

## TESTIMONY

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U.S. Department of Energy  
Before the  
Defense Nuclear Facilities Safety Board

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Mr. Chairman and Members of the Defense Nuclear Facilities Safety Board,

Thank you for this opportunity to provide you with an interim report of the National Nuclear Security Administration's review of the Columbia Accident Investigation Board (CAIB) Report of the loss of the Space Shuttle COLUMBIA. We have nearly completed our review and recommendations are being developed. Today I will provide you with some of the general highlights. Once the report is complete and has been reviewed by our Leadership Coalition, I would be pleased to provide you with a copy of the report, along with more details on our lessons learned, recommendations and suggested way ahead. We anticipate completion of the report by the middle of this month. The results and a suggested way ahead could be presented to our Leadership Coalition as early as March. Additionally, our report will be forwarded to the Office of the Secretary of Energy as a potential source of recommendations, which may be applicable Department-wide.

The 13-member NASA CAIB spent nearly seven months investigating the root causes of the loss of COLUMBIA and had over 125 dedicated investigators, consultants, and assistants at their disposal. As a result, the report was exceptionally well detailed and thorough in its analysis and provided succinct recommendations to the National Aeronautics and Space Administration (NASA) for improving their organization and minimizing the chance of another disaster of equivalent scale.

Ambassador Linton Brooks, the NNSA Administrator, after reading the CAIB Report and its conclusion that organizational causes were key elements of NASA's failure to identify and evaluate critical safety issues, realized that there were likely to be valuable lessons learned within the report that could be used to develop recommendations to improve the NNSA of the Future. Accordingly, on September 9, 2003, he directed me to lead a NNSA team to assess the following questions:

1. Is NNSA's management and safety culture appropriate for an organization managing high technology, high-risk activities?
2. Are there issues raised by the CAIB Report that should be considered as we implement NNSA's new organizational model?
3. Will the re-engineered NNSA provide for the necessary technical capability for properly executing NNSA's safety management and regulatory responsibilities?
4. What changes would you recommend that NNSA adopt in light of the lessons learned by NASA?

## **NNSA CAIB Lessons Learned Review**

I assembled three sub-teams as part of our internal review, one for each of the first three questions posed by Ambassador Brooks. Each sub-team was comprised of NNSA employees from headquarters, the NNSA Service Center and the Site Offices. In all, over 30 people have directly contributed to the review and many others have contributed indirectly through side discussions and meetings with review participants.

Our first action was to read the CAIB Report in detail and to identify the Board's conclusions regarding their assessment of NASA. These conclusions were then assigned to one or more of the sub-teams: Culture, Organizational Structure, and Technical Capability. The sub-teams used these conclusions as guiding points in assessing and comparing NNSA with NASA. The review was strictly limited to the context of the CAIB Report.

Individual sub-teams met as required to conduct their review and the composite team met on seven different occasions for progress reports and discussions. These discussions were lively at times and demonstrated some of the best open communications between headquarters and field elements that I have seen during my tenure at NNSA. I believe that when complete, the report will be of great value to our organization and will make significant recommendations that have the potential to greatly improve the safety of our operations and the overall effectiveness of NNSA.

As you know, the CAIB focused their review on NASA's high-risk, high-consequence activities related to human space exploration. The NNSA CAIB Lessons Learned Team also focused its efforts on potential high consequence activities internal to NNSA, namely the operation of nuclear facilities at NNSA sites and the nuclear weapons production program. We did not examine our relationship with the DoD where the NNSA functions as a partner in designing and supplying weaponized nuclear explosives to the U.S. military. In short, the most important result of the NNSA review is the need to understand and shape NNSA's safety culture through leadership, organizational alignment with safety requirements and policies, and the maintenance of adequate technical capability.

### **Safety Management and Culture**

There are striking similarities between NASA and NNSA when comparing the two organization's safety systems and culture. Both organizations were built on the Cold War rivalry with the former Soviet Union and both suffered similar uncertainties in their missions with the collapse of the Soviet Union. The CAIB Report states, "The end of the Cold War in the late 1980s meant that the most important political underpinning of NASA's Human Space Flight Program - U.S.-Soviet space competition - was lost, with no equally strong political objective to replace it." NNSA's core mission, nuclear weapons design and production, suffered a similar loss of national priority and both organizations have pursued similar paths in dealing with this loss, namely downsizing personnel, consolidating operations, and relying more and more on contractors.

