Meeting Summary – DNFSB Public Hearing on DOE Oversight (October 23, 2003)

Purpose of series of public meetings: To examine DOE's current and proposed models for safety oversight.
Purpose of this meeting: To gather information from the Columbia Accident Investigation Board (CAIB).
Main Speaker: Major General John L. Barry, Executive Director of the CAIB

Testimony on the Direct or Technical Cause:

- A piece of foam came off the bipod connecting point between the external tank and orbiter, and hit the leading edge of the left wing of the orbiter at a high rate of speed, ultimately leading to failure of the leading edge of the wing, and loss of the orbiter.
- Evidence that the CAIB used to reach this conclusion was extensive and included: (1) videos of the launch, (2) calculation of the impact speed and force of the foam, (3) radar cross section and re-entry characteristics of a piece of the orbiter that came off in orbit, (4) videos of the re-entry, (5) temperature and other sensor data from the left wing, (6) historical records and videos indicating that this piece of foam comes off in about 10% of launches, (7) visual inspection of similar foam pieces showing voids, de-bonds, de-laminations, and other quality issues, (8) damage and heat-patterns on debris, and the presence/absence of certain debris, (9) a test firing of foam into the leading edge material of reinforced carbon carbon, and (10) evaluation and elimination of other viable causes.

Testimony on the Organizational, Managerial, and Cultural Cause (Equal in Weight To The Technical Cause):

- Summary: Reliance on past success, organizational barriers, lack of integrated management, informal chain of command, communications problems
- Federal workforce reduced by 40 percent; shuttle was prematurely declared operational; significant out-sourcing to contractors, leading to an unintended consequence - the reduction in federal technical expertise; organization did not identify and preserve its core competencies; arrogance due to past successes
- Flawed decision-making – Operational mindset; Poor listening to signals (such as from prior incidents where same foam piece fell off); Normalization of deviance – accepting multiple deviations as normal way of doing business because no major failure resulted in the past; Weak trend analysis, weak hazard analysis review; Emphasis on proving that a safety problem existed, rather than on proving it didn't exist
- Organizational structure problems – check and balances were not evident; the balance of power was toward operations rather than safety; there was no strong independent technical voice for safety, with authority over waivers; Organization lacked effective integration function, to see the big picture and make sense of little signals available
- Lack of a learning culture – NASA had not gone to school on Challenger accident (there were lots of "echoes"); Culture didn't encourage dissenting points of view; Culture accepted flaws as routine business

Key Board comments/questions:

- Conway: DOE has undertaken major changes. There are a lot of lessons in the CAIB report.
- Eggenberger: There's no substitute for a strong engineering organization. Safety is a line management responsibility.
- Mansfield: The CAIB list of characteristics of healthy/unhealthy organizations is transferable to DOE. DOE is making choices that may have to be reversed.
- Matthews: DOE is moving toward greater de-centralization and reduced redundancy in oversight.
- Fortenberry: Centralization/decentralization decisions should depend on the organizational functions involved. Centralization is right for developing standards, conducting trend and risk analysis, and identifying anomalous events.
- McConnell: The independent technical organization you recommend would have veto power, not directive power.
- Barry (CAIB): On Independent Technical organization – Operators/Program managers should not be able to waive technical issues without substantive analysis. Role of independent technical assessment group includes constant learning, technical analysis, trend analysis, metric review, checks & balances, redundancy, resilience, preoccupation with failure… The independent technical organization is intended to be secondary check, a redundant effort.
- Barry (CAIB): On decentralization – balancing centralization and decentralization is an important issue; optimum is centralized control and decentralized execution, with norms, procedures and standards established by central group. Could have decentralized representatives with centralized supervision.
- Barry (CAIB): On culture change – Culture change requires leadership at the top, and specific organizational change objectives. The desired safety culture needs the experienced technical personnel and processes that can see and hear weak signals, little things, whispers, flags, trends, spikes, indications, echoes, hidden echoes, rhythm changes, higher risk states, challenges to assumptions, needs for more comprehensive testing, needs for less waivers, and identify these weak signals as issues that must be addressed.
- Barry (CAIB): On Powerpoint – Powerpoint presentations must have back-up technical analysis.
- Barry (CAIB): On e-mails – E-mails flatten an organization but important information can get lost in the noise