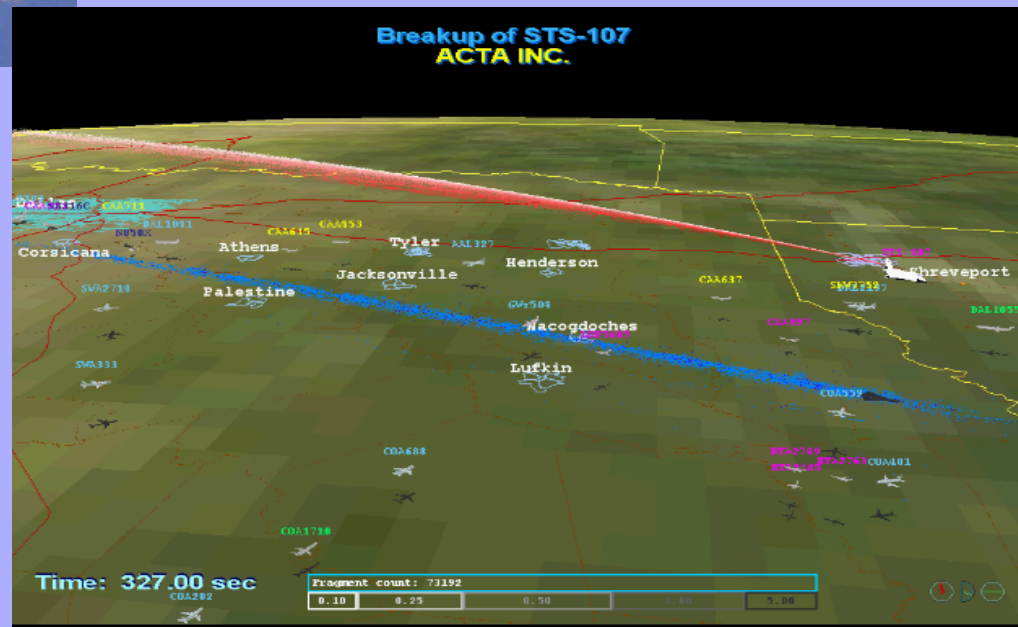


Acceptable Risks: The Public Speaks



Third International Conference

International Association for the Advancement of
Space Safety

October 2008

J. Haber & R. Lamoreaux

2007: IAASS Working Group proposed four goals for Space Safety.

The first was to:

“Ensure that citizens of all nations are equally protected from “unreasonable levels” of risk from over flight by missiles, launch vehicles and returning spacecraft”

It is understood that protection should address all hazardous mechanisms from normal flights and malfunctions.

Outline

- Have we achieved the goal already?
- What progress have we made?
- What issues must be addressed?
- Recommendations to the Space Faring Community

Outline

- **Have we achieved the goal already?**
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Checklist: Achieved the Goal?

- “Unreasonableness” is a matter of perception. Risk takers must be part of the process.
- We need to speak the “same language” when talking about risk.
 - What level (s) of injury and damage do we mean?
 - (fatality, casualties, severe injuries, minor injuries, etc.)
 - What are our measure (s) of risk?
 - (maximum individual risk, collective risk / societal risk, catastrophic risk, impacts to critical assets)
 - What threats must be addressed?
 - Planned and malfunctions
 - Inert debris, explosions, fire, toxics
- We need methods to consistently quantify risk and aggregate the risk over all launches, launch sites, and launching nations.

Outline

- Have we achieved the goal already?
- **What progress have we made?**
- What happens if we do not?
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- Recommendations to the Space Faring Community

We've made some progress! (but have a long way to go):

- As a community, space faring nations have made some progress:
 - Through the IAASS and other platforms we are
 - Sharing our methods for quantifying launch and reentry risk
 - Sharing our risk management methods
 - Sharing our standards for acceptable risk
 - In the USA, we have been developing consensus standards for risk quantification and risk acceptability among our ranges.
 - ESA and the USA have made initial steps to exploring each other's risk quantification and risk acceptability standards.
 - We have begun asking the critical questions to identify present and future issues.

