Headquarters U.S. Air Force

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Disasters In Space

Mr. Gary Payton
Deputy Under Secretary
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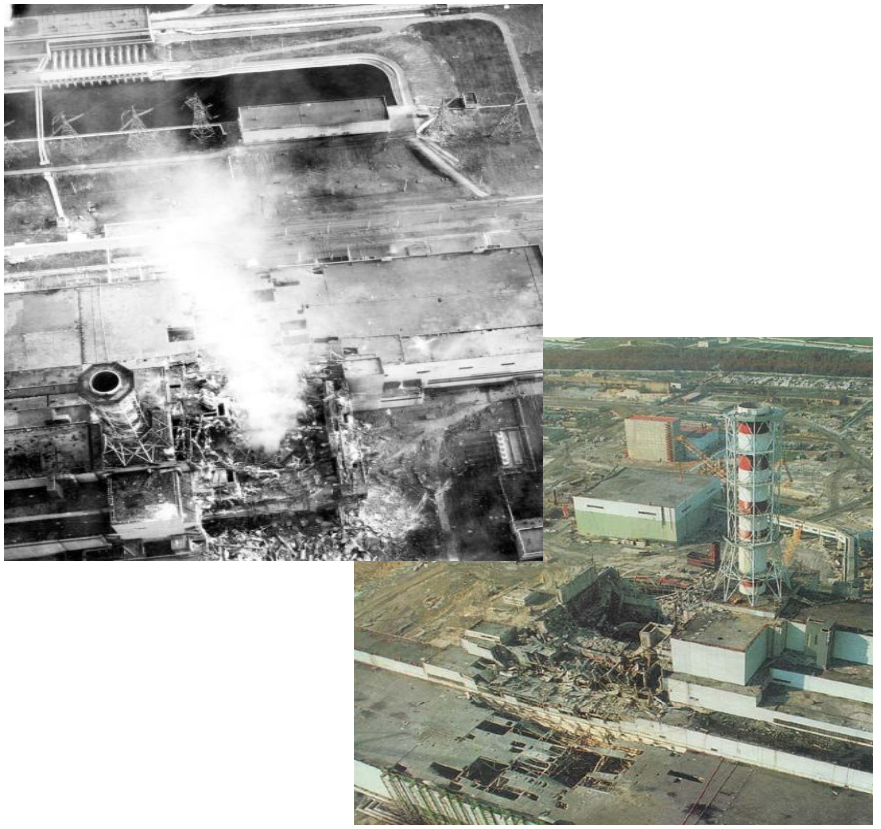
Chernobyl Power Station, Reactor 4, 04/26/86

Root Causes:

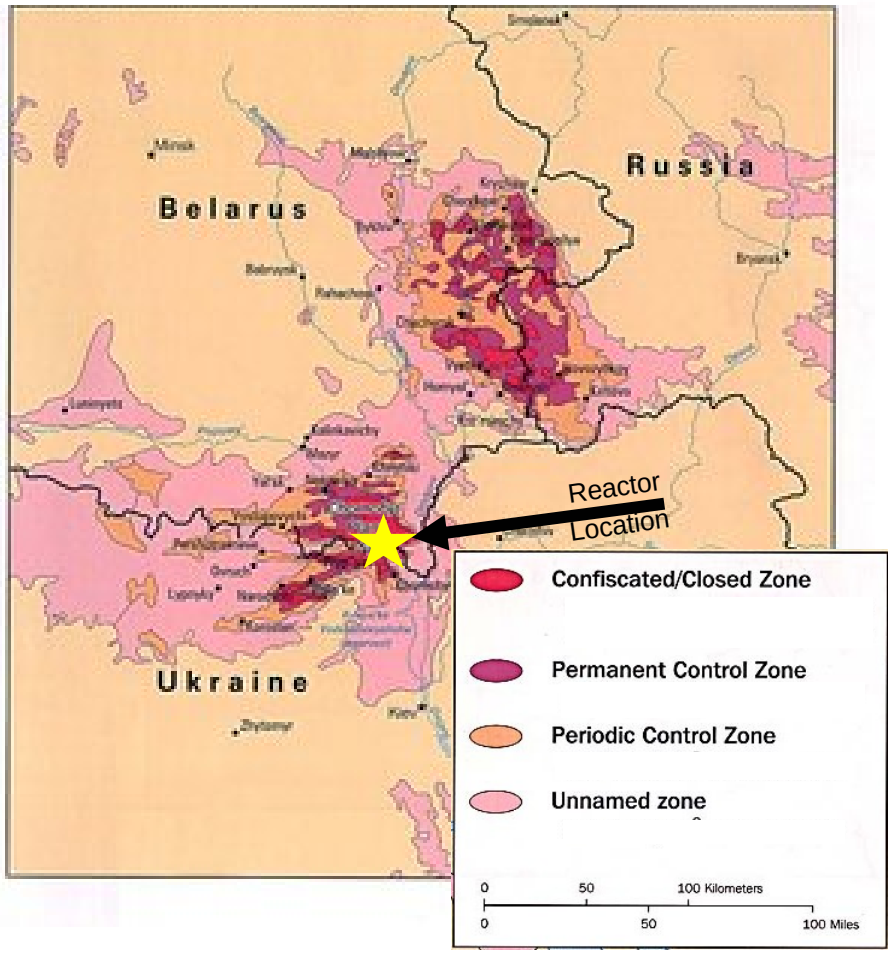
- Basic reactor design
- Automatic safety system turned off
- Poorly designed experiment
- Decision to continue with experiment even though reactor went unstable
- Operator failure to adapt to new realities



