

DRAFT TESTIMONY TO THE CONGRESSIONAL COMMISSION  
ON THE STRATEGIC POSTURE OF THE UNITED STATES

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www.fas.org/RLG/  
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Thank you for agreeing to hear me. I will be brief in the hope that my informal presentation could be followed by some useful discussion.

BACKGROUND

I am Dick Garwin. Since 1950 I have worked with the U.S. government on nuclear weapon technology. I have been involved also a lot with radar and defenses against aircraft and missiles, and also with conventional forces, navigation, and arms control and nonproliferation. I chaired the State Department's Arms Control and Nonproliferation Advisory Board from 1993 to 2001, and I have worked with the JASON group on its studies for NNSA. Most recently I was a member of The National Academies' Committee on QMU (Quantification of Margins and Uncertainties), the report of which has just been published with a small classified Annex.

SECURE NUCLEAR FUEL CYCLE

As noted in your Commission's interim report of 12/15/08, protecting the United States against nuclear attack involves much more than military capability. To this end, I support reducing the coupling between civil nuclear power and nuclear weapons by providing an assured supply of low-enriched uranium (LEU) fuel for commercial reactors, and for disposing of that spent fuel outside its country of origin. I favor the introduction of competitive, commercial, mined geologic repositories regulated by the IAEA, to accept packaged spent fuel or high-level reprocessed waste also to be regulated by the IAEA. But the leadership of the Global Nuclear Energy Partnership (GNEP) program announced by President George W. Bush in February 2006 increases the hazard of proliferation by equating "proliferation resistant" reprocessing of spent fuel with any process that does not separate pure plutonium-- e.g., a 50:50 mixture of Pu and U oxides such as will be produced by the Rokkasho-Mura plant in Japan. Such a product poses no significantly greater barrier to weapon use of Pu than does a plutonium oxide product itself, since the Pu is readily separated from the uranium

The overlap of my comparative expertise with the interests of the Commission is primarily in maintaining a future U.S. nuclear force that is safe, reliable, and secure, with a few comments on missile defense.

THE FUTURE OF US NUCLEAR WEAPONS

THE SCIENCE-BASED STOCKPILE STEWARDSHIP PROGRAM

The Science-Based Stockpile Stewardship Program (SSP) has been a tremendous success. New experimental capabilities, both bench scale and large facilities such as DARHT and NIF have combined with the million-fold increase in computer speed and advanced analytical and mathematical tools to enable far more sophisticated 3-D simulation of nuclear explosive phenomena. We are close to routine "button-to-boom"

simulations, which, of course, to make any sense must be validated against experiment. The experimental base includes the more than 1000 underground nuclear explosions of the past, plus additional current simulations that include so-called "sub-critical" experiments that may use segments of actual nuclear weapon primaries, for instance.

One of the fruits of the SSP program is the announcement in late-2007 by NNSA that the weapon laboratories have established that the plutonium pit at the core of each of the U.S. nuclear weapons will survive more than 85 years. An ongoing result is the ability of the Directors of the weapon laboratories to assess each year that the legacy weapons under the SSP remain safe and reliable. And we now have at LANL the proven capability to manufacture certifiable W88 replacement pits. The striking agreement of boost-cavity shape predicted by the simulation with that observed in radiography now and in PINEX tests before 1992 exemplifies the increase in understanding that makes it possible to imagine putting a new-design weapon into the stockpile without verification by nuclear explosions.

Of course many problems are discovered in the SSP, and the so-called significant findings ("SF") are now promptly investigated and resolved. Almost all of the significant findings have to do with elements outside the nuclear package, and these can be re-engineered, tested without nuclear yield as they always have been, and modified, with great care that they do not impact the performance of the nuclear package itself.

#### THE RELIABLE REPLACEMENT WARHEAD--RRW

With the knowledge gained from the SSP, it has been possible to undertake the design of the Reliable Replacement Warhead-- RRW-- with the constraint that it not require a nuclear explosion test. As I indicated in my December 2008 Arms Control Today article, I think the RRW effort has energized the nuclear laboratories and is something that should be encouraged and repeated every five years or so. That does not mean that I now believe that the RRW could now be certified without a nuclear test, a question that depends on the detailed design and probably on the acquisition of more expertise under the SSP. But I think it would have a good chance in a few years to be so certified.

