



International Space Safety
Foundation

ISSF

Vision for Voluntary Space Safety
Standards Development

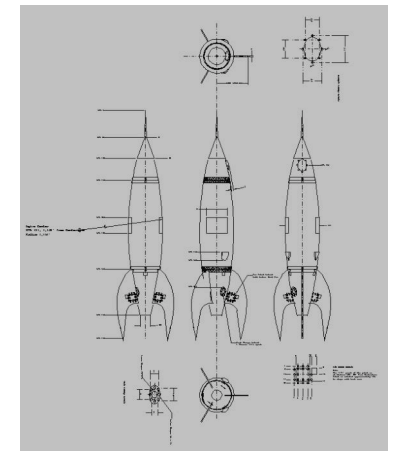
By

J. Steven Newman D.Sc.

November 2007

Safety Risk in Space

- Regardless of the energy, expertise and excitement today in the Commercial Space Industry, management of safety risks still guide all of our endeavors
 - Hardware fails
 - Software does unintended things
 - Operators make errors
 - Designs have flaws
 - Manufacturing, production & assembly can make mistakes





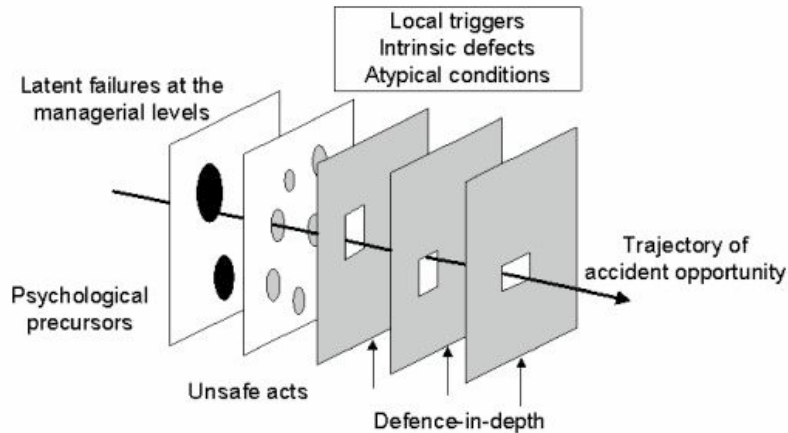
... unenviable safety record



- As of today (at least) 200 people have been killed by rocket explosions during processing, testing, launch preparations and launch. 31 fatalities have already been counted in this century. Most recent explosion at the Mojave Spaceport, CA (USA)
- In the last 10 years at least 6 launches were terminated by launch range safety officer to prevent risk for the public. Several more cases of launchers which did not make to orbit and crushed back on Earth.
- A total of 22 astronauts and cosmonauts have lost their lives since the beginning of human spaceflight. Four of which on ground during training, (one Russian, plus the Apollo 1 crew). **About 4% of those who flew to space, died.**
- The Shuttle Columbia accident in 2003 posed also a serious risk to civil aviation traffic through the huge falling debris “curtain” (in the order of 1/1000 for commercial airlines and 1/100 for general aviation)
- As of today, 10 cases of space system failures with dispersal of radioactive material
- The orbital debris population, a major threat to manned and unmanned vehicles, continues to grow such to possibly negate use of valuable space regions to future generations



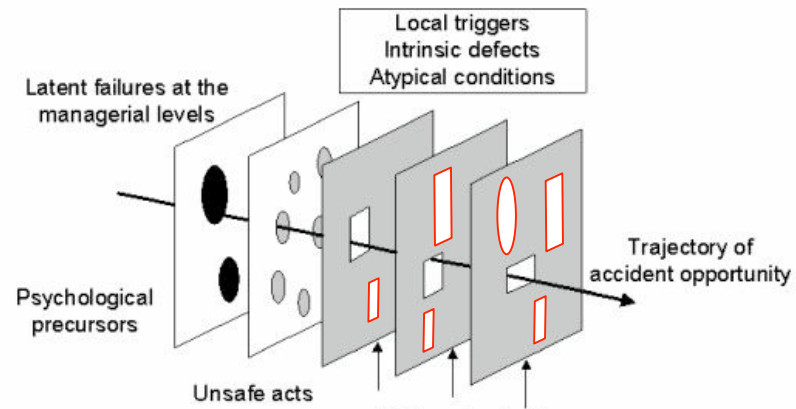
Barriers Align - Barriers Erode



From Reason, 1990

Complex, Tightly Coupled Systems are especially vulnerable – unseen / unknown failure vectors can simply route around the barriers although

Over Time changes in people, process, management, leadership, organization take place ... the holes multiply and enlarge



Degrading Barriers

.... Who/What is ISSF?

