



**National
Transportation
Safety Board**

Hazard Analysis and Waivers

System Safety
presentation



Hazard Analysis Requirements

- Section 437.55 requires experimental permit applicant to identify hazards, including those resulting from human and software errors
- Assess risk of hazards
- Identify elimination or mitigation strategies as appropriate
- Validate and verify mitigations

Hazard Analysis Guidance

- FAA Advisory Circular 437.55-1 provides an approach to perform hazard analysis
- Analysis must address human errors including
 - Decision errors
 - Skill-based errors

SpaceShipTwo Hazard Analysis

- Uncommanded feather operation
- Catastrophic hazard during boost phase
- Included assumptions that flight crew
 - Would be properly trained in simulator
 - Would follow established procedures

SpaceShipTwo Hazard Analysis

- Feather system design determined to be adequate
- No mitigations considered to prevent early feather unlocking

Issuance of Waivers

- May 2013 – FAA granted SS2 experimental permit renewal
- FAA determined SS2 hazard analysis did not meet requirements for human and software errors
- July 2013 – FAA issued waiver from requirements
- Scaled did not request waiver

Waiver Mitigations

- Extracted from Scaled's experimental permit application
- Not verified or validated
- Inspectors unfamiliar with waiver details
- Provisions needed to ensure implementation of waiver mitigations



National Transportation Safety Board