RCC 321-07 Achievements

- U.S. acceptable risk guidelines for launch by launch
 - Societal risk
 - Individual risk
 - Protection of ships and aircraft
- Rationale for acceptable risk criteria
- Hazard thresholds
- Guidance for modeling launch risks from
 - Inert and explosive debris
 - Toxic exhaust and combustion products
 - Distant focusing overpressure
 - Radiation hazards

Risk Communications

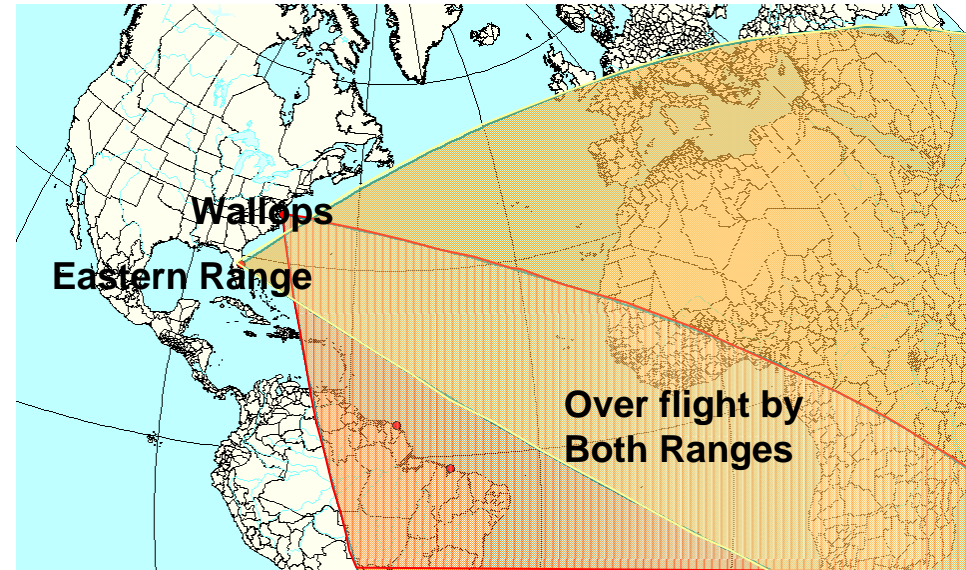
- The launch authority and his safety representatives
 - Evaluate the risk
 - Launch authority: National need -- accept above baseline risks
- Communication of acceptable levels of risk
 - General policy is public: RCC 321-07
 - Major evolution from early policy of non-disclosure of acceptable levels outside of range safety offices
- Evolving issues
 - Published acceptability levels encourage launch agencies to “push the envelope” instead of minimizing risk
 - When and what to communicate of risk analyses of particular missions

Outline

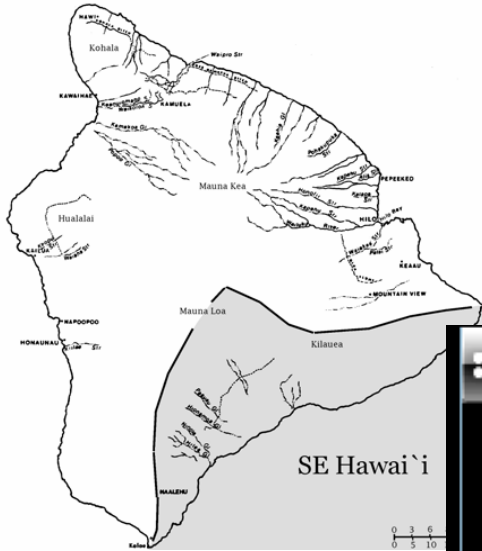
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Some challenges

- Launch acceptability is typically treated on a **per launch** basis.
- Risk acceptability is generally understood on an **annual basis**.
- Multiple launch sites from different nations can hazard the same areas.
- Risk acceptability is linked to perceived benefits and choice. Perceived benefits from different launches will vary; choices may depend on relationships between the launching nation and the over flown nation.
- How should allowable risks be allocated back to the space faring nations?
- Implementation and monitoring?
- Emergency preparedness and response



Involvement, Risk Communication, and Acceptance



Press Releases

- New Mexico Spaceport Authority officials announced a successful launch of a test flight vehicle [Read More](#)
- Doña Ana County Commissioners approved a contract setting up a spaceport tax district [Read More](#)

- In the US, failure to obtain timely involvement of the public resulted in the demise of the proposed Hawaiian Spaceport.
- Spaceport America is enthusiastically supported by its neighbors.



