

# Leadership in Cinema



Wildland Fire Leadership Development Program

## SPACE SHUTTLE DISASTER

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Phone: 208-387-5318  
Producer: Frank Eskenazi ..... Director: Gilles Cavatte  
Studio: NOVA ..... Released: 2008  
Genre: Documentary ..... Audience Rating: Not rated  
Runtime: 53 minutes

### Materials

NOVA's Space Shuttle Disaster video (purchased or online); Columbia Accident Investigation Report, Chapter 7: The Accident's Organizational Causes (one per student); South Canyon Fire Investigation Executive Summary (one per student); notepads; and writing utensils.

### Objective

The objective of this lesson is for students to read the Chapter 7: The Accident's Organizational Causes, watch the Space Shuttle Disaster video, and participate in group discussion about the factors that may have contributed to the Columbia space shuttle disaster.

### Basic Plot

Space Shuttle Disaster is a behind-the-scenes look at the space shuttle project. "It offers a penetrating look at the history of the shuttle program and the political pressures that made the shuttle a highly complex engineering compromise, which fell short of its ambitious goal to make space travel routine, cheap, and safe." (NOVA website)

## Cast of Main Characters

Neil deGrasse Tyson .....	Narrator
Leroy Cain .....	STS-107 Flight Director
Jon Clarke .....	Flight Surgeon, NASA
Michael Griffin.....	NASA Administrator (Retired)
William Harwood.....	CBS News Space Analyst
Scott Hubbard.....	Columbia Accident Investigation Board
Roger Launius .....	National Air & Space Museum
John Logsdon .....	Space Policy Institute
Howard McCurdy.....	American University
Story Musgrave.....	NASA Astronaut (Retired)
Don Nelson.....	NASA Engineer
Sean O'Keefe .....	NASA Administrator (2001–2004)
Douglas Osheroff.....	Columbia Accident Investigation Board
Allen Richardson.....	Boeing Engineer
Rodney Rocha.....	STS-107 Division Chief Engineer
Harrison “Jack” Schmitt .....	Astronaut, Geologist
John Schwartz .....	The New York Times

## Facilitator Notes

- [NOVA website and Space Shuttle Disaster video transcript](#).
- Download and print a copy of the [Columbia Accident Investigation Board Report \(Volume 1\), Chapter 7:“The Accident’s Organizational Causes](#) for each student.
- Download and print a copy of the [South Canyon Fire Investigation Executive Summary](#) from the full investigation report for each student.

## Facilitation Tips

1. Organize a group of students to participate in the Space Shuttle Disaster discussion.
2. Have students, individually or as a group, watch Space Shuttle Disaster.
3. Conduct a guided discussion using some or all of the associated resources (handout and possible comments provided). Have students discuss their findings and how they will

apply leadership lessons learned to their role in wildland fire suppression. Facilitate discussion in groups that have difficulty.

## References

Facilitators are encouraged to review the links below in order to obtain information that may be helpful during group/classroom discussions and for continued leadership development.

- [“The Insider Who Knew”](#)—NOVA podcast featuring NASA engineer Rodney Rocha.
- [“Final Space Shuttle Launch Will Be the End of an Era.”](#) The Washington Post. 2011.
- [“Performing a Project Premortem.”](#) Klein, Gary. Harvard Business Review. September 2007.
- [High Reliability Organizing – What It Is, Why It Works, How to Lead It](#) (information from the BLM Fire and Aviation Directorate, Division of Fire Operations, March 2010 HRO training session).
- [Wildland Fire Lessons Learned Center](#)

## Leadership Challenges

As part of this lesson, facilitators are encouraged to challenge students to read the following selections. The last three are suggested reading items from the Professional Reading Program.

- Boin, Arjen and Schulman, Paul. [“Assessing NASA’s Safety Culture: The Limits and Possibilities of High-Reliability Theory.”](#) Public Administrative Review. December 2008.  
(This article is included to spur discussion about high reliability organizations (HRO). Included in the [Columbia Accident Investigation Report, Chapter 7](#) is a reference to assertions that NASA failed as a safety culture.)
- Perrow, Charles. Normal Accidents. Princeton University Press. 1999.
- Vaughan, Diane. “Targets for Firefighting Safety: Lessons from the Challenger Case.” Presented at Interagency Hotshot Crew Workshop. 1996. Based on her extensive research regarding NASA’s culture and the decisions leading up to the launch of the space shuttle Challenger, Vaughan discusses the role that organizational culture can play in affecting firefighter performance and safety.
- Weick, Karl E. and Kathleen M. Sutcliffe. Managing the Unexpected. Jossey-Bass. 2001. Subtitled “Assuring High Performance in an Age of Complexity,” this book looks at how HROs like aircraft carriers, nuclear power plants, and firefighting crews manage high-risk operations.

