken without prior consultation with the military, and reportedly the announcement took Defense Minister Pierre Joxe by surprise. Though Joxe opposed the initiative, he did not publicly say so.⁴¹

President Mitterand’s moratorium on nuclear testing and support for the negotiation of a CTBT reflected

major policy changes. Except for a brief pause during the political troubles in Paris in summer 1968, France had never before suspended nuclear tests for arms control reasons. Though, earlier in mid-1989, France had noted a reduction from eight to six tests per year; and from 1990 onward had begun to notify the U.N. secretary-general of the number of tests conducted in the previous year.⁴²

Following elections in March 1993 and the coming into office of Gaullist Prime Minister Edouard Balladur, and facing mounting pressure from a conservative National Assembly, President Mitterand appointed a committee, headed by Admiral Jacques Lanxade (Chief of Staff of the Armed Forces), to examine the issue of nuclear testing. The Lanxade report, submitted to the president in October 1993, stated that additional tests were required to certify the TN-76/TN-100 nuclear warhead for the M-45/M-5 SLBM and to develop computer simulation techniques.⁴³ A separate National Assembly defense committee report of December 1993 concluded that up to 20 additional tests were needed—10 tests for a new variable-yield warhead for a longer-range air-launched missile and for the new TN-76/TN-100 warhead; and another 10 tests to develop computer simulation technologies.⁴⁴

Approved in June 1994, France’s defense modernization program for the period 1995 to 2000 calls for four third-generation (*Triomphant*-class) fleet ballistic missile submarines carrying M-45 multiple-warhead ballistic missiles, the development of fifth-generation M-5 submarine-launched missiles for possible deployment in fixed land-based silos in the plateau d’Albion in the first decade of the 21st century, the development of new nuclear-armed cruise missiles, together with a diverse fleet of nuclear-certified strategic bombers.⁴⁵

Under Jacques Chirac, who heads the Gaullist party *Rassemblement pour la République (RPR)*, France has returned to Gaullist formulations of the 1960s: that while there is no specific threat, the French nuclear force is to deter potential threats from any direction (*touts azimuts*). Despite the breakup of the Soviet Union, France continues to justify the existence and modernization of its nuclear forces in terms of the threat potential of former Soviet forces deployed in Russia (and elsewhere). And, while not explicitly stated as such, French nuclear forces also serve as the ultimate guarantor against a militarily resurgent Germany—despite the latter’s unquestioned adherence to the NPT and other global nonproliferation treaties, and despite German

renunciation of weapons of mass destruction as a condition for unification. At the same time, President Chirac has publicly offered to “share” or extend the French nuclear deterrent to serve the common defence interests of the E.U., as well as “co-determination” with Germany to decide on a nuclear deterrent for Europe. Furthermore, French nuclear capabilities might also be directed toward the “South” (in addition to the “East”) to deter against threats from countries such as Algeria, Iran, Iraq, and Libya, as well as Russia and Ukraine.⁴⁶

The current round of French nuclear tests, therefore, suggests that France is continuing to complete its nuclear modernization program and will continue to rely on nuclear weapons as the backbone of its defense posture.

THE EFFECT OF FRENCH TESTING ON NUCLEAR ARMS CONTROL

Toward the end of the Cold War, from the late 1980s on, it became increasingly evident that continuation of nuclear testing was neither essential for military reasons nor appropriate in the context of peaceful purposes but rather detracted from the global nonproliferation effort. Any residual reasons for nuclear tests disappeared after the end of the Cold War when the political momentum increased for achieving a permanent end to all nuclear weapon testing in all environments.

Negotiations on a CTBT have been underway at the Conference on Disarmament in Geneva since January 1994, but progress has been slow and painstaking. France’s decision to resume nuclear weapon tests could well serve to strengthen those who oppose a test ban both in the United States and in Russia and delay the conclusion of a treaty. Further, French nuclear testing in the South Pacific is conducted in an environmentally sensitive area. French nuclear explosions there have essentially destroyed coral reefs at Mururoa and Fangataufa, risking leakage of hazardous radioactive materials into the ocean. The French government itself has admitted that three tests resulted in radioactive contamination of the environment.⁴⁷ Resumption of nuclear testing by France, therefore, makes it a renegade from both nuclear arms control/nonproliferation and environmental perspectives. South Pacific states, including Australia and New Zealand, have been particularly concerned about French testing and have consistently opposed Paris on this issue. New Zealand restarted proceedings (that were suspended in the early 1970s) at the International Court of Justice seeking a halt to French

atmospheric nuclear testing, but the Court rejected reopening the case because atmospheric nuclear testing was not the issue at this time.⁴⁸

