NSFCam Explosion

What Happened and Lessons Learned

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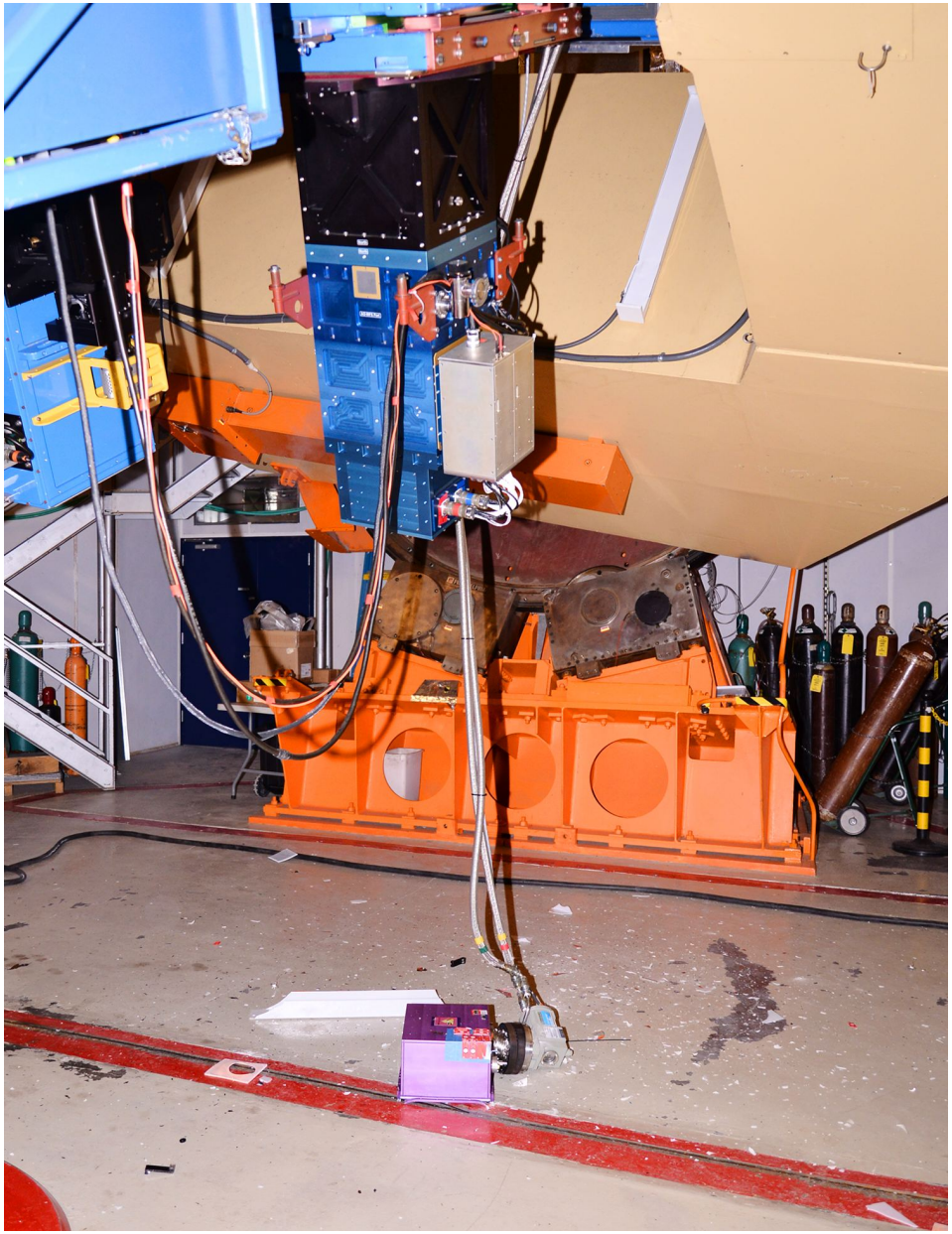
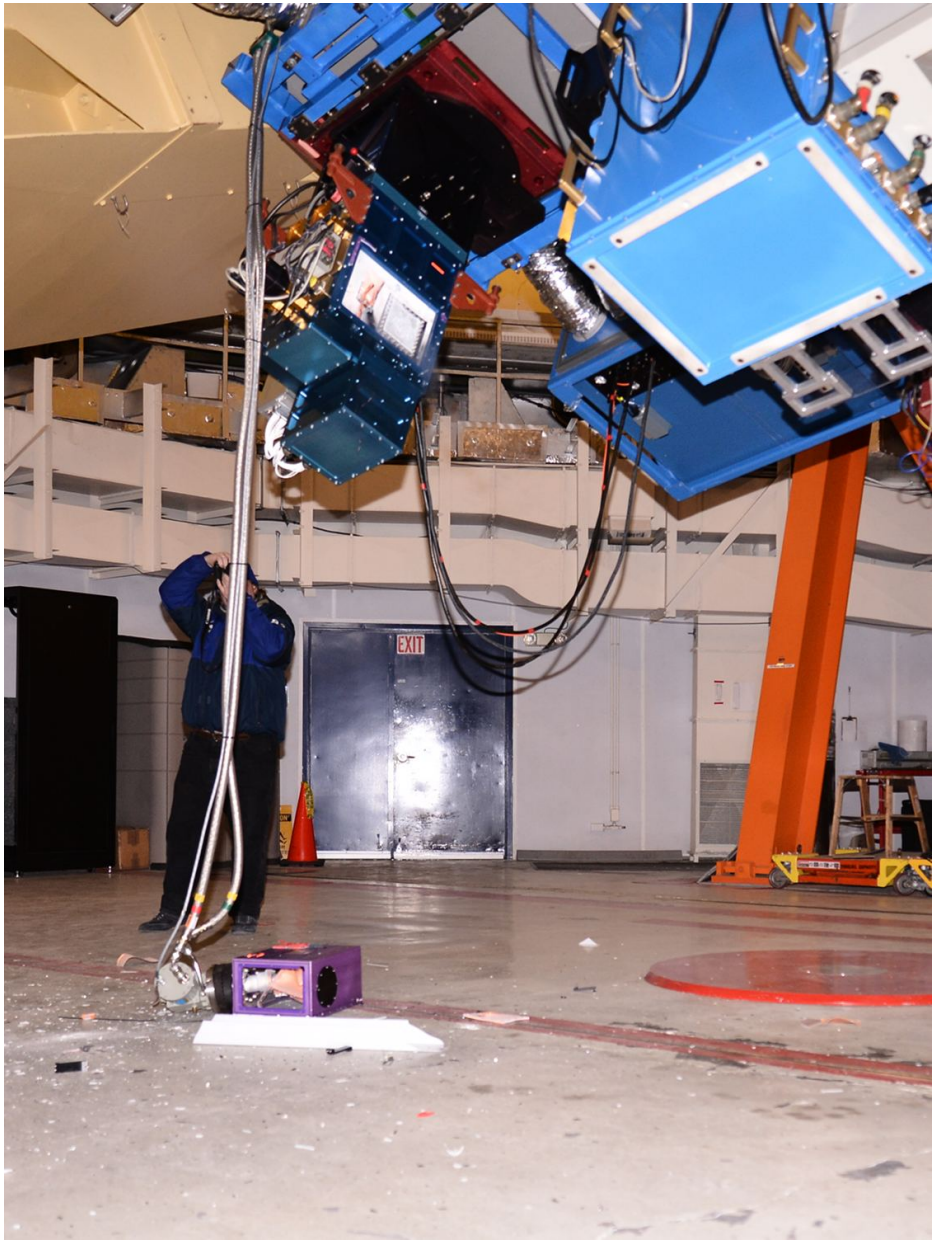
Dec 8, 2016



