



United States Government Accountability Office
Washington, DC 20548

May 4, 2012

Congressional Committees

Subject: *Nuclear Weapons: Evaluation of Report on Feasibility of Increasing Air Transportation of Nuclear Weapons, Components, and Materials*

Transporting nuclear weapons, components, and materials represents a safety and security risk. House Report 110-652, which accompanied the National Defense Authorization Act for Fiscal Year 2009 (Pub. L. No. 110-417), directed the National Nuclear Security Administration (NNSA)¹ and the Air Force to conduct a feasibility study on increasing the use of aircraft to transport nuclear weapons, components, and materials and to report back to Congress by December 31, 2008.² In turn, House Report 112-78, which accompanied the National Defense Authorization Act for Fiscal Year 2012 (Pub. L. No. 112-81), directed us to conduct an independent evaluation of the air transportation study (ATS) jointly issued by the Administrator of NNSA and the Secretary of the Air Force in September 2009.³ The conclusions of the 2009 ATS report supported maintaining the current balance of air and ground transportation of nuclear weapons.⁴

We provided a classified briefing of our preliminary observations to staff of the Subcommittee on Strategic Forces, Committee on Armed Services, House of Representatives, on February 2, 2012. On March 13, 2012, we provided classified briefing slides to the House Armed Services Committee.

This report provides information on whether (1) acceptable methodologies were used in the ATS report to develop nuclear weapons transportation options that considered safety, security, and operational requirements, (2) acceptable methodologies were used in the report to develop cost estimates for nuclear weapons transportation options identified in the report, and (3) recent changes to

¹NNSA, a semi-autonomous agency within the Department of Energy, is responsible for the management and security of the nation's nuclear weapons programs.

² NNSA and the Air Force were directed to conduct the study in coordination with the joint Department of Defense/Department of Energy Nuclear Weapons Council.

³Specifically, GAO was directed to submit a report of our independent evaluation to the congressional defense committees.

⁴NNSA and the Air Force, *Report to Congress on the Feasibility of Increasing Air Transportation of Nuclear Weapons, Components, and Materials*, Sept. 3, 2009.

nuclear weapons transportation operations, technologies, or threat information might alter the conclusions reached in the report.

To conduct our work, among other things, we applied a GAO methodology for assessing evaluation designs using support from ATS documents and interviews with NNSA and Department of Defense (DOD) officials from cognizant organizations (stakeholders); applied accepted economic practices for conducting feasibility studies; and reviewed pertinent DOD and Department of Energy guidance on transporting nuclear weapons, as well as interviewed additional officials from the office of the Assistant Chief of Staff of the Air Force for Strategic Deterrence and Nuclear Integration, and Sandia National Laboratories about changes in operating procedures, technologies, or threat information since the issuance of the ATS report. In addition, we visited key NNSA and Air Force organizations, selected on the basis of their importance to the nuclear transportation mission, located at Kirtland Air Force Base in Albuquerque, New Mexico.

We conducted this work between November 2011 and May 2012 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

In summary, we found the following:

- The ATS report was supported by generally acceptable methods for developing transportation options and evaluating safety, security, and operational requirements for these options. The assessment of safety risk from a possible airplane crash transporting nuclear weapons was the key factor supporting the report's conclusions to maintain the current balance of air and ground transportation of nuclear weapons. In addition, the majority of the nuclear weapons in the active nuclear stockpile require special DOD approval to be transported by air.
- The ATS report was supported by an acceptable methodology to develop relative costs among the different transportation options under review and included selected costs, such as per-weapon, per-mile operating costs for transportation of nuclear weapons via current air and ground approaches. However, it did not analyze all costs—for example life cycle costs—or for developing infrastructure, such as airfields, necessary to support some air transportation options.
- According to stakeholders, changes in operational requirements for transporting nuclear weapons, new technologies that have improved security and safety, or reassessments of potential threats of future attacks

since the report's completion in 2009 would probably not mitigate the safety risk of air transportation and would be unlikely to alter the report's conclusions.

For additional information on the results of our work, please see enclosure I, an unclassified version of the briefing slides that were delivered to the House Armed Services Committee. We are not making any recommendations for congressional consideration or agency action.