- *IAASS*
 - *International Association for Space Safety*
- *ISSF*
 - *International Space Safety Foundation*
- *ISSI*
 - *Proposed International Space Safety Institute*

**Shared Objectives of Promoting
Space Exploration / Recognizing the
Critical Need for Safety**

ISSF Goals

- *Ensure that citizens of all nations are equally protected from the risk of overflying launch vehicles and returning spacecraft*
- *Ensure that launch vehicles and spacecraft are developed, built and operated according to uniform minimum safety standards which reflect the status of knowledge and the accumulated experience*
- *Prevent the risk of collision or interference during transit in the airspace and on-orbit operations*
- *Ensure the protection of the ground, air and on-orbit environment from chemical, radioactive and debris contamination*

ISSF Programs

- Research and Publications on Safety
- International Standards Development
 - Design/Build/Test Standards
 - Operate Standards
- Academic Programs
- Training
- Conferences and Workshops

Volume 102, Number 1, January–February 1997

Journal of Research of the National Institute of Standards and Technology

**GIQLP INFORMATION NEWS
FOR PROCUREMENT CONTRACTORS**

Information on the Government & industry effort to develop a single quality management system requirement is available on the GIQLP Web. This interagency and industry effort involves major industry associations, and representatives from the Federal Acquisition Regulation Control and the American National Standards Institute. This article describes the panel's vision for quality management and a strategy to achieve this vision. ...

“Back to The Future”

- Standardization Efforts -

**From the Days of Acquisition
Reform & Re-Invention of
Government**

The aim of the cooperative effort is to establish a single quality system within a contractor's facility with demonstrated capability for meeting both government and industry customer needs; recognition and use of advanced quality concepts by government and industry in their procurement processes; and the development of uniform criteria and mechanisms within government agencies whereby audits of basic quality system requirements performed by one agency will be accepted by all others.

Those with access to the World Wide Web can find information on GIQLP through the NIST Technology Services' home page at <http://ts.nist.gov/ts/htdocs/210/216/giqlp.htm>.

Approach for Developing Safety Program Guidelines for Commercial Space Ventures

- An effective Safety Program that provides a means to anticipate and prevent failures and errors while living within the cost-constrained commercial world is required
- Engagement with Commercial Space Community
- Best Practices from international government and private space enterprises
- Lessons Learned from space system failures
- Create an assurance framework as a starting point
 - Within each cell of the framework identify assurance activities that provide the greatest risk reduction

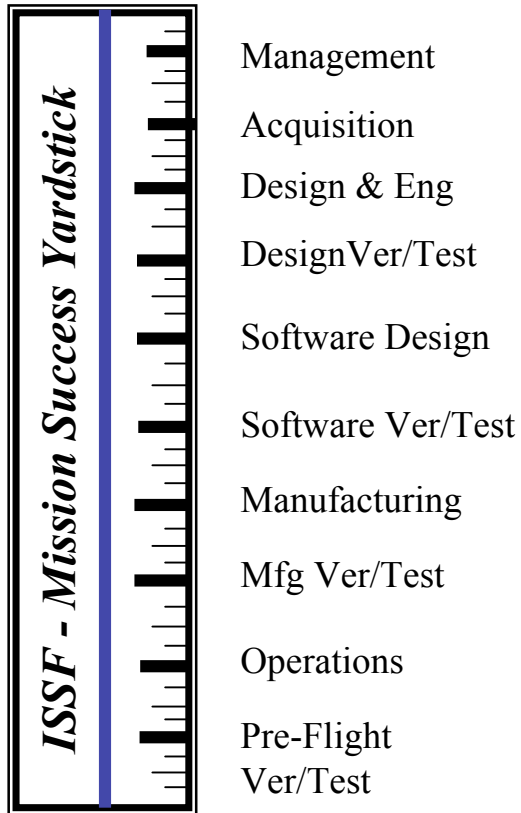
ISSF Mission Success Framework

ISSF Project Phase Elements	Formulation			Implementation				
	Pgm Mgmt	Concept Devel.	Acq.	HW Dsg	SW Dsg	Mfg	Integ. Test	Ops
Policies (Rules & Req.)	1.1	2.1	3.1	4.1	5.1	6.1	7.1	8.1
Plans	1.2	2.2	3.2	4.2	5.2	6.2	7.2	8.2
Processes	1.3	2.3	3.3	4.3	5.3	6.3		
Controls	1.4	2.4	3.4	4.4			7.4	8.4
Verification	1.5	2.5	3.5	4.5	5.5	6.5	7.5	8.5

Working Proposal

Each cell contains process options, lessons learned, & best practices

ISSF Life-Cycle, Process-based Risk-Reduction Assurance Elements



Risk Management Thinking

Conclusions

- ISSF looks forward to working with the Commercial Space Industry in developing standards that represent essential safety measures and additional best-value risk reduction options for international space ventures.
- The ISSF can be the catalyst for a new international partnership to develop standardized approaches which will enable growth of a viable commercial space industry

