BALBOA Structural Analysis

Spring Ft. Sumner, 2021

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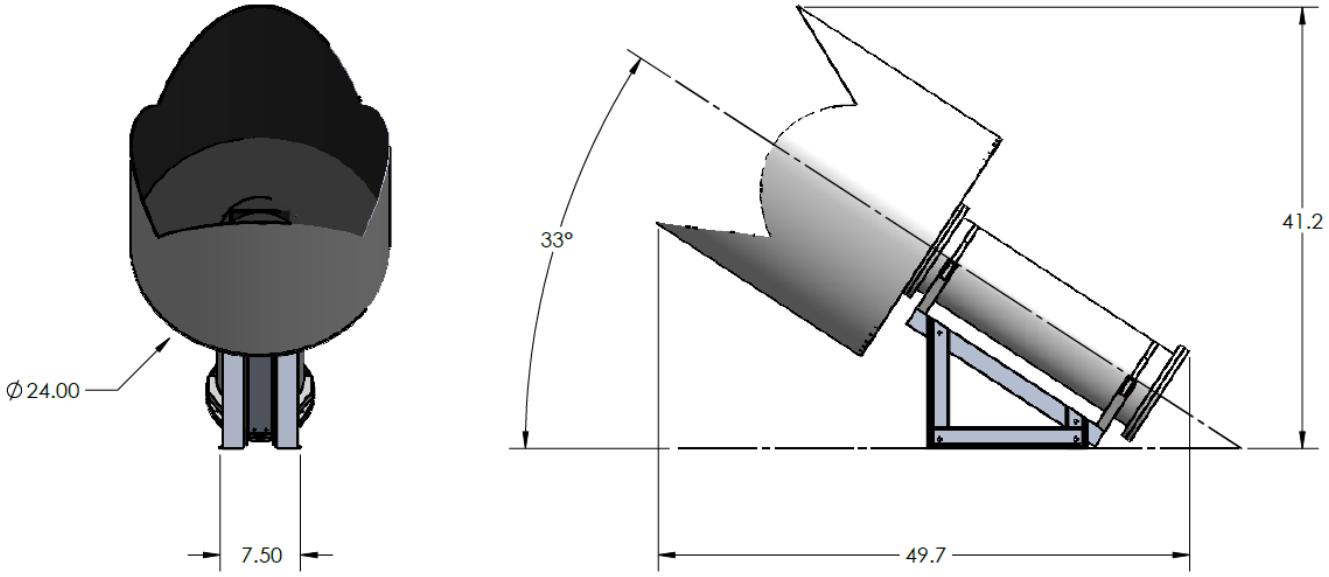
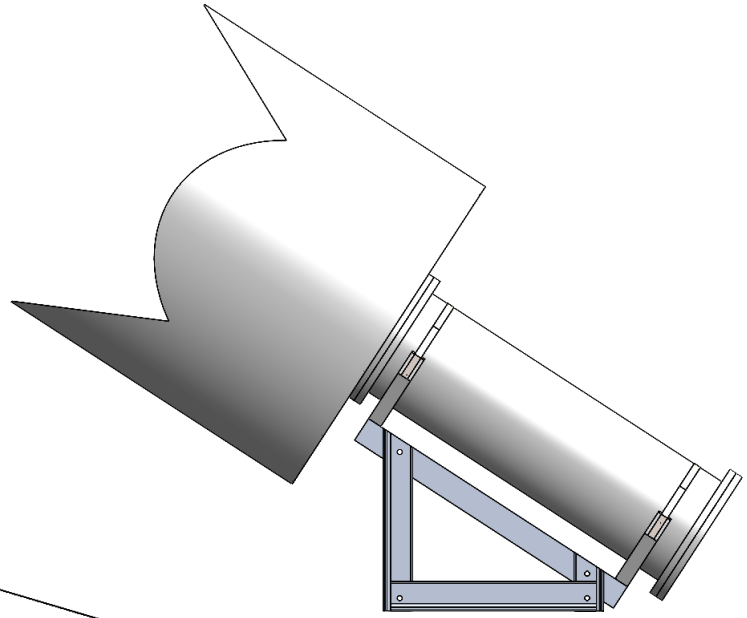
Introduction

