



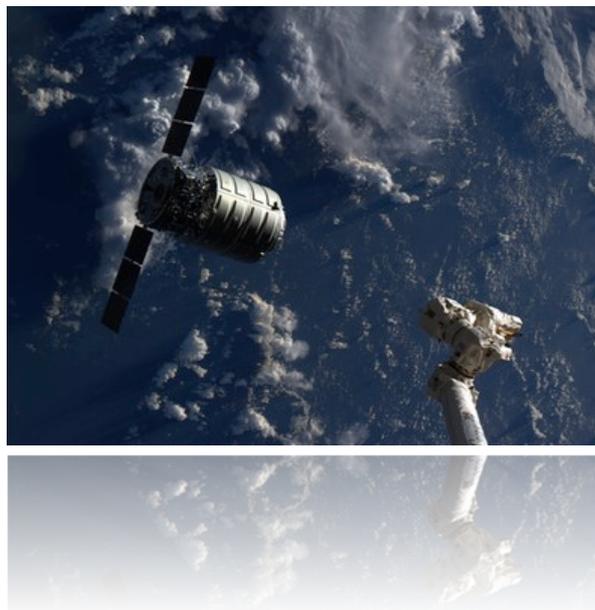
Apollo1—Challenger—Columbia Lessons Learned

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Terry Wilcutt

Chief, Safety and Mission Assurance



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ENDURING LESSONS

Annually reviewing lessons from our three major mishaps is our best chance to never forget them. Wayne Hale (former NASA Flight Director and Space Shuttle Program Manager) has recorded 10 enduring lessons from his experience:

1. It can happen to you.
 - Nobody is smart enough to avoid all problems. A preoccupation with failure results in high reliability organizations.
2. Focus.
 - “Aviation in itself is not inherently dangerous. But [...] it is terribly unforgiving of any carelessness, incapacity, or neglect.”
– Captain A. G. Lamplugh, RAF.
3. Speak up.
 - A foolish question is more forgivable than a mistake. Loss of respect, loss of your job, loss of a promotion pale compared to Program shutdowns, life-long regret, and funerals.
4. You are not nearly as smart as you think you are.
 - “One mouth, two ears.” Too many people are so busy giving their thoughts that they fail to hear warnings of a disaster. Then, don’t just listen, but comprehend and take action.
5. Dissent has tremendous value.
 - No dissent means the issue hasn’t been examined enough. Appoint devil’s advocates and don’t let people remain silent—draw them out.



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ENDURING LESSONS (continued)

6. Question conventional wisdom.

- “People in groups tend to agree on courses of action, which, as individuals, they know are stupid.” Told that the shuttle was as safe as an airliner, we denied the shuttle crew parachutes and pressure suits—something patently wrong to a casual observer.

7. “Do good work.” – Gus Grissom

- There is no room for half-hearted efforts or second best. Do it well or don’t do it at all. Don’t accept excuses from others.

8. “Engineering is done with numbers.”

- “Analysis without numbers is only an opinion. Not having all the information you need is never a satisfactory excuse for not starting analysis. Space is a completely unforgiving environment. If you screw up the engineering, somebody will die.” – Dr. David Aikin

9. Use your imagination.

- Apollo 1 was referred to by Frank Borman as a failure of imagination. They couldn’t imagine a ground test could be hazardous. Keep vigilant and have an active imagination of possible hazards.

10. Nothing worthwhile was accomplished without taking risk.

- At some point we must leap off into the unknown without knowing everything we should. Fear or preoccupation of failure cannot paralyze us into inaction. Make the risk of those who put their life on the line as small as possible, then go forward.



NASA suit technicians assist Gus Grissom. Source: NASA

REMEMBER LESSONS AND APPLY THEM

How can we honor our lost crews today? We can review hard-won lessons. But doing that alone, walking out of the room, and getting back to work is not enough.

Actually putting lessons into practice, using the knowledge to alter our policies, requirements, and management behavior—this is what such lessons are for.

Each of us at our own level can and should think about and discuss the lessons of Apollo 1, Challenger, and Columbia in the context of today's efforts—and tomorrow's planning.

Include reviewing these lessons with your organization.

