

NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

March 09, 2015

Attachment 5 – Section 7.3 Additional Information about Hazards

SYSTEM SAFETY

DCA15MA019



The FAA has asked for additional detail about the qualitative mitigations for the hazards discussed in Section 7.2 submitted previously. This document enhances that document and extends material in the Application for an Experimental Permit.

1 Background

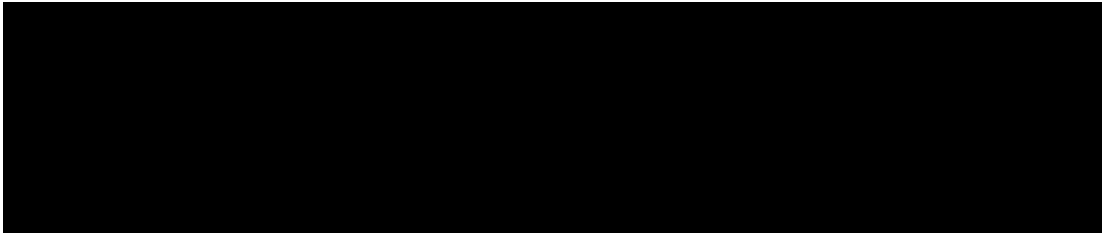
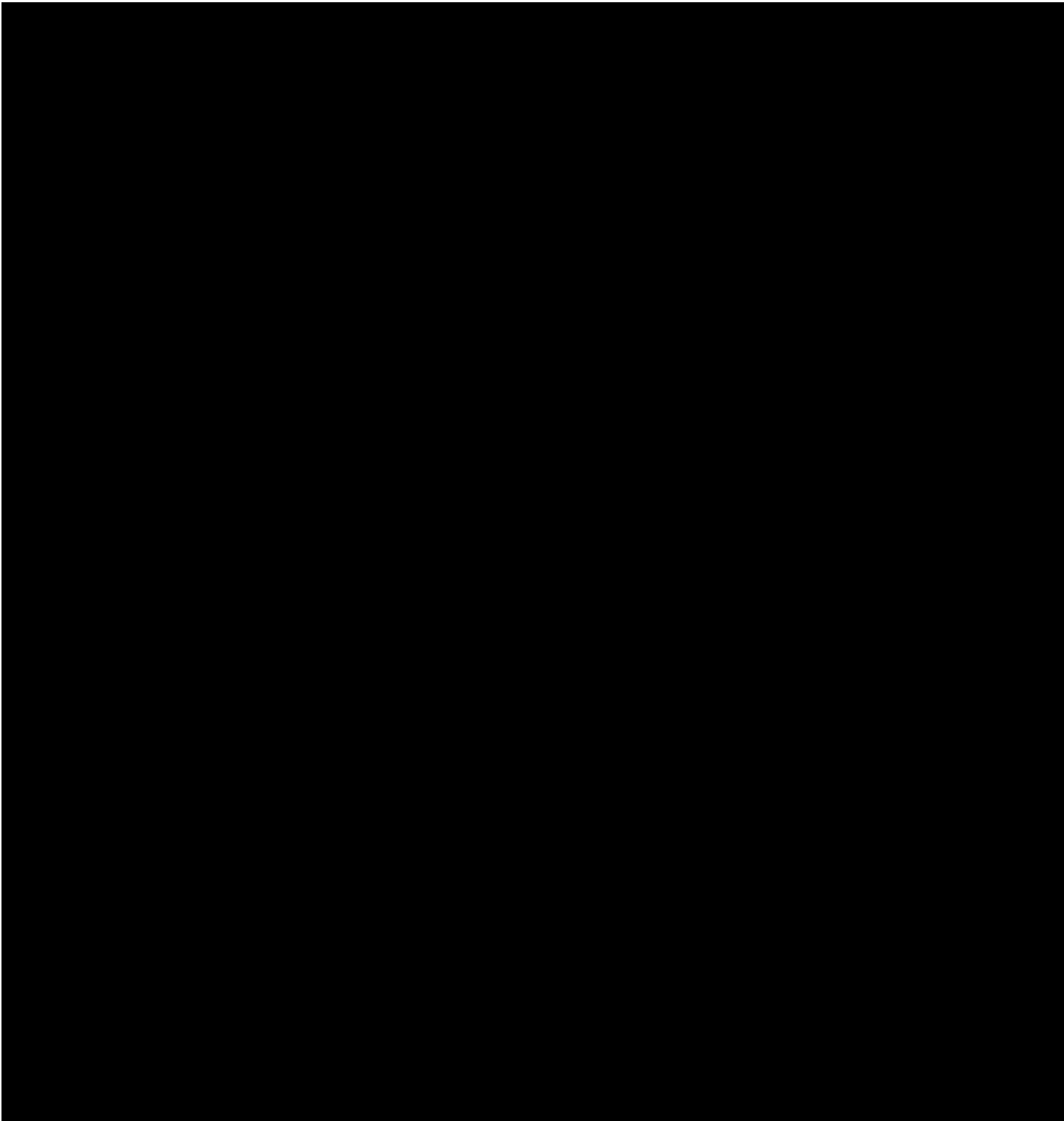
In 7.2 we provided a table showing the set of hazards from our FHA/FTA that do not meet our requirements (which are equivalent to the FAA requirements) for hazards categorized as “hazardous” or “catastrophic”. In 7.2 we described additional mitigations for these hazards related to public safety which **qualitatively reduce the probability of these hazards (affecting public safety or property) to the “extremely remote” level**. This document describes the hazards and mitigations in more detail.

As a reminder, all probabilities in the hazard analysis are normalized to 1 hour of flight time. Hazards with a key period smaller than one hour have a smaller probability of occurring during that key period.

In many cases the separation from SS2 to uninvolved people or property is mitigation. Each hazard which uses “separation” as a mitigation depends on keeping SS2 away from the uninvolved public or property and thus reducing the probability of injury or damage to them. There are several kinds of separation including the following. The kind of separation being used as mitigation will be specified in each hazard.

- During the boost phase, envelope expansion, or other items covered by 14 CFR 437.59(a), the IIP is required to be in unpopulated or sparsely populated areas. In this Application to Modify an Experimental permit (and answers to question) we describe how Scaled achieves this requirement. By keeping the IIP in sparsely or unpopulated areas we reduce the probability of harming the uninvolved public or property substantially. We call this “Key Flight Safety Event Separation”.
- During the hazardous parts of takeoffs or landings SS2 is mostly in the runway or airport environment of a towered airport with Class D airspace. Normal air-traffic segregation and ground segregation keeps the uninvolved public away from SS2 during these operations and reduces the probability of harming the uninvolved public substantially. We call this “Class D Separation”.

Please refer to the fault trees for details on each hazard failure condition.





4 SS2 Hazard 13.01 – Feather fails to operate

Hazard: The feather doesn't operate during a launch and the aircraft does not safely reenter.
Probability = 1.06E-4.

Key period for this hazard: from boost through reentry. The hazard is only critical after about 20 seconds of boost.

Qualitative mitigations:

- **Exposure:** the total exposure of this hazard of about 6 minutes (boost thru reentry) makes the probability of this hazard during the key period about 1.06E-5.
- **Test:** the feather locks are tested before SS2 is released and are actuated early in the boost. If the locks don't actuate the boost is aborted and the feather isn't required for a safe landing.
- **Test:** the feather mechanism is tested during preflight.
- **Separation:** during boost and reentry the aircraft is separated from the uninvolved public by Key Flight Safety Event Separation as described above.

The results of these mitigations make the probability of this hazard affecting public safety or property "extremely remote".