We requested comments from NNSA and the Air Force on a draft of the classified version of the briefing slides. NNSA officials provided their comments via e-mail on March 5, 2012, stating that the briefing accurately reflects the findings, results, and conclusions of the ATS report and that NNSA does not have any concerns or substantive comments. Air Force officials also provided oral comments on the draft briefing the same day, stating that they generally agreed with the information presented. They also provided technical comments, which we incorporated as appropriate.

We are sending copies of this report to the Secretary of Energy, Administrator of NNSA, Secretary of Defense, Secretary of the Air Force, Director of the Office of Management and Budget, Director of the Congressional Budget Office, and other appropriate congressional committees. This report is also available at no charge on GAO's website at <http://www.gao.gov>.

Should you or your staff have any questions concerning this report, please contact either Gene Aloise at (202) 512-3841 or aloisee@gao.gov or John Pendleton at (202) 512-3489 or pendletonj@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. Key contributors to this report were Jonathan Gill (Assistant Director), Penney Harwell Caramia (Assistant Director), Thomas Baril Jr., David Keefer, Thomas Laetz, Sally Newman, and Kiki Theodoropoulos.

A handwritten signature in black ink that reads "Gene Aloise". The signature is written in a cursive style with a large, looped initial "G".

Gene Aloise, Director
Natural Resources and Environment

A handwritten signature in black ink that reads "John H. Pendleton". The signature is written in a cursive style with a large, looped initial "J".

John Pendleton, Director
Defense Capabilities and Management

Enclosures – 1

List of Committees

The Honorable Carl Levin
Chairman
The Honorable John McCain
Ranking Member
Committee on Armed Services
United States Senate

The Honorable Daniel Inouye
Chairman
The Honorable Thad Cochran
Ranking Member
Subcommittee on Defense
Committee on Appropriations
United States Senate

The Honorable Howard P. McKeon
Chairman
The Honorable Adam Smith
Ranking Member
Committee on Armed Services
House of Representatives

The Honorable C.W. Bill Young
Chairman
The Honorable Norman D. Dicks
Ranking Member
Subcommittee on Defense
Committee on Appropriations
House of Representatives

Unclassified Briefing on Air Transportation Study Report



Nuclear Weapons Transportation: Evaluation of Air Transportation Study Report

**Unclassified Version of Briefing to
Strategic Forces Subcommittee
House Armed Services Committee
March 13, 2012**

For more information, contact Gene Aloise, aloisee@gao.gov

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Background

- House Report 110-652 that accompanied the National Defense Authorization Act for Fiscal Year 2009, directed the National Nuclear Security Administration (NNSA) and the Air Force, in coordination with the joint Department of Defense (DOD)-Department of Energy (DOE) Nuclear Weapons Council, to conduct a feasibility study on increasing the use of aircraft to transport nuclear weapons, components, and materials and to report back to Congress by December 31, 2008.
- NNSA transmitted a status report to congressional defense committee chairs on December 29, 2008, that also clarified scope and assumptions and extended the report date to July 31, 2009.
- The joint NNSA-Air Force Air Transportation Study (ATS) *Report to Congress on the Feasibility of Increasing Air Transportation of Nuclear Weapons, Components, and Materials*, was submitted on September 3, 2009.
- House Report 112-78 that accompanied the National Defense Authorization Act for Fiscal Year 2012, directed GAO to conduct an independent evaluation of the ATS report. We presented our preliminary views to congressional staff on February 2, 2012. This briefing provides a final update on our evaluation of the ATS report.



GAO's Objectives

Our objectives were to determine whether:

1. Accepted methodologies were used in the ATS report to develop nuclear weapons transportation options that considered safety, security, and operational requirements;
2. Accepted methodologies were used to develop cost estimates for the nuclear weapons transportation options identified in the report; and
3. Recent changes to nuclear weapons transportation operations, technologies, or threat information might alter the conclusions reached in the report.



Scope and Methodology

- To evaluate the report's methodologies used to develop nuclear weapons transportation options that considered safety, security, and operational requirements, we applied a GAO methodology for assessing evaluation designs, using support from ATS documents and interviews with NNSA and DOD officials from cognizant organizations (stakeholders). A list of these organizations is found at the end of these briefing slides.
- To assess the approach used in the report to develop cost estimates, we reviewed ATS documents, interviewed stakeholders, and applied accepted economic practices for conducting feasibility studies.
- To assess the potential effect of ongoing or recent changes in operations, technologies, or threat information on the conclusions reached in the report, we reviewed DOD and DOE/NNSA guidance and interviewed stakeholders.