Wednesday, July 7, 1999 Published at 11:02 GMT 12:02 UK

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Sci/Tech

Proton worry for space station



The ISS service module is due to go up in November

The next phase of the multi-billion-dollar International Space Station (ISS) hangs on the outcome of an investigation into a Proton-K rocket failure at the Baikonur Cosmodrome.

SPECIAL REPORT

The rocket, carrying a communications satellite launch scattering debris...

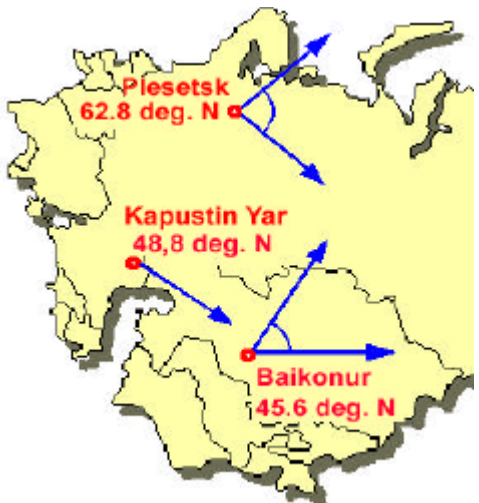
In a statement on local TV, picked up by BBC Monitoring, the Kazakh government was said to be angry with Russia because of the accident. The Khabar TV presenter said the ban on further launches would stay in place "until all issues related to the catastrophe are investigated and the material damages inflicted on Kazakhstan are established."

ISS service module

Part of the Proton launcher, weighing some 200 kilograms (440 lbs), fell into the backyard of a villager on the steppe of the northern Kazakh region of Karkaralinsk.



There were no victims, although a woman and her son were at home when the rocket part fell from the sky, the TV said.



Relations between Russia and Kazakhstan have been strained since the 1999 Proton-K rocket launch is reported to have scattered debris over the region.

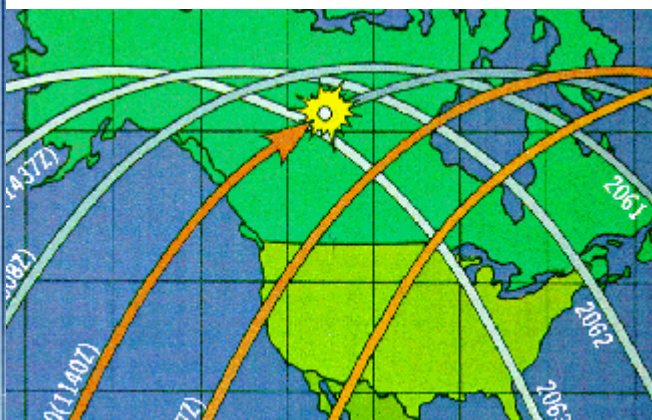


Baikonur was established during the time of the Soviet Union. Following its breakup, Russia and Kazakhstan negotiated terms for the use of the facility.

Nevertheless, the need for an on-going balance between the risk takers and the Russian space program offers challenges.

Cosmos 954

From Wikipedia, the free encyclopedia



renaissance Sa
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ive material,
kilometres (4

Re-entry

Re-entry risks are particularly challenging.

The *communications and emergency response* issues are magnified when it is an uncontrolled re-entry.

on Morning
oot and air until the spring ice
breakup in April made further searches impractical. They were ultimately able to recover 12 larger pieces of the satellite. These pieces displayed radioactivity of up to 1.1 sieverts per hour, yet they only comprised an estimated 1% of the fuel. For these recovery efforts, the Canadian Government billed the Soviet Union \$6,041,174.70 for actual expenses and additional compensation for future unpredicted expenses; the U.S.S.R. eventually paid the sum of 3 million dollars.



Emergency Management Australia Update on Re-entry of Russian Mir Space Station

03-16-2001

0

STATUS REPORT

Date Released: Friday

Source: [Emergency Ma](#)



Emergency Management Austr
Territory

MEDIA ENQUIRIES

Brian Flanagan
EMA Media Liaison
Mobile: 0409 489 344

On current indications from
Station is predicted to spa
New Zealand and Chile, at

Any variation to that date
atmospheric conditions.