Both organizations have a proud tradition of scientific and technical excellence. This led NASA to view itself as a “perfect place.” This in turn led to NASA managers losing their ability to accept criticism, leading them to reject the recommendations of many boards and blue-ribbon panels. A parallel to NASA’s “perfect place” culture within NNSA would be the nuclear weapons design laboratories, commonly referred to as the nation’s “crown jewels.” Also like NASA, DOE has been criticized for years by Congress, GAO, the IG and others (e.g., the June 1999 report by the Special Investigative Panel of the President’s Foreign Intelligence Advisory Board, the March 1999 report by the Commission on Maintaining United States Nuclear Weapons Expertise, and the March 1997 “120 Day Study” by Institute for Defense Analysis) for its reluctance to adopt changes recommended by outside organizations. In fact, it was this very criticism, in part, that led Congress to create the NNSA as a semi-autonomous agency within DOE.

The NNSA CAIB Lessons Learned Review Team identified several potential attributes of an effective NNSA safety culture including:

- A visible commitment to safety, both corporately and individually, along with genuine concern for co-workers’ safety.
- Trust, support of open communications, and valuing a diversity of opinions coupled with senior management embracing the concept that healthy tension is good.
- Determination of NNSA’s safety performance baseline and the establishment of performance metrics and indicators.
- Rigorous self-assessments along with objective evaluation and consideration of outside reviews and recommendations.
- Visible accountability (i.e., a system of rewards and punishments).
- A technically competent staff that is committed to and involved in assuring the safety of operations.

The NNSA Review Team found that the organization was lacking, in varying degrees, in all of the above attributes. However, changes in an organization’s culture cannot take place without the buy-in and active leadership of top management. The NNSA Review Team believes that to be effective, the NNSA Leadership Coalition and other senior managers must fully and actively support NNSA’s safety culture in order for individual employees to commit themselves to a culture of safety excellence. The NNSA leadership must develop and establish clear safety values and expectations in order for safety to be an organizational value that is a fundamental part of mission accomplishment. They must also demonstrate a genuine attitude of ownership for safety within NNSA. Although cultural values are intangible, these values, if fully espoused by senior leadership, can lead to tangible improvements in the safety of operations. The NNSA Review Team also acknowledges that it is important for NNSA to be able to judge the status and effectiveness of its safety culture, as it exists today and in the future, as well as identify and track trends in its effectiveness.

DOE and NNSA have invested many resources in Integrated Safety Management (ISM). The team believes that ISM could serve as a model of a system that has demonstrated its value and that has survived multiple changes of leadership in DOE and NNSA. It is our belief that ISM can help lead NNSA and its contractors to a stronger safety culture. ISM is a key enabler of safe

operations through the use of effective work planning, hazards identification, the development and implementation of work controls, performance of work within those controls and feedback for improvement. However, without robust and active support by NNSA senior management, ISM will not lead to an enduring NNSA safety culture, nor is ISM specifically designed to improve an organization's safety culture.

The majority of the NNSA Review Team believes that NNSA has an adequate concern for safety for potentially high consequence programs, such as nuclear facility operations and nuclear weapons design and production, including adequate systems to ensure that operations are proven safe prior to initiation or deployment. But, additional cultural change is needed to maximize the assurance of safety in those high-risk activities. NNSA needs to actively encourage a diversity of views, accept outside criticism, and avoid oversimplification of technical information. Additionally, NNSA management must be vigilant in guarding against the organization being conditioned by past successes. As the CAIB Report states, and with which the team agrees, "Organizations that deal with high-risk operations must always have a healthy fear of failure – operations must be proved safe, rather than the other way around."

### **Corporate Organization**

The CAIB concluded that within NASA, the loss of a truly independent, robust capability to protect the system's fundamental requirements and specifications inevitably compromised those requirements and therefore increased risk. In particular, they found that the organization responsible for program accomplishment decided on its own how much safety and engineering oversight was needed. The CAIB concluded that the separation of authority of Program Managers – who, by nature, must be sensitive to costs and schedules – and "owners" of technical requirements and waiver capabilities – who, by nature, are more sensitive to safety and technical rigor – is crucial.

