



**National
Transportation
Safety Board**

Human Factors and Organizational Issues

Human Performance
presentation



PF04 Flight Crew Performance

- Checklists and brief completed before release
- Copilot made 0.8 Mach callout
- At 0.82 Mach, copilot stated “unlocking” and then moved feather lock handle to unlocked position
- Both pilots stated “pitch up”

PF04 Flight Crew Procedures

PILOT

Action: Vehicle control
Verbal command: "Fire"

Action:
Trim stabilizer

WK2 release

0.8 Mach

Transonic bobble

1.4 Mach

COPLOT

Action:
Ignite rocket motor

Verbal call:
"0.8 Mach"

Verbal call:
"Stabs (degrees)"

Action:
Unlock feather

PF04 Flight Crew Training

- SS2 simulator
 - Normal and non-normal procedures
 - Full mission rehearsals
- WhiteKnightTwo aircraft
 - Simulated glide through touchdown
- Extra EA-300L aerobatic airplane
 - G tolerance training
 - Upset recovery training

PF04 Flight Crew Preparations

- PF04 flight readiness reviews
- Town hall meeting
- No issues related to pilot procedures for feather system

Stressors Contributing to Copilot's Error

- Memorization of tasks
 - Flight test data card not referenced
- Time pressure
 - Complete tasks within 26 seconds
 - Abort at 1.8 Mach if feather not unlocked
- Operational environment
 - No recent experience with SS2 vibration and loads

Lack of Consideration for Human Error

- System not designed with safeguards to prevent unlocking feather
- Manuals/procedures did not have warning about unlocking feather early
- Simulator training did not fully replicate operational environment
- Hazard analysis did not consider pilot-induced hazards

FAA/AST Preapplication Consultation

- Scaled first met with AST in March 2010
- SS2 designed and manufactured before preapplication consultation
- System safety analysis in progress

FAA/AST Experimental Permit Evaluation

- January 2012 – Scaled submitted application
- Review within 120 days
- One point of contact between AST and Scaled
- AST staff questions filtered by AST management
- Pressure to approve applications
- May 2012 – SS2 initial permit approved

FAA/AST Safety Inspections

- Safety inspection plans completed before each launch
- Inspectors assigned to launch activity and not operator



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