France has always seemed reluctant to join nuclear arms control treaties. It did not implement “full-scope” or comprehensive safeguards on its nuclear exports until September 1991,⁴⁹ and did not accede to the NPT until August 1992. France delayed ratifying Protocol I of the 1967 Treaty of Tlatelolco, establishing a nuclear-weapon-free zone in Latin America, until August 1992; and France (along with the United States and the United Kingdom) refuses to endorse the 1986 Treaty of Rarotonga creating a nuclear-free zone in the South Pacific (because of continuing French nuclear testing in that region). Like China, France has yet to sign the 1963 Partial Test Ban Treaty (PTBT). As a matter of fact, while the world moved to ban atmospheric testing in 1963, France exploded 41 nuclear devices in the atmosphere after the entry into force of the PTBT and did not move its tests underground until as late as 1974 (China only ceased atmospheric tests in 1980, after 23 detonations). Facing mounting criticism, France has declared its intention to become a party to a CTBT in fall 1996. However, France gave up its insistence on conducting hydronuclear tests at yields up to 200 tons even within a CTBT only in August 1995, in a transparent attempt to neutralize international criticism of its renewed testing program.

CONCLUSION

Over the years France has developed nuclear weapons and delivery systems of advanced and mature designs. Currently, France deploys the world’s third largest nuclear arsenal, after those of the United States and the Russian Federation. French nuclear forces already have in operation nuclear-armed multiple-warhead submarine-launched ballistic missiles that have the range to strike targets at intercontinental ranges. The French Air Force can accurately and reliably deliver nuclear ordnance at potential targets closer to French shores. In sum, France already possesses a potent nuclear deterrent force. When President Mitterand called a halt to French nuclear testing in 1992, he did so securely based on the knowledge that French nuclear forces had been modernized and were both safe and reliable. In effect, he decided on a moratorium to forestall over-armament (or *surarmement*).

President Chirac’s decision to resume testing seems

to be based primarily on political considerations of reinforcing France's position as one of the world's "great powers" in a post-Cold War era that is lacking in direction and leadership at the global level and where "uncertainty" is perceived as the main threat rather than global thermonuclear war. As well, President Chirac seems to be echoing the strategic policy choices of his Gaullist predecessor, General Charles de Gaulle, in adopting a force posture that is designed to deter threats to France from any and all directions and thus necessitates the development and deployment of new nuclear systems.

Furthermore, France's declaration of commitments to nuclear arms control, including to a potential CTBT, are somewhat suspect, particularly since there is near universal agreement that resumed French testing complicates the already problematic negotiations on a CTBT and may well serve to undermine confidence in the NPT regime. Many developing countries are still smarting from the pressure tactics and heavy handedness of the nuclear weapon states at the 1995 NPT Conference, and resumed French testing—however limited though it might be—only serves to detract from the goals of non-proliferation and a global nuclear test ban. Given the rise in importance of domestic agendas both in the United States and in Russia, and the increasing power of conservative forces seemingly hostile to nuclear arms reductions, French testing might well have the unintended yet unfortunate effect of weakening support for pursuing a CTBT in Washington and in Moscow—thus possibly permanently damaging the currently propitious circumstances favoring a CTBT.

The responsible choice for France would be to cancel the remaining planned tests and to affirm its pledge to support the international norms on nonproliferation. Cancellation of tests would help restore some of its lost diplomatic credentials and reaffirm France's place in the community of nations. In the long run, however, arms controllers can take heart from the fact that President Chirac's actions have resulted in a fracturing of the domestic consensus in France on nuclear weapons—with 60 percent now opposed to resumed testing⁵⁰—and in the future this might well result in lower defense spending, leading to a smaller nuclear weapons establishment in France. Also, strong international criticism—from some 150 nations—of resumed French nuclear testing apparently forced France to concede on relinquishing its insistence on the right to conduct hydronuclear experiments within a CTBT, thus ironically facilitating progress

on the "scope" of a CTBT at the Geneva-based Conference on Disarmament. And finally, in the wake of President Chirac's decision on testing, international public opinion has "woken up," and it will not countenance further nuclear testing by any nuclear weapon state.

¹ Philip Shenon, "France, Despite Wide Protests, Explodes a Nuclear Device," *The New York Times*, September 6, 1995, p. A3.