A January 2008 description by Bruce T. Goodwin at LLNL

*"The goal of the RRW approach is to replace aging warheads with ones manufactured from materials that are more readily available and more environmentally benign than those used in current designs. RRWs can include advanced safety and security technologies, and they are designed to provide large performance margins for all key potential failure modes. Large margins enhance weapons reliability and help to ensure that underground nuclear testing will not be required for design certification."*

#### RRW AS AN OPTION, NOT A NECESSITY

I see the RRW as an option and not a necessity. In this I differ with the apparent meaning of a statement by Defense Secretary Robert Gates, *"there is absolutely no way we can maintain a credible deterrent and reduce the number of weapons in our stockpile without either resorting to testing our stockpile or pursuing a modernization program."*

In short, I believe that the legacy weapons can remain closer to their test pedigree than the RRW will be to any specific nuclear test, and that responsible choice of modifications to the legacy weapons would result in *increased* confidence in their performance with time, rather than the *erosion* of confidence.

It will always be to someone's bureaucratic interest to claim that a new device or system is better and more reliable than, the existing system, and that the existing system cannot be responsibly maintained. This was the case in the 1960s when I chaired the Military Aircraft Panel of the President's Science Advisory Committee under Presidents Kennedy and Johnson, when the Air Force argued that the B-52 could not be flown beyond about 1970 because of metal fatigue. B-52s are still a mainstay of the U.S. bomber force. It was the case with the MX missile, which as now come and gone.

#### BENEFIT AND COST OF THE RRW PROGRAM NEED TO BE ASSESSED

Some believe enhanced surety against theft and misuse dominates all other considerations and that the RRW is absolutely necessary because a new development permits improved surety that cannot be achieved in most of the legacy weapons. Even if this priority were to be accepted, what counts is the overall vulnerability of the United States to nuclear attack from our own weapons, and that depends not on the characteristic of the individual weapons but on the characteristic of the entire force. Thus, if we were to maintain a 5000-weapon force, and if RRWs were built at the rate of 50 per year, it would take 50 years for them to replace half of the existing force. And it is likely that this would not improve the surety of the force one bit, since miscreants could concentrate on the non-RRW portion of the force.

Of course, if the United States were maintaining a force totaling 500 weapons, a 50/yr production rate for the RRW could replace the entire force in ten years.

Evidently, an ongoing stream of RRW types would be required. First, to satisfy those who believe that the introduction of weapons of new design (even if they don't provide new military capability) is the only way to maintain the expertise of the laboratories; and, second, to avoid dependence of the future stockpile on cloning a single design.

#### ESSENTIAL TO DEFINE WEAPON NUMBERS VS. TIME

In any case, this highlights the importance of the Commission's setting a number of warheads vs. time in order to guide the complex. This is not a matter for the Department of Defense or STRATCOM. It is something that must be done on the national level.

#### WILL WE LONG RELY ON AN "UNTESTED" RRW?

I am concerned, though, that if the RRW were to be certified without nuclear test, it would not be long before from some influential quarter would come the complaint that the United States security was based on untested nuclear weapons. I think it likely that this would lead to a test and therefore to the destruction of the CTBT regime and of the NPT with it. In particular, both China and Russia appear quite ready for nuclear explosion testing if the CTBT moratorium should end, and China could add significant military capability from a few tests beyond its current base of 40.

#### OVERCOMING PROBLEMS WITH LEGACY WEAPONS

I realize that there may be specific problems identified with legacy warheads (for classified oral discussion).

If there are specific limitations on a particular legacy weapon, one cannot automatically say that an RRW program will immediately fix it. In fact, the RRW would need to be a substitute for that bomb or warhead, for instance-- and it would not be available until after a substantial time for development and manufacturing. If the need for such a capability were urgent, there would be no alternative to modifying (repairing) the legacy weapon. This would need to be done with common sense and judgment and responsibility, and verified by the full simulation of at least that portion of the explosion process.

