

North American landing sites discussion results

- A. Contingency landing sites in North America were originally defined by Russia for possible use should a Soyuz contingency situation occur during daily orbits 7 – 12. NASA and RSC-E technical specialists evaluated these sites and mutually agreed to updates during this TIM and the previous TIM in August 2000.

It should be noted that these sites do not satisfy all landing site requirements across their entire 3 \square dispersion area. Since this was not possible, every attempt was made to satisfy requirements across a smaller, 1 \square , dispersion area. Even so, there are areas in Arizona, Mexico and South-central Texas that are highly undesirable for ballistic entry and should be avoided if at all possible. There are no acceptable alternatives to these regions.

These sites in North America are considered to be the best available and are recommended for agency approval as shown in Figure G and Table G.

- B. Considerable crew risk mitigation and general populous risk mitigation are only possible during a controlled Soyuz descent.

The following qualitative capabilities are afforded by a controlled reentry as opposed to a ballistic reentry.

A decrease in dispersion of landing points to a circle with a radius of 30 km. which leads to:

- decrease in the area of possible landing sites 20-25 times
- decrease in probability of landing into populated areas 100 times
- exclusion of Mexico as a landing site
- selecting only 2 landing sites in Canada and exclusion of landing sites where assistance would be impaired

All these factors considerably reduce the risk to the crew, general populous and possible property damage caused by the landing. The conditions for landing and rescue also improve.

- Reentry acceleration loads affecting the crew decrease 2 times.
- Risk to the general populace caused by vehicle elements that didn't burn out during reentry also decreases substantially.
- The probability of most hazardous landing into the ocean decreases.

- C. Proposed materials on organization of controlled descent have been reviewed:

1. Technical reference on possibilities for a controlled descent in the event of Soyuz emergency deorbit and landing in backup zones.
2. Reference ballistic materials on organizing the landing of Soyuz vehicles in North America as per the ISS program.

The sides came to the following conclusions:

- The updated control system of Soyuz TMA descent module reentry provides for a descent module landing to a predetermined landing site (assuming 30 km. radius dispersion)
- The existing Soyuz TMA movement control system (MCS) doesn't allow to perform a contingency landing during any cycle without crew participation (An automated landing of a descent module is possible in the USA only one time per day.)
- Because of stress associated with emergency deorbiting it is necessary to eliminate crew participation. To perform a fully automated controlled entry on any cycle it is necessary to modify MCS (to replace on-board computer in avionics compartment of the vehicle).