² The Australian Seismological Centre, based in Canberra, estimated the yield of the French nuclear explosion as equivalent to 8,000 tons of high-explosive (TNT). William Drozdiak, "France Rebuffs Critics, Readies More A-Tests," *The Washington Post*, September 7, 1995, p. 33.

³ Fred Brechley, "French intention could be to test new warhead," *Financial Review*, June 16, 1995, p. 6.

⁴ Sandy MacIntyre (Associated Press), "France detonates 2nd nuclear bomb in month," *The Monterey County Herald*, October 2, 1995, pp. 1A, 10A. The estimated yield of the test was "less than 110 kilotons."

⁵ Programme for Promoting Nuclear Non-Proliferation, *Newsbrief* No. 30 (2nd Quarter 1995), p. 7. According to one report, the French government notified the Japanese government that "it is possible for France to reduce the planned eight nuclear tests to three or four," in "France Offers to Reduce Nuclear Tests," *Tokyo Shimbun*, July 27, 1995; in FBIS-EAS-95-149 (27 July 1995). Later, in a published report following the first test, President Chirac indicated that if France obtains "the information that we need to move to simulation, it is clear that I will stop the explosions," cited in Mark M. Nelson, "France Sets Off Nuclear Blast in South Pacific, But Chirac Says Number of Tests May Be Cut," *The Wall Street Journal*, September 6, 1995, p. A13.

⁶ "Al-Qadhafi Hails French Decision on Testing," the Great Jamahiriya Radio Network, Tripoli, June 28, 1995, 12:30 GMT; in FBIS-NES-95-125 (28 June 1995).

⁷ "Keating Calls French Test 'Act of Stupidity,'" Melbourne Radio Australia, September 6, 1995; Michael Richardson, "Asia-Pacific Nations Angered Over French Nuclear Tests," *International Herald Tribune*, June 15, 1995; "Japan Says Tests Could Harm Ties: Tokyo Again Urges Paris to Scrap Nuclear Plans," *International Herald Tribune*, August 8, 1995; and Philip Shenon, "Nuclear Test Plan Tarnishes France's Image in Pacific," *The New York Times*, September 1, 1995, p. A3.

⁸ "Principles and Objectives for Nuclear Non-Proliferation and Disarmament," NPT/CONF.1995/32/DEC.2, 11 May 1995; and "Strengthening The Review Process For The Treaty," NPT/CONF.1995/32/DEC.1, 11 May 1995.

⁹ Alain Juppé, "Global peace still requires nuclear deterrent," *Ottawa Citizen*, September 9, 1995, p. B6, (reprinted from *Le Figaro*); Giovanni de Briganti and Theresa Hitchens, "Skepticism Rains on EU Nuclear Umbrella Idea," *Defense News*, September 11-17, 1995, pp. 1, 52.

¹⁰ On September 11, 1995, Reuter reported from Bonn that "Germany said...that France's fear of Russia's right wing as an argument for French nuclear testing was 'new' and would need to be considered." Christopher Lockwood, "EU moves to block French nuclear tests," *The Daily Telegraph*, August 9, 1995, p. 12. See also, Briganti and Hitchens, pp. 1, 52.

¹¹ A poll published by *Le Monde* in Paris on September 6, 1995 noted that 60 percent of French respondents opposed President Chirac's decision to resume testing. Alan Riding, "Despite Wave of Protest, France Defends Nuclear Test," *The New York Times*, September 7, 1995, p. A7.

¹² This section draws extensively from Robert S. Norris, Andrew S. Burrows, and Richard W. Fieldhouse, *Nuclear Weapons Databook, Volume 5: British, French, and Chinese Nuclear Weapons* (Boulder, CO: Westview Press, 1994) hereafter referred to as *Nuclear Weapons Databook, Volume 5*; and Andrew S. Burrows, Robert S. Norris, William M. Arkin, and Thomas B. Cochran, *French Nuclear Testing, 1960-1988*, Nuclear Weapons

Data Center Working Paper NWD 89-1, (Washington, D.C.: Natural Resources Defense Council, February 1989).

¹³ French nuclear scientists, Bertrand Goldschmidt, von Halban, and Leo Kowarski, based in Canada during World War II, indirectly participated in some of the work of the Manhattan Project team, under British (rather than) French national auspices. David Fischer, former assistant director general for external relations at the International Atomic Energy Agency, conversation with the author, Monterey, California, October 4, 1995.

¹⁴ Stanford Research Institute (SRI), *New Perspectives in U.S.-French Nuclear Relations*, Research Memorandum SSC-RM-8974-2, August 1972, (partially declassified and released under the Freedom of Information Act), cited in *Nuclear Weapons Databook*, Volume 5, p. 191.