## Space Shuttle Disaster

### Guided Discussion with Possible Answers

1. What is meant by the term “high reliability organization” (HRO)?
  - “An organization that operates continuously under trying conditions and has fewer than its fair share of major incidents.” (Karl E. Weick and Kathleen M. Sutcliffe)
  - “An organization that has succeeded in avoiding catastrophes in an environment where normal accidents can be expected due to risk factors and complexity.” (Wikipedia)
2. What are the five basic principles/characteristics of HROs?
  - Preoccupation with failure
  - Reluctance to over simplify
  - Sensitivity to operations
  - Deference to expertise
  - Commitment to resilience
3. What are the pillars of a safety culture?
  - Reporting culture: Safety cultures are dependent on knowledge gained from near misses, mistakes, and other “free lessons.” People must feel willing to discuss their own errors in an open, non-punitive environment.
  - Just culture: An atmosphere of trust where people are encouraged to provide essential safety-related information yet a clear line is drawn between acceptable and unacceptable behavior.
  - Flexible culture: One that adapts to changing demands by flattening hierarchies and deferring to expertise regardless of rank.
  - Learning culture: The combination of candid reporting, justice, and flexibility enables people to witness best practices and learn from ongoing hazard identification and new ways to cope with them.
4. How did NASA’s organizational culture and structure contribute to the Columbia accident?
  - Refer students to the Columbia Accident Investigation Report, Chapter 7: The Accident’s Organizational Causes, p. 177.
    - “The organizational causes of this accident are rooted in the Space Shuttle Program’s history and culture, including the original compromises that were required to gain approval for the Shuttle Program, subsequent years of resource constraints, fluctuating priorities, schedule pressures, mischaracterizations of the Shuttle as operational rather than

developmental, and a lack of an agreed national vision. Cultural traits and organizational practices detrimental to safety and reliability were allowed to develop, including: reliance on past success as a substitute for sound engineering practices (such as testing to understand why systems were not performing in accordance with requirements/specifications); organizational barriers which prevented effective communication of critical safety information and stifled professional differences of opinion; lack of integrated management across program elements, and the evolution of an informal chain of command and decision-making processes that operated outside the organization's rules."

5. What was NASA's number one priority for human space travel? Did focus on this priority become blurred with other objectives? If so, what caused the blur? How is this similar or different from your experiences in wildland fire?
  - Safety was NASA's number one priority.
  - A focus on launch schedules may have resulted in a compromise of safety.
    - "Launch schedule was a prime consideration. We kept saying that safety is the number one consideration, but launch schedule was right up there with it." – Don Nelson, NASA engineer (12:43 – 13:10)
  - Answers will vary. Facilitate respectful group discussion.
6. What are you doing on your local unit to promote a safety culture? Are there areas of improvement and lessons learned from watching the video and reading the literature that will benefit your organization?
  - Answers will vary. Facilitate respectful group discussion.
7. Respectfully discuss the following statements in relation to wildland fire. How does attitude and culture affect the organization?
  - "The successes of the past, the report [the CAIB] tells us, had generated a culture of complacency, even hubris. NASA had become an arrogant organization that believed it could do anything." (cf. Starbuck and Miliken, 1988, as cited in Public Administration Review, November/December 2008)
  - The Apollo era created at NASA an exceptional "can-do" culture marked by tenacity in the face of seemingly impossible challenges." (CAIB 2003, 101 cited in Public Administration Review, November/December, 2008)
  - "The 'can do' attitude of supervisors and firefighters led to a compromising of Standard Firefighting Orders and a lack of recognition of the 18 Watch Out Situations." (South Canyon Fire Investigation—Executive Summary, 1994, p. 3.)
8. Moments after Columbia is determined to have broken apart in flight, Flight Director Leroy Cain locks Mission Control's doors and ceases all communication with the "outside" world (27:22 – 28:02). As a fire leader, how would you handle a sensitive situation such as this? Discuss in your groups ways to minimize the impact of social

media when an accident or incident within an incident occurs. What is your local procedure for such events?