The ability to operate in a centralized manner or a de-centralized manner, as appropriate, is the hallmark of a high-reliability organization. However, complex organizational structures, such as NASA that mix centralized and de-centralized functions or split functions into centralized and de-centralized pieces can hinder effective operations and result in severe consequences. The CAIB determined that NASA failed to operate effectively in both centralized and de-centralized modes based on the roles, responsibilities, authorities and relationships that developed over time. As a result, organizational complexity created artificial barriers to effective communications throughout the organization. Assigning individuals to multiple, and in some instances, competing places in the organization, complicated the problem.

Confusion about decision-making processes within NNSA, the attenuation of technical information, and the lack of clear accountability created by redundant management activities were previously significant concerns within NNSA. The "NNSA of the Future" model, with its line management responsibility for safety, eliminates much of the complexity and confusion that previously existed by now clearly holding Site Office Managers accountable for the operational safety and security of their sites. The NNSA Safety Functions, Responsibilities and Authorities Manual (FRAM), published on October 15, 2003, is an important step in eliminating any remaining confusion about those responsibilities.

NNSA's new organizational model depends heavily on de-centralized decision making by Site Office Managers. As NNSA's risk acceptance officials, the primary responsibility of Site Office Managers is operational safety and security. NNSA has intentionally optimized its organization for de-centralized risk acceptance decision-making to ensure that risk acceptance authority is delegated to the technically competent senior managers who have access to the most accurate and current information. However, some confusion still exists regarding the role of centralized decision-makers with respect to operational safety oversight, given that NNSA has a limited independent safety organizational construct.

NASA's organizational structure changes, designed to improve efficiency, undermined the redundancy essential to successfully operating a high-risk enterprise. NASA's contractual arrangements, organizational structure and downsizing together undermined the adequacy of federal oversight of the contractor and resulted in the transfer of too much authority for safety to the contractor. The team concluded, that for NNSA, redundancy and the level of oversight should be proportional to the risk (i.e., higher risk = more redundancy). No hazardous facility or operation that presents a risk to the public and/or co-located workers should be without redundancy in oversight processes. NNSA Site Managers do have multiple, although not necessarily redundant, federal sources of technical information to support risk acceptance and safety assurance decision-making, including Authorization Basis professionals, Facility Representatives and Subject Matter Experts. Additionally, the DOE Office of Independent Assessment (OA) provides the NNSA Administrator with an independent audit function, although OA has no day-to-day safety assurance function. However, the Team believes NNSA can enhance the levels of redundancy in its oversight processes.

Finally, the CAIB determined that NASA's complex and often hierarchal organizational structure diffused and confused responsibility, essentially leaving no one person accountable. NASA's culture also lent greater technical credence to communications that originated from higher in the organization, the organizational structure often stifled or blocked communications.

The NNSA Review Team identified several potential attributes of an effective NNSA safety organization including:

- Effective centralized and de-centralized operations require an independent, robust safety and technical requirements management capability.
- Assuring safety requires a careful balance of organizational efficiency, redundancy and oversight.
- Effective communications along with clear roles and responsibilities are essential to a successful organization.

The Team agreed that NNSA should consider establishing the position of Chief of Defense Nuclear Safety in lieu of an ES&H Advisor. This individual would be responsible for developing, maintaining and overseeing corporate technical environment, safety and health (ES&H) policies and standards, including reviewing and approving any waivers to those policies or standards. He or she might also be empowered to veto NNSA headquarters programmatic or budget decisions deemed unsafe or in violation of existing policies and standards, or potentially

leading to an unsafe condition, until resolved to the Chief's or NNSA Administrator's satisfaction. The Chief could also be tasked with monitoring the health of NNSA's ES&H technical staffing. Additionally, this office could provide technical staffs a place in Headquarters to communicate minority opinions that have been overlooked or rejected in other parts of the organization.

The combination and interrelationships of contractor and Site Office self-assessment and oversight by headquarters should not be permitted to tip in either direction. The careful balance between organizational efficiency and the adequate assurance of safety through redundancy and oversight must be maintained. With regard to the implementation of Line Oversight/Contractor Assurance Systems (LO/CAS), the adequacy of these new assurance systems should be verified before reducing existing oversight, particularly in high-hazard operations. NNSA should consider re-instating headquarters line management oversight practices to address self-assessment and external review of federal and M&O contractor operations until LO/CAS is fully implemented.