¹⁵ Bertrand Goldschmidt, *The Atomic Complex: A Worldwide Political History of Nuclear Energy* (Le Grange Park, IL: American Nuclear Society, 1982), p. 131.

¹⁶ The Suez crisis was critical to shaping the French decision to develop their own nuclear weapons. The lack of support from the United States, in particular, proved to be a signal lesson for the French not to rely on allies but to be responsible for their own affairs. In the Suez crisis, as it was put by Bertrand Goldschmidt, "French impotence in the situation had been clearly demonstrated. Abandoned by Britain, held back by NATO, thwarted by the United States, and threatened by the Soviet Union, France found herself suddenly and terribly alone, at the very moment when the war in Algeria was entering its most difficult phase. To many people, an autonomous French defense system based on national nuclear armaments then seemed the only answer to the failure and humiliation they had suffered." Goldschmidt, p. 137. This in effect determined the "independent" course taken by France on nuclear and military matters. Further, the perceived abandonment of France during the Suez crisis and the "victory" of the Arabs, persuaded the then French government of Prime Minister Guy Mollet to provide nuclear technology to Israel, i.e. a plutonium-production reactor built at Dimona, plus a plutonium separation plant and design information on nuclear weapons. Later, President Charles de Gaulle scaled back the level of French nuclear assistance to Israel.

¹⁷ *Nuclear Weapons Databook*, Volume 5, pp. 183-184.

¹⁸ Based on "French Nuclear Warheads, 1960-Present," Table 4.2, *Nuclear Weapons Databook*, Volume 5, p. 187. France has developed nine different warhead types, six fission and three thermonuclear. *Ibid.*, pp. 212-13.

¹⁹ The French government published, for the first time, a full and detailed list of its nuclear tests since 1960. Published on August 2, 1995, the report listed 204 nuclear explosions—the tests on September 5 and October 1, 1995, bring this number to 206. Jacques Isnard, "Paris Publishes List of N-Tests Since 1960," *Le Monde*, August 2, 1995, p. 3; in FBIS-TAC-95-016-L (2 August 1995).

²⁰ Updated totals based on "Known Nuclear Tests Worldwide, 1945-1994," *The Bulletin of the Atomic Scientists* (May/June 1995), p. 71.

²¹ SRI report cited in *Nuclear Weapons Databook*, Volume 5, p. 191.

²² Michael Richardson, "Asia-Pacific Nations Angered Over French Nuclear Tests," *International Herald Tribune*, June 15, 1995, p. 1; "Japan: Chirac Must Nix Nuke tests," *Defense News*, July 10, 1995, p. 8; and Philip Shenon, "Nuclear Test Plan Tarnishes France's Image in the Pacific," *The New York Times*, September 1, 1995, p. A3.

²³ Helen Trinca, "France's Nuclear Obsession," *Weekend Australian*, June 17, 1995, p. 23.

²⁴ Thérèse Delpech, the Deputy Director of International Relations, Commissariat à l'énergie atomique, quoted in Susan B. Welsh, "Delegate Perspectives on the 1995 NPT Review and Extension Conference," *The Nonproliferation Review* (Spring-Summer 1995), p. 21.

²⁵ *Nuclear Weapons Databook*, Volume 5, pp. 191-193. A useful account of U.S.-French nuclear collaboration is provided by Richard H. Ullman, "The Covert French Connection," *Foreign Policy* (Summer 1989).

²⁶ *Ibid.*, the U.S.-France agreement was signed on July 22, 1985, and updated the earlier "Agreement for Cooperation in the Operation of Atomic Weapon Systems for Mutual Defense Purposes," dated July 27, 1961. Rumors of U.S. nuclear weapons assistance to France (as well as to the United Kingdom) has occasionally fuelled charges of "violations" of NPT commitments. However, such accusations have been difficult to document and hence

have usually either been brusquely swept aside or ignored by the three Western nuclear weapon states. A recent article, though, notes that the United States has assisted France in developing an enhanced radiation warhead ("neutron" bomb), nuclear warhead components, missile-guidance systems, and low-observable ("stealth") technology for cruise missiles. Daniel Plesch and Simon Whitby, "France's Bomb, Our Problem: The U.S. has quietly abetted Chirac's tests," *The New York Times*, September 30, 1995, p. 17. In fact, though, the United States steadfastly opposed French attempts to develop nuclear arms in the 1950s and the 1960s, leading to French accusations that the United States had "unfairly penalized an ally and sought to relegate that ally to a place of permanent political, military, and technological inferiority in the councils of the great powers," it has provided nuclear weapons assistance to France for over two decades. *Nuclear Weapons Databook*, Volume 5, p. 190.