- Answers will vary. Facilitate respectful group discussion.
- Consider having a local subject matter expert discuss local accident/incident protocols.
- Consider hosting a regional [Taking Care of Our Own](#)® training session provided through the National Fallen Firefighters Foundation.

9. Sean O’Keefe stated, “Ironically, in November of 2002, we actually conducted an exercise where we activated a board. We had listed all the members of the board who would be involved in an investigation and so on. And the day this happened [referring to the actual Columbia disaster], at about 9:30, that plan was activated. (28:59 – 29:17)” Within the scope of HRO, what type of exercise was conducted? Do you conduct these types of exercises on your local unit?

- NASA conducted a premortem exercise.
  - A method “which helps project teams identify risks at the outset.” Individuals participate in a scenario depicting a real-life project failure in order to determine the cause of the failure and to identify means of preventing the failure in the future. Dissenters are encouraged to speak up. (Klein, 2007).
  - For more information, refer to Gary Klein’s [“Performing a Project Premortem.”](#)

10. Douglas Osheroff stated, “We actually tasked NASA [after the accident] to put together a team of engineers to imagine that it’s day five of the flight and they’ve just learned that there’s a big hole in the left wing of Columbia. So what could they do about it? (40:55 – 41:08)” Within the scope of HRO, what type of exercise was conducted? Do you conduct these exercises on your local unit?

- NASA conducted a postmortem exercise.
  - Participants in a postmortem exercise look at a past incident to identify what happened and then analyze why it happened.

## Quotes and Themes That May Promote Discussion

- “Launch is...it’s acceptance of the risk.” – Story Musgrave, Astronaut (2:31-3:08)
- “I had been concerned about the erosion of safety culture, and that’s based on my observations in the involvement I had taking care of the crew...‘Well, if it was so risky, why didn’t NASA tell me that?’” – Jon Clark, Flight Surgeon, NASA (4:17 – 4:52)
- “But as NASA was planning the future, the powers in Washington were planning to slash NASA’s budget, starting with the remaining Apollo missions. – Narrator (7:39 – 7:48)
- “But combining all the shuttle’s functions with cheapness and reusability proved impossible in the end.” – Narrator (10:53 – 11:12)
- “Launch schedule was a prime consideration. We kept saying that safety is the number one consideration, but launch schedule was right up there with it.” – Don Nelson, NASA engineer (12:43 – 13:10)
- “The engineers down in...close to the vehicle, knew how risky this was, but the upper management chose to ignore the message of problems and said, ‘We’ve committed to do this, and we’re going to do it.’” – John Logsdon, Space Policy Institute (13:10 – 13:25)
- “The Challenger accident was a surprise in two ways to us. It was a surprise just to have the accident. The other surprise is that there were engineers that knew the problem that caused the Challenger accident, and they had been trying to bring it forward to the management, and the management wouldn’t listen to them.” – Don Nelson, NASA engineer (15:23 – 15:40)
- “The safety regime of this is what makes it so expensive.” – Sean O’Keefe, NASA Administrator, 2001-2004 (18:37 – 18:58)
- “When you see something, however abnormal, often enough, you begin to think it’s normal. The fact that it’s happened several times and always explainable upon return and inspection, and you look at what the damage was of the effect of whatever, and said, ‘Okay, that’s within a margin of acceptable damage or consequence and so therefore not safety- or flight-threatening.’” – Sean O’Keefe, NASA Administrator, 2001-2004 (21:33 – 22:00)
- “...but again, fortunately, your training kind of kicks in, and it forces you to not get zeroed in on any one specific area until you have good reason to do that.” – Leroy Cain, STS-107 Flight Director, referring to the moments of the Columbia disaster (24:57 – 25:39)
- “NASA has this terrible expression called ‘It’s in-family.’ In other words, ‘We’ve seen this before. It never did anything before. I don’t think it’ll do anything now.’” – William Harwood, CBS News Space Analyst (37:28 – 37:40)

## High Reliability Organizing (HRO)

HROs practice a form of organizing that reduces the pain created by unexpected events, helps us contain them, and speeds up recovery.