The importance of fully evaluating and considering minority opinions cannot be overstated. The Naval Reactors program has embraced this as part of their culture from the program's inception and NNSA as a whole should embrace it as well. It may be necessary to provide a new or revitalized organizational conduit along with revised decision-making processes as a means to encourage the airing of minority opinions and the effective evaluation of their input into NNSA's decision-making.

### **Technical Capability**

The CAIB concluded that NASA (1) became dependent on contractors for technical support, (2) contract monitoring requirements increased, and (3) as engineers were placed in management roles, their positions were subsequently staffed by less experienced engineers. Years of workforce reductions and outsourcing culled NASA's layers of experience and hands-on systems knowledge that once provided a capacity for safety oversight. Safety and mission assurance personnel were eliminated, careers in safety lost organization prestige, and the respective program manager decided how much safety and engineering oversight was needed.

The CAIB also concluded that NASA had a number of information systems for reporting and capturing information with potential safety significance. However, information captured in those systems was not consistently analyzed, tracked, trended, or acted upon to resolve underlying causes and this failure was one of many root causes in both the CHALLENGER and COLUMBIA accidents.

Finally, the CAIB concluded that NASA did not have a recurring training program, was not aggressive in training, and did not institutionalize lessons learned into training. The CAIB was appalled that the Navy had trained more personnel on the root causes of the loss of the CHALLENGER than had NASA.

After studying the CAIB Report, the NNSA Review Team highlighted three items with regard to adequate technical capability including:

- Workforce reductions, outsourcing, and loss of organizational prestige can cause an erosion of technical capability.
- Technical capability to track known problems and manage them to resolution is essential.
- A quality technical training and qualification program is vital for the success and safety of high-risk operations.

Similarly, the erosion of ES&H technical capability may be a serious issue within NNSA. As the organizational transition progresses (e.g., stand up of Service Center in Albuquerque), it is not clear whether the Site Offices have sufficient ES&H support. Consolidation of personnel into the Service Center has already resulted in a large loss of ES&H nuclear safety expertise. Over 50% of nuclear safety experts within the ES&H department have taken other positions or declined the directed re-assignment. Headquarters, the Service Center and the Site Offices must establish clear mutual expectations of each other's technical capabilities and support plans. Although each recently completed and validated individual staffing plans, a deeper integrated review may be useful in ensuring that adequate technical capability is maintained and that sufficient capacity and processes are in place for the recruiting, training and career development of technical personnel.

Like NASA, NNSA has access to a wide variety of information management systems, including local issue tracking and management systems of the contractor. Examples include:

- NNSA Lessons Learned System
- Occurrence Reporting and Processing System (ORPS)
- Safety Issues Management System (SIMS) for DNFSB related issues
- Corrective Action Tracking System (CATS) for OA findings/corrective actions
- Significant Finding Investigations (SFI) for weapon related issues
- Government-Industry Data Exchange Program (GIDEP) for suspect/counterfeit materials issues

Also like NASA, NNSA needs the ability to capture, analyze and share safety information, but has limited capability to do so in some areas. NNSA may need to consider establishing an analysis/trending function for complex-wide issues at either HQ or the Service Center to be periodically reviewed by NNSA senior leadership. Additionally, NNSA needs a process to identify and evaluate operational experiences outside of itself and DOE, such as the Davis-Besse near-miss and the COLUMBIA, to disseminate the lessons learned from those experiences, and to develop and implement recommendations resulting from those lessons learned.

Finally, NNSA requires a cadre of technically trained personnel in order to properly perform its mission. This includes key senior management positions, such as Site Office Managers, whose responsibilities include safety of nuclear and other hazardous facilities and operations. Formal qualification and experience requirements, training, and/or compensatory measures must be identified for those individuals within NNSA. The TQP remains an important and valuable tool within NNSA that must be well utilized and managed to be useful. The Site Offices and Headquarters have recently re-baselined their TQP requirements, and review and analysis of that effort is underway.

## **Closing**

In closing, these same interim results will be presented to senior managers at our NNSA Safety Summit tomorrow. I think it is clear that the NNSA CAIB Lessons Learned Review Team believes further changes are needed at NNSA to assure the safety of future operations and to avoid the pitfalls experienced by NASA. In particular, the need to assess and, as necessary, alter our culture, will be a significant challenge. NNSA is committed to objectively reviewing and considering the recommendations of the Review Team.

I would be happy to answer your questions.