Scope and Methodology

- We visited key Air Force and NNSA organizations, selected on the basis of their importance to the nuclear transportation mission, located at Kirtland Air Force Base in Albuquerque, New Mexico. Our observations made at Kirtland cannot necessarily be generalized to other DOD and NNSA sites.
- This briefing satisfies the requirement for GAO to independently evaluate the ATS report, as stated in House Report 112-78.
- We conducted this review between November 2011 and May 2012 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Scope and Methodology

At Kirtland Air Force Base, we:

- Observed wing preparation and briefings for a loading exercise as well as traveled delivery route. We received security briefings detailing wing procedures. We were shown a flatbed trailer (fig. 1) for transporting nuclear weapons to the loading.
- Visited NNSA's Office of Secure Transportation's (OST) Command and Control Center, discussed active defense concepts, and viewed a Safeguards Transporter (fig. 1) and support vehicle.
- Viewed a prototype nuclear weapons security container system at Sandia National Laboratories.

Figure 1: Examples of Ground and Air Transportation Vehicles and Aircraft



Sources: Sandia National Laboratories (trailer and transporter photos) and Air Force (C-17 photo).



Results in Brief

- The ATS report was supported by generally acceptable methods for developing transportation options and evaluating safety, security, and operational requirements for these options. The assessment of safety risk from a possible airplane crash transporting nuclear weapons was the key factor supporting the report's conclusions to maintain the current balance of air and ground transportation of nuclear weapons. In addition, the majority of the active nuclear stockpile require special DOD approval to be transported by air.
- The report was supported by an acceptable methodology to develop relative costs among the different transportation options under review and included selected costs, such as per-weapon, per-mile operating costs for transportation of nuclear weapons via current air and ground approaches. It did not, however, contain detailed cost estimates for new infrastructure, such as airfields, that would be required for some options.
- According to stakeholders, changes in operational requirements, technologies, or threat information since the report's completion in 2009 would probably not mitigate the safety risk of air transportation and would be unlikely to alter the report's conclusions if the study were conducted today.



Objective 1: Safety, Security, and Operational Requirements

- The ATS report was supported by generally acceptable methods for developing transportation options and evaluating safety, security, and operational requirements.
- The evaluation approach of the report had both design strengths and weaknesses, but the weaknesses were in part mitigated by the extensive comment and review processes that were used in drafting the report to resolve comments and reach concurrence among the report's stakeholders. Additional review and endorsement by the joint DOD-DOE Nuclear Weapons Council also mitigated these weaknesses.
- Stakeholders who participated in and reviewed the ATS report, including those who took issue with portions of the report, agreed that a different methodological approach would not have changed the report's conclusion—the safety risk from a possible airplane crash transporting nuclear weapons was the key factor supporting the report's conclusions to maintain the current balance of air and ground transportation of nuclear weapons. In addition, the majority of the active nuclear stockpile require special DOD approval to be transported by air.



Objective 1: Safety, Security, and Operational Requirements

Strengths

The report:

- Included relevant stakeholders in planning the evaluation
- Identified clear and measurable evaluation objectives
- Established criteria to measure performance
- Chose a reasonable design to answer evaluation objectives given time and resource constraints
- Included qualified subject matter experts from cognizant organizations
- Supported evaluation conclusions with data, analysis, validation processes, and stakeholder reviews

Weaknesses

The report did not:

- Provide evidence of a formal evaluation plan to guide the effort
- Define how cost-effectiveness would be assessed against other evaluation criteria (safety, security, and operational requirements)
- Develop a systematic process for collecting and analyzing data based on a defined plan
- Clearly articulate some specific steps used in the evaluation, such as how options were rated by stakeholders



Objective 1: Safety, Security, and Operational Requirements

The identified weaknesses in the report were sufficiently mitigated by:

- A contemporaneous internal Sandia National Laboratories nuclear weapons transportation study that reached conclusions similar to those of the ATS report while using a slightly different methodology;
- An extensive comment and review process that was used in drafting the report to resolve comments and reach concurrence among the report's stakeholders; and
- Additional review and endorsement by the joint DOD-DOE Nuclear Weapons Council, which helped ensure broad acceptance of the ATS report. Established by Congress in 1986, the Council provides an interagency forum for reaching consensus and establishing priorities. It also provides policy guidance and oversight of the nuclear weapons stockpile management process to ensure the safety, security, and reliability of U.S. nuclear weapons.