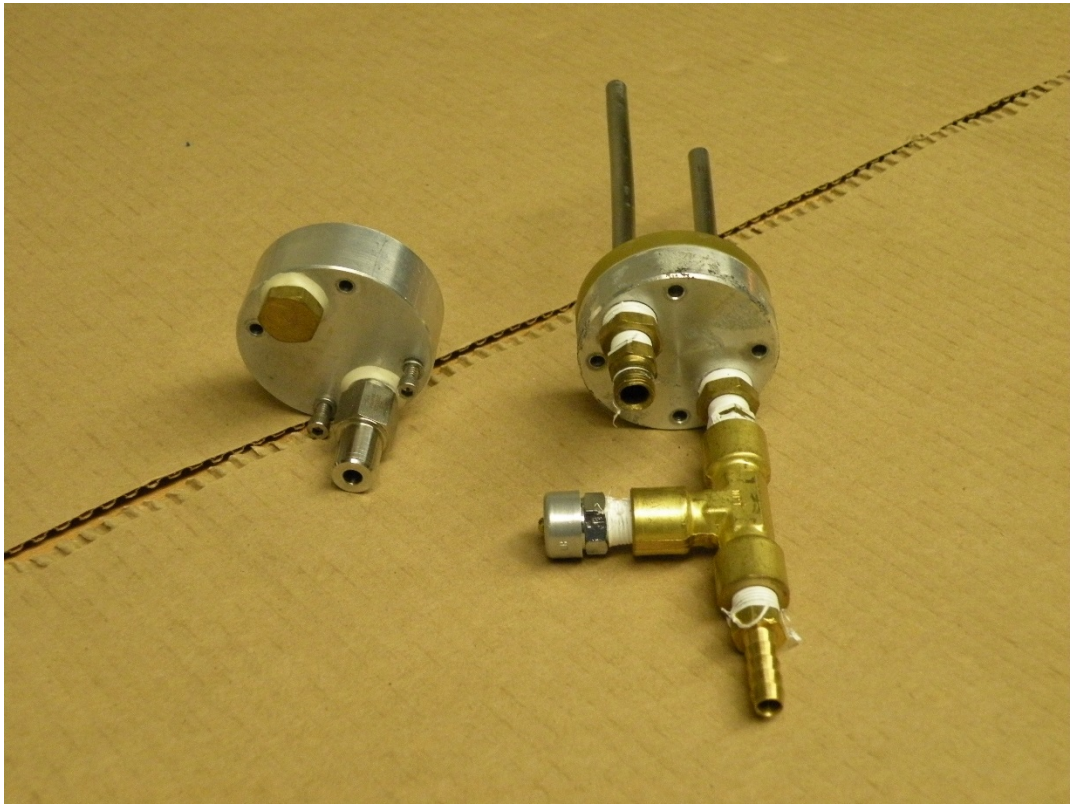

EXIT

Chain of Events

- Facility work used extra power, reducing effectiveness of water chillers.
- Not enough cooling capacity to keep 3 instruments cold. Decided to warm NSFCam at 1 pm (not scheduled for a while).
- Exploded at 9 pm.

Why Did NSFCam Explode

- Pre-charge can normally empty, used to cool NSFCam from ambient only.
- Cap used to keep air from cryopumping into can. O-ring seals with pressure release valve.
- Poor design allowed cap to be installed incorrectly.
- Design change to cap deleted tubes, which would have prevented incorrect install



A few good things

- No one hurt
- Detector survived
- All filters survived
- Retired pre-charge can design
- We can warn others

Lesson's Learned

1) Murphy's Law. Safety critical parts must be designed so they cannot be incorrectly assembled.
2) Complex chain of events. Design of safety harware needs to be able to handle unforseen events.
3) Design changes must be carefully reviewed, especially for safety critical hardware.

Actions Taken

- External investigation and report
- Removed pre-cool box from CSHELL. Won't use this design again.
- Burst disk added to iSHELL design
- Other near-misses have lead to changes:
  - Different electrical connector sizes (color coding is NOT enough)
  - Instrument rotation stops