Mir's current altitude is ab
2.4km per day. While this

Mir will be brought back in
reaches an altitude of 220

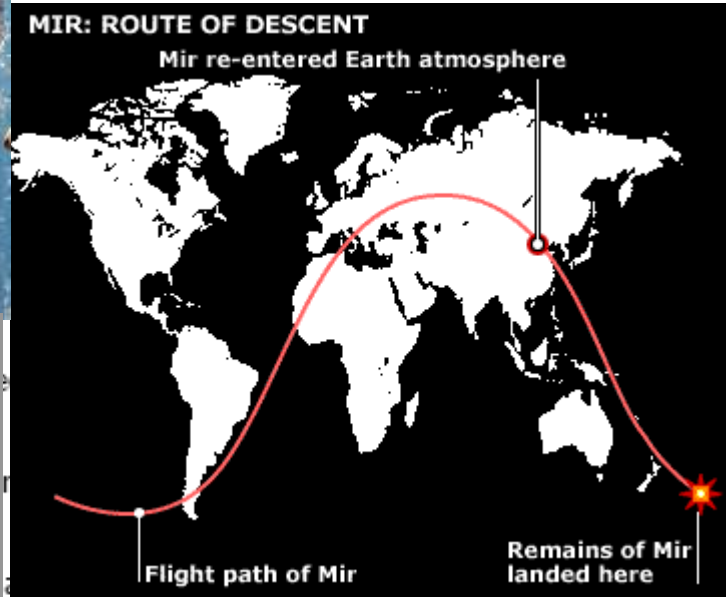
NASA and ESA are following the flight of Mir and information gathered is being passed to Russian Miss

Two officers from the Australian Embassy in Moscow will be in the Space Centre during re-entry and w
real-time information to EMA on the progress of the operation.

EMA will continue to issue updates on the re-entry process and will advise arrangements being put in
briefings around 21-22 March.

MIR Re-entry

Controlled MIR re-entry
provided an opportunity for
effective communications and
emergency and emergency
preparedness.



and to increase as Mir gets lower.

controlled braking impulses after t
completed in about six hours.



Summary of Key Issues

- *Informed Consent*
 - Common measures of risk
 - Agreement on “Baseline” Risk
 - Consistent risk assessment methods
 - Protocols for aggregating risks
 - Protocols and institutions to receive risk information to represent their constituencies

Summary of Key Issues

- *Emergency Planning, Preparation, Communication & Response*
 - Launch area international exposure
 - Who:
 - Launching nation and host nation different
 - Shipping lanes
 - Airways
 - Affected parties need
 - Information on risk characteristics
 - Notification/Acceptance by populations exposed to risk above baseline
 - Pre-planned response given a disaster
 - Notification of a disaster

Summary of Key Issues

- *Emergency Planning, Preparation, Communication & Response*
 - Down range international exposure
 - Who:
 - Land: typically, all foreign
 - Shipping lanes
 - Airways
 - Affected parties need
 - Mobile
 - » Surveillance and vector to safety
 - Land
 - » Response advise and assistance
 - Notification/Acceptance by countries exposed to risk above baseline

Future Concerns

- It is foreseeable at some time a space booster will fail late in flight. The consequences may be debris impacting on foreign soil, possible impacts to sea lanes, and possible impacts to air corridors.
- The impact of that accident on future space flight and international relationships will be affected by how well we lay the ground work to
 - Involve parties at risk in understanding and accepting the elevated risks, recognizing that there are precedents with aircraft over flight and other technologies and
 - Implement emergency response procedures to manage the consequence of the accident.

Outline

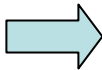
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Risk Communication

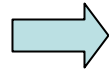
- FAA Standards
- RCC 321 Guidance
- ESA guidance?
- Other contributors?



**Risk Analysis
Standards**



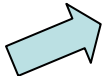
**Risk
Reporting
Protocol**



National Representative

**Informed
Consent**

**Annual
Risk
Measures**



- Treaty / protocol for acceptance
- Acknowledgement and Acceptance of Excessive risk
- Negotiating mitigation with launching states

- Pr {Casualty producing accident)
- Pr (Accident with > \$X/National asset)
- Annual Collective (Societal Risk)
- Other?

Emergency Management