Objective 2: Cost Estimating

- The report was supported by an acceptable methodology to develop relative costs among the 11 different transportation options under review and included selected costs, such as per-weapon, per-mile operating costs for transportation of nuclear weapons via current air and ground approaches.
- The report did not contain a detailed cost analysis that analyzed all costs (e.g., life cycle costs) associated with each transportation option. For example, the report recognized the comparative costs of developing infrastructure, such as airfields, that would be necessary to support some air transportation options but did not contain detailed cost estimates for this infrastructure.
- According to ATS team members, conducting more detailed cost analysis of the transportation options would have:
 - required more time to collect and analyze all necessary data; and
 - distracted from a focus on transportation safety and security.



Objective 3: Changes to Operations, Technologies or Threat Information

- According to stakeholders we spoke with, changes in operational requirements, technologies, or threat information during the report's preparation and since its issuance would be unlikely to alter the conclusions if the feasibility study were conducted today.
- The ATS stakeholders reported that, during the study period, they considered:
 - Information from an intelligence organization within OST;
 - Operational changes that were being implemented by OST;
 - DOE's 2008 Graded Security Program and DOD's *Nuclear Security Threat Capabilities Assessment*; and
 - Security analyses and exercises such as DOD's MIGHTY GUARDIAN and OST vulnerability assessments.



Objective 3: Changes to Operations, Technologies or Threat Information

- Since the report's issuance, DOD and DOE have taken additional actions and are making improvements in the security and safety of ground transportation of nuclear weapons, components, and materials. For example:
 - development and future deployment of a nuclear weapons security container system designed to mitigate a specific vulnerability;
 - design and future production of a new secure ground transporter; and
 - ongoing efforts to assess the potential threats of a future attack.



Objective 3: Changes to Operations, Technologies or Threat Information

- Several factors could cause the assessment of transportation options to shift in the future:
 - arms control treaties and international agreements—which might increase the need to move weapons both within the United States and abroad;
 - innovation in life extension programs—which could increase the inherent safety and security of nuclear weapons;
 - new technologies—which could increase the safety and security of air transport, such as a closed trailer for on-base movement to aircraft, equipment to reduce loading time, and containers to mitigate aircraft safety and security risk; and
 - an accident or event involving either ground or air transport of nuclear weapons, components, and materials—which could change the current level of acceptable risk for either safety or security.



Agency Comments

- We requested comments on a draft of this briefing from NNSA and the Air Force.
 - NNSA provided comments via e-mail on March 5, 2012, noting that the briefing accurately reflects the findings, results, and conclusions of the joint NNSA-Air Force 2009 ATS, and that NNSA does not have any concerns or substantive comments.
 - Air Force officials provided oral comments on the draft briefing on March 5, 2012, stating that they generally agreed with the information presented. They also provided technical comments, which have been incorporated as appropriate.



Organizations Contacted

Washington, D.C.

- Department of the Air Force
 - Strategic Deterrence and Nuclear Integration (A10)
- Department of Energy
 - Headquarters, National Nuclear Security Administration
 - Office of Secure Transportation
- Office of the Secretary of Defense
 - Assistant Secretary for Nuclear, Chemical, and Biologic Defense Programs (Nuclear Matters)
- Former senior defense officials

Headquarters, U.S. Strategic Command (by telephone)

- J872



Organizations Contacted

Kirtland Air Force Base, Albuquerque, New Mexico

- Air Mobility Command
- Air Force Nuclear Weapons Center
 - 377th Air Base Wing
 - 498th Nuclear Systems Wing
- NNSA, Office of Secure Transportation
- Sandia National Laboratories

Fort Belvoir, Virginia

- Defense Threat Reduction Agency

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