Lessons From History - Chernobyl

Chernobyl shared traits common to disasters:

- Everything was working well one moment and not the next
- Root causes that “could” have been recognized and, if acted on in time, might have made it possible to avoid or at least mitigate the consequences



Lessons From History – Liberty Ships

Positive example of how to understand root causes and mitigate consequences

World War II - Liberty Ships

- 30% of Liberty fleet experienced catastrophic structural failure
- Recognition of “root” cause: small cracks in welded steel
- Crews taught to spot cracks and initiate simple fix
  - Drilled a hole
  - Became “CRACK STOPPERS”

Space “mishaps” often make a bang, a fire ball, and the evening news

Vanguard 1 - U.S. response to Sputnik, started off with a loud bang!

Lessons From History - Soviet Space

Soviet Space program had similar mishaps

Nedelin disaster, October 1960

- Prototype R-16 ICBM exploded on launch pad
- 126 deaths including the commander of the R-16 program …Marshall Nedelin

Lessons From History - Soviet Space

- Nedelin disaster left Moscow without an improved ICBM to compensate for the delays in the R-16 program, Nikita Khrushchev risked installation of inter-mediate range ballistic missiles in Cuba
  - Led to the Cuban Missile Crisis
  - Almost led to World War III
- Bottom line is that relatively “small disasters” in our space business can lead to horrific consequences

Lessons From History – Challenger

U.S. has had several mishaps that resulted in loss of the crew

Challenger – STS 51-L

- Root cause KNOWN:
  O-Ring leaks and temperature limits
- Root cause became LETHAL when paired with artificial schedule imperative

Columbia – STS-107

- Root cause KNOWN: Foam was falling off and hitting the external tanks & shuttles during launch
- Root cause became LETHAL when paired with artificial schedule imperative

UNMANNED space programs have also suffered launch and on-orbit mishaps

- Mars Climate Orbiter
- Mars Polar Orbiter
- European Mars Lander
- Titan 34D
- Delta

In Perspective

Two examples:

- SBIRS High – Space Based Infrared System
- NPOESS – National Polar Orbiting Environmental Satellite System
- Both suffered Nunn-McCurdy Breaches
  - Ultimately Certified …
  - But with draconian reductions in scope … to control costs
  - And, to give current program managers a fighting chance to deliver on promises made

We Stepped Away From the "BASICS"!

Root Causes – Young Report

1. Using “cost as primary driver”
2. Starting program with unrealistically low cost estimates and budgeting
3. Failing to provide discipline in requirements definition and growth
4. Erosion in Government’s ability to lead and manage
5. Industry failed to implement proven acquisition practices

“Back to Basics” Acquisition Strategy

- Center on requirements, resources, & risks
  - Manage technology risks, funding risks, and schedule risks
  - Stabilize requirements
- “Block Approach”
- Build deliberate incremental delivery plans with renewed emphasis on requirements, resource and management

“Back to Basics” Acquisition Strategy

- Stabilized requirements, budgets, and workforce
- Document incremental capabilities with a approved Acquisition Program Baseline
- Match deliveries to changes in tactics, techniques, procedures and user equipment

Must Reduce the Cycle Time

“Back to Basics” Implementation

- Emphasize delivering initial capability
- Manage program risks
- Manage expectations
- Stabilize budgets
- Identify most critical technologies and align them with incremental delivery plan
- Maintain and grow experienced, professional space acquisition and engineering cadre

Summary

- Not all disasters make the evening news
  - We have experienced disasters in our space acquisition programs
  - These disasters can have impacts that are far greater than those associated with a single mishap

We must all be “Crack Stoppers”
We must get “Back to Basics”