²⁷ "Foreign Ministry Denies U.S. Offer on Testing Simulation," *Les Echos*, August 14, 1995, p. 32; in FBIS-TAC-95-016-L (14 August 1995).

²⁸ "France To Resume Nuclear Testing: Move Draws International Criticism," *Arms Control Today* (July/August 1995), p. 22.

²⁹ Jacques Isnard, "Paris Publishes List of N-Tests Since 1960," *Le Monde*, August 2, 1995, p. 3; in FBIS-TAC-95-016-L (2 August 1995).

³⁰ According to the latest issue of *Strategic Comments*, published by the London-based International Institute for Strategic Studies, France is resuming testing for three reasons: a) one test for completing development of the TN-75 warhead for deployment on submarine-launched ballistic missiles; b) two tests to verify triggers in older warheads; and c) four tests to help develop computer simulation techniques. "Test and shout," *The Economist*, September 9, 1995, p. 50.

³¹ "The Road from Alamogordo," *The Economist*, June 24, 1995, p. 94.

³² *Ibid.*

³³ Speech by President François Mitterrand on March 3, 1991, reported in *Le Monde* on March 5, 1991, p. 6, cited in David S. Yost, "Nuclear Weapons Issues in France," chapter in John C. Hopkins and Weixing Hu, eds., *Strategic Views from the Second Tier: The Nuclear Weapons Policies of France, Britain, and China* (San Diego, CA: Institute on Global Conflict and Cooperation, University of California, San Diego, 1994), p. 19. Hereafter cited as Yost (1994).

³⁴ Yost (1994), p. 22.

³⁵ David S. Yost, "Nuclear Debates in France," *Survival* 36 (Winter 1994-95), p. 116. Hereafter cited as Yost (1995).

³⁶ Yost (1994), p. 24.

³⁷ Yost (1994), p. 24, citing Ministère de la Défense, "La Défense de la France: Une action inscrite dans la durée," (Paris: Service d'Information et de Relations Publiques des Armées, October 1990).

³⁸ Yost (1994), p. 24, citing President Mitterrand's press conference of February 7, 1992, noted in *Politique Étrangère de la France: Textes et documents, Janvier-Février 1992* (Paris: Ministère des Affaires Étrangères, 1992).

³⁹ "France Announces Testing Halt; Congress Debates Similar Measure," *Arms Control Today* (April 1992), p. 17.

⁴⁰ Yost (1994), p. 31, citing Statement of Prime Minister Pierre Bérégovoy to the National Assembly on April 8, 1992, *Le Monde*, April 10, 1992.

⁴¹ Yost (1994), p. 45.

⁴² Yost (1994), pp. 32-33.

⁴³ "France To Resume Nuclear Testing: Move Draws International Criticism," *Arms Control Today* (July/August 1995), p. 22.

⁴⁴ Yost (1995), p. 125.

⁴⁵ Yost (1995), pp. 116-117; *Nuclear Weapons Databook*, Volume 5, pp. 258-260.

⁴⁶ Yost (1994), p. 44.

⁴⁷ As already noted earlier, a French government listing of its nuclear tests notes that three tests—respectively, in July 1966, September 1966, and August 1973—resulted in contamination. See note 29 above. Since then, France maintains its tests have not created any environmental problems at its South Pacific test site.

⁴⁸ "World Court rejects attempt to halt French nuclear tests," *The Monterey County Herald*, September 23, 1995, p. 2A; and "Hague Denies Injunction on French Nuclear Tests," *The New York Times*, September 23, 1995, p. 4. In 1973, New Zealand filed suit at the World Court seeking a ban on French

testing in the atmosphere, but the motion was dropped in 1974 when France moved its tests underground.

⁴⁹ Yost (1994), pp. 34-35, citing speech by Foreign Minister Roland Dumas to the United Nations General Assembly on September 24, 1991, noted in *Politique Étrangère de la France: textes et documents, Septembre-Octobre 1991* (Paris: Ministère des Affaires Étrangères, 1991), p. 70. In fairness, though, France began to implement full-scope safeguards as a condition of supply in advance of Belgium, Switzerland, and the United Kingdom.

⁵⁰ Alan Riding, "Despite Wave of Protest, France Defends Nuclear Test," *The New York Times*, September 7, 1995, p. A7.