



Is it safe?

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Safety and Mission Assurance

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- Is it safe?
- How do you answer that question when we've put people atop a vehicle loaded with millions of pounds of rocket fuel?
- Of course it isn't "safe"!
- Our challenge is to achieve the best understanding of the risk our mission poses to the public and our workforce, to include flight crews, in order to ensure that the goals we hope to achieve justify the risk.
- Is it safe enough?

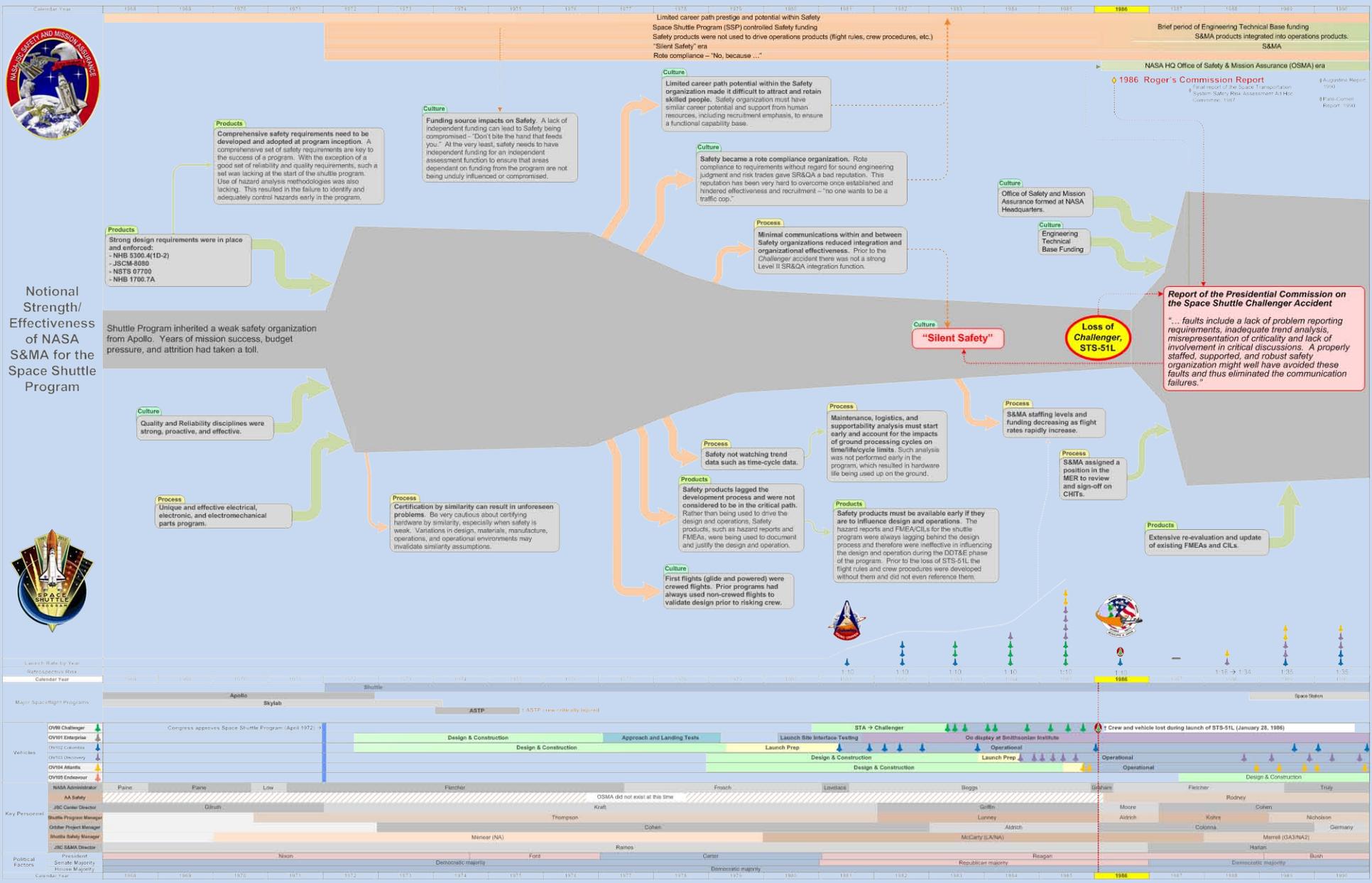


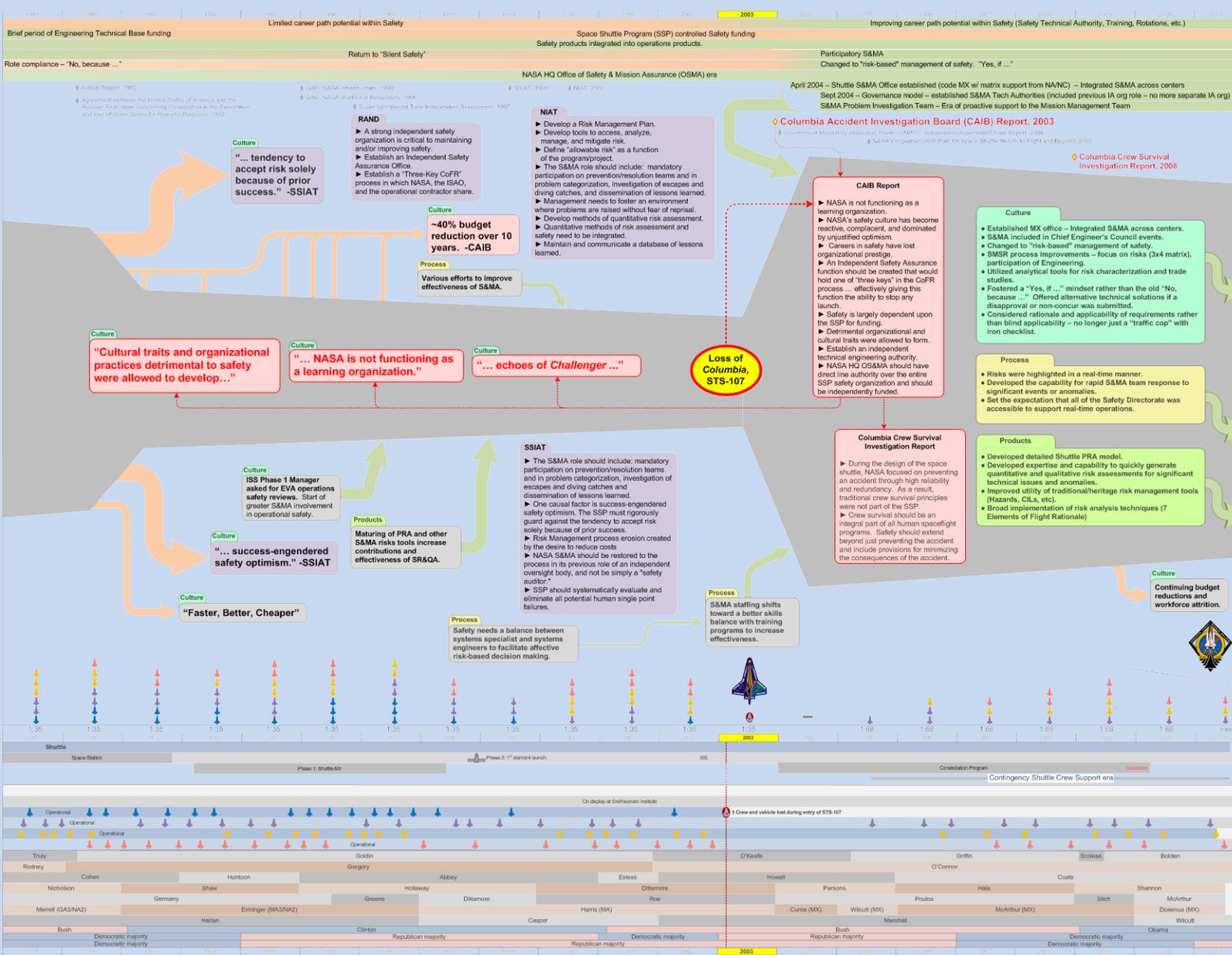
Lessons Learned (the hard way)



- Processes grew out of painful experiences.
- Human spaceflight organizations focused on a few, high visibility missions.
- Why do people, well-trained and committed to excellence, make horrific mistakes?
 - Over confidence
 - Schedule pressure
 - Budget pressure
 - Extremely complex systems
 - Normalization of deviance
 - Failure to heed “lessons learned”
- What is different today?







For a lesson learned to be beneficial, it must be captured and implemented in future programs in the form of requirements, organizational structures, and/or policies.