We all plan for what we expect and even develop contingencies for ways we think things could go wrong. Managing the unexpected is difficult to “plan” for by definition. We never imagined those surprises!

Relying only on what we can imagine can eventually mean big surprises, unless we create a mindful infrastructure that is continually

- Tracking small failures
- Resisting oversimplification
- Sensitive to operations
- Maintaining capabilities for resilience
- Taking advantage of shifting locations of expertise

There are ways to build upon our skills to both anticipate and recover from the unexpected test.

The ability to see things coming long before they arrive, even when events are quickly unfolding outside of expectations, or our systems are quietly breaking down just below the surface, can be learned and taught.

The ability to recombine the resources at hand into novel approaches to problem resolution, emotional maturity evidenced in respectful communication under duress, and deep knowledge of how the system’s technologies function are a few signs of a commitment to building resilient people, teams and organizations.

The best HROs expect people will make mistakes and that their systems can fail in unimagined ways. This vision is evident in the underlying principles of mindfulness that heighten awareness, increase vigilance, create clarity in the midst of noise, and deal with disasters before they can fully develop.

Continuous updating in a mindful way minimizes the likelihood of large failure, speeds recovery, and facilitates real organizational learning.

*Managing the Unexpected; Assuring High Performance in an Age of Complexity*

*Dr. Karl Weick and Dr. Kathleen Sutcliffe*

*Wildland Fire Lessons Learned Center*



## High Reliability Organizing

### *What It Is, Why It Works, How to Lead It*

*(Derived from the BLM Fire and Aviation Directorate's Division of Fire Operations March 2010 HRO training session)*

## HRO ~ Why It Works

Karl Weick and Kathleen Sutcliffe cite wildland firefighting crews as one example of a high reliability organization in their book, *Managing The Unexpected – Resilient Performance in an Age of Uncertainty*. They ask their readers to use our organization as a benchmark, “not because they ‘have it right’ but because they struggle to get it right on a continuous basis.”

## HRO: A Discipline or a Recipe?

Donna Hunter explained to attendees that HROs are developed more through discipline than following a recipe for success.

The goal of HRO is to have employees operate in a hyper-vigilant state of mind. Hyper-vigilant employees “recognize even subtle signals, and know that the signal was significant in context.”

Quoting Karlene Roberts in *New Challenges to Understanding Organizations*, Hunter noted that employees in HROs:

1. Seek perfection but never expect to achieve it.
2. Demand complete safety but never expect it.
3. Dread surprise but always anticipate it.
4. Deliver reliability but never take it for granted.
5. Live by the book but are unwilling to die by it.

The four key pillars for sustainable risk management taken from James Reason's *Managing the Risks of Organizational Accidents* are:

- Reporting Culture – Safety cultures are dependent on knowledge gained from near misses, mistakes, and other “free lessons.” People must feel willing to discuss their own errors in an open, non-punitive environment.
- Just Culture – An atmosphere of trust where people are encouraged to provide essential safety-related information yet a clear line is drawn between acceptable and unacceptable behavior.
- Flexible Culture – One that adapts to changing demands by flattening hierarchies and deferring to expertise regardless of rank.
- Learning Culture – The combination of candid reporting, justice, and flexibility enables people to witness best practices and learn from ongoing hazard identification and new ways to cope with them.

To be a premier organization we must:

- Feed the learning back into the organizations
- Encourage team members to ask critical questions.

## **HRO ~ The Five Basics Principles**

*Dave Thomas and Donna Hunter*

### **1. Preoccupation with Failure**

- Vigilant attention to early detection of small errors.
- Encourage reporting of errors and near misses.
- We should be worried we haven't caught everything...we worry when things are going too smoothly...we realize that any lapse is a symptom that something could be wrong with the system.
- We tend to look at large errors with catastrophic consequences but we should look for small failures to avoid large errors. We should be preoccupied with failure before an event occurs.
- We should look at fatality incidents starting months before the accident and ask ourselves, "Why did everything they did make sense to them at the time?"