Even if laboratory management in the future would find it easier as the SSP expertise and tools advance to do the annual assessment of legacy weapons and to find them safe, reliable, and secure, could not some influential critic in the future-- even a STRATCOM commander-- simply state that she could not be responsible for a fleet of weapons that had not been tested for 30 years, for example.

But what would be the function of a nuclear test?

In an underground test, one typically removes much of the flight hardware, or disables it. That is, one cannot mimic underground the specified stockpile-to-target sequence that is required for arming the warhead. If part of the operation depends on the vacuum of space, that needs to be simulated. One often uses a different initiator, and, of course, the fuzing system is entirely different. Furthermore, the environment underground is significantly altered from that for an explosion in air in ways that we can discuss at the session. There is no strong deceleration as is the case for the airburst of a bomb or warhead in the atmosphere, and no spin of the warhead in test.

What would be tested? A nominal weapon under nominal conditions? Or a weapon near the end of boost-gas life, under the most stressing temperature conditions, and under the greatest conditions of combat stress? Of course there would be very many experimental data obtained because the opportunity to test instrumentation and to diagnose every aspect of the weapon performance would not be missed, but the benefit to a skeptic who urged the test would largely be the yield-- whether the weapon "worked" or not.

#### HISTORIC LACK OF INTEREST IN STOCKPILE CONFIDENCE TESTS

In the era of US underground nuclear tests, concerns were sometimes expressed that much of the fleet had not undergone a test of weapons that had been in the stockpile for years or decades. In fact, production verification tests were often delayed for years. After congressional insistence on stockpile confidence tests, I believe that only two were conducted. On the other hand, high-fidelity flight tests (without nuclear yield) provide essential information.

#### COMMENTS ON US STRATEGIC MISSILE DEFENSE

I have just a moment to comment on the US program for strategic missile defense on which my views are amply documented. In the Google search box, enter

Site:fas.org/RLG/ "missile defense"

for links to papers I have posted. I oppose the deployment of this mid-course defense because it will be nullified by balloon countermeasures and antisimulation. As for the "demand" of allies for protection by missile defense and by the deployment of nuclear weapons on their territories, see a January 9, 2009, article by 4 leading German personages<sup>1</sup> who argue for the elimination of BMD sites in Europe and for progress toward reduction and elimination of nuclear weapons.

I am reminded of the experience of the late Don Brennan who had been an avid supporter of BMD and was a smart and honest man. As I recall, he spent a month in Europe to personally assess the views of national leaders and analysts and was dismayed to find no real interest in missile defense. Our motives in deploying missile defense are mixed, as demonstrated by the testimony of a panel that included me and Jim Woolsey to the Senate Committee on Foreign Relations. Senator Biden asked Secretary Woolsey whether he would favor the deployment of a limited BMD stipulated effective against Iran and North Korea but ineffective against China; Woolsey replied that he would not.

For years BMD spokespeople credited the system with the potential to protect against ballistic missile delivery of WMD, but in recent years they are silent about the effectiveness against the militarily preferable attack with chemical or biological agents delivered by scores or hundreds of bomblets separated at the end of boost phase and thus not subject to intercept by the mid-course system. Nor has MDA provided a solution to the combination of balloon countermeasures and "antisimulation" that would enclose a nuclear warhead in a similar balloon in the vacuum of space.

#### SUMMARY

1. There is a national need for the Commission to recommend numbers of nuclear weapons vs. time.
2. It should be recognized that confidence in the reliability of legacy weapons under a responsible stockpile stewardship program is likely to increase with time rather than diminish.
3. RRW programs lack quantitative assessment of benefit and cost streams as RRW are assumed to enter the force—overall improvements in surety, reliability, safety within the force numbers from (1).
4. The MDA program for defense against strategic ballistic missiles similarly lacks quantitative assessment of effectiveness and benefit, in view of feasible countermeasures and zero effectiveness against bomblet-delivered biological or chemical weapons.

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<sup>1</sup> Declaration on Freedom from Nuclear Weapons, by Helmut Schmidt, Richard von Weizsäcker, Egon Bahr and Hans-Dietrich Genscher  
<http://www.iht.com/bin/printfriendly.php?id=19226604>