- Culture**
 - Cooperation and Coordination within and between organizations is needed to increase organizational effectiveness - avoid "sandboxing."
 - Benefits: (1) Better coordination and sharing of technical data resulted in improved timeliness and quality of S&MA risk assessments. (2) Earlier coordination and resolution of technical issues resulted in better S&MA support to the SSP and OSMA.
 - Safety must be more than a rote compliance organization. (Rote compliance to requirements without regard for sound engineering risk trades gave SR&QA a bad reputation.)
 - Benefits: Improved working relationship with other organizations and added real value to program mission support.
- Process**
 - Safety must be involved early to be effective and must be committed to "near real-time/real-time" support for flight operations.
 - Benefits: Provided MMT with information needed for risk-based decision making.
- Products**
 - Improve risk assessment capability through use of quantitative and qualitative risk assessment tools.
 - Benefits: Helped frame risk discussions and characterized Safety risks for program and agency management.

Safety and Mission Assurance Space Shuttle Program Legacy Report

JSC Flight Safety Office

Shuttle	Launch Rate By Year	Retrospective Risk	Calendar
Challenger	↑	↑	1983
Enterprise	↑	↑	1981
Columbia	↑	↑	1981
Discovery	↑	↑	1981
Atlantis	↑	↑	1985
Endeavour	↑	↑	1985
Orion	↑	↑	2014

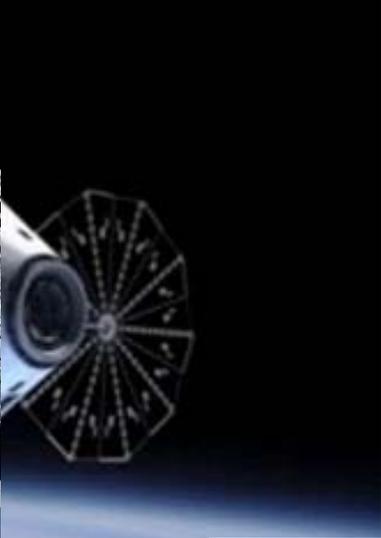
Leadership:

- NASA Administrator: O'Keefe, Griffin, O'Connor, Coats
- JSC Center Director: AA Safety
- Shuttle Program Manager: Nicholson, Cohen, Huntoon, Gregory, Abbey, Estess, Dittmore, Parsons, Howell, Griffin, O'Connor, Coats
- Order Project Manager: Memell (GASNAZ), Germany, Shaw, Hollaway, Dittmore, Roe, Curie (MX), Wilcutt (MO), Foulos, McArthur (MX), Slich, Shannon, McArthur, Downum (MX), Wilcutt
- Shuttle Safety Manager: Memell (GASNAZ), Harlan, Eminger (MASNAZ), Greene, Harts (MA), Casper, Harts (MA), Curie (MX), Wilcutt (MO), Foulos, McArthur (MX), Slich, Shannon, McArthur, Downum (MX), Wilcutt
- JSC S&MA Director: Bush
- President: Bush
- Senate Majority: Democratic majority
- House Majority: Democratic majority



~~Future~~ Current Challenges

- **Constrained budgets – less oversight**
- **Reductions in the contractor workforce**
- **Reductions in the Civil Service workforce**
- **Risk Informed Decision Making/Continuous Risk Management**
- **We all are responsible for identifying opportunities to reduce risk, day-in and day-out**
- **Is it safe (enough)? If not, SAY SO!**





Managing Risk

- The systematic identification, assessment, prioritization and mitigation of risk is essential to our success.
- One of the most effective ways to reduce risk during the development and production of new vehicles is an emphasis on quality assurance, up front.
 - “Quality goes in before the name goes on.”
- Success requires commitment at all levels.



Managing Risk

- Smart people learn from their mistakes; a wise people learn from the mistakes of others
- Study history, especially “lessons-learned”
 - Avoid mistakes of the past
 - Emulate the successes
- Promote a culture that accepts “bad news” without retribution
 - Do not shoot the messenger
 - Encourage dissenting opinions
 - Bad news is not like a fine wine...



Managing Risk

- We have forged partnerships which at one time were unthinkable.
 - ISS
- We will succeed...or fail...together
- Trust
 - Insight versus oversight
 - When is “better” the enemy of “good enough”?
 - “Business as usual” is not good enough.

How can the sky be the limit...



...when there are footprints
on the moon?