### **2. Reluctance to Over Simplify**

"Checklists have their place so we shouldn't throw them out because they are over simplified. Rather, we need to continually ask ourselves what we are missing in our over-simplification." ~ Michelle Ryerson, BLM Safety Manager

- This is not the KISS (Keep It Simple and Short) theory. While checklist and standard operating procedures (SOPs) help us stay focused on key issues and indicators, we know that to manage for the unexpected, we should be reluctant to accept over-simplification.
- We must overcome the tendency to simplify by inviting skepticism to conventional wisdom, questioning standard procedures, and reconciling diverse opinions.

### **3. Sensitivity to Operations**

Quote: "When they (HROs) 'recognize' an event as something they have experienced before and understood, that recognition is a source of concern rather than comfort. The concern is that superficial similarities between the present and the past mask deeper differences that could prove fatal." ~ Karl E. Weick

- Even small variations in operations deserve individual attention.
- A vigilant eye on operations helps us make continuous adjustments that prevent small errors now before they become large errors in the future.

- We must notice anomalies while they are still tractable and can be isolated. They need to be caught before they escalate into a catastrophic accident.
- Most accidents are not the result of a single error, but rather an accumulation of numerous small errors that result in a disproportionately large accident.
- “We look at our organization like an air traffic controller looking at a radar screen...looking for weak signals that just bleep on occasion. This is how we maintain an organizational preoccupation with failure and sensitivity to operations.”  
~ Sheldon Wimmer, SFMO Utah

#### 4. Deference to Expertise

- HROs push decision making down to the front line (point of the spear), and authority migrates to the person with the most expertise, regardless of rank.
- Expertise is not confused with experience. Experience by itself does not guarantee expertise. We must scan up and down the chain of command to find the right expertise needed to handle the current or potential problem.
- Decision making should migrate to the person with the unique knowledge needed to confront the given situational complexities.

#### 5. Commitment to Resilience

- HROs have the ability to be stretched and still bounce back. They continuously evaluate the worst case scenario and practice internal fire drills.
- They know they haven't seen all the ways that a system can fail.
- HROs cultivate employees to confront organizational obstacles and actively find solutions or workarounds.
- HROs are vigilant at keeping errors small and improvising workarounds that allow the system to keep functioning.

***“HROs put a premium on training, personnel with deep and varied experience, and skills of recombination and making do with whatever is at hand.” ~ Karl E. Weick and Kathleen M. Sutcliffe***

### Organizational Inputs to a Resilient System

The ability to deal with an emergency situation is dependent on the systems, structures, and cultures put in place before a crisis occurs. Resiliency includes both individual and organizational inputs. These inputs include:

- Knowledge gained through openness and sharing of information.
- Accumulated experience.
- Facilitated learning.
  - Maximize a reporting culture.

- Restructuring to meet demand of the organization not previously anticipated.
- Coping with unforeseen challenges.
- Flexibility and adaptability in available people and resources to mitigate challenges.
  - We need to have the right people with the right authority to make decisions in a timely matter.
  - We feel empowered to take drastic measures when necessary; e.g., closing down a major freeway during a wildfire or exercising the right to turn down an assignment.

## How Do We Maintain Resiliency?

- Sponsor leadership courses which stress communications and the ability to speak up at all levels of the organization.
- Lead by example (show quick decision making or play “what if” games).
- Run premortem and postmortem exercises

### premortem exercises

Premortem exercises are very powerful tools that begin by looking at an incident that will take place in the near future. All participants are instructed to assume that something went spectacularly wrong and are then asked to determine the cause of this tragic ending, and identify ways of preventing this failure from happening. Premortem exercises:

- Can be done on a scheduled prescribed fire or in an incident action plan (IAP).
- Let all participants introduce their idea of what went wrong. Supervisors invite subordinates to tell them how this incident or plan can fail.
- Look for blind spots.
- Determine ways to prevent this failure.

### Postmortem Exercises

Postmortem exercises look at a past incident. Participants identify what happened and then analyze why it happened. Postmortem exercises:

- Are more in depth than an after action review (AAR) but not as detailed as an investigation.

Look at organizational systems months before the incident.

- Are designed to avoid hindsight bias.

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Source: [High Reliability Organizing – What It Is, Why It Works, How to Lead It](#). BLM Fire and Aviation Directorate, Division of Fire Operations. March 2010.

## Space Shuttle Disaster

### Guided Discussion

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6. What are you doing on your local unit to promote a safety culture? Are there areas of improvement and lessons learned from watching the video and reading the literature that will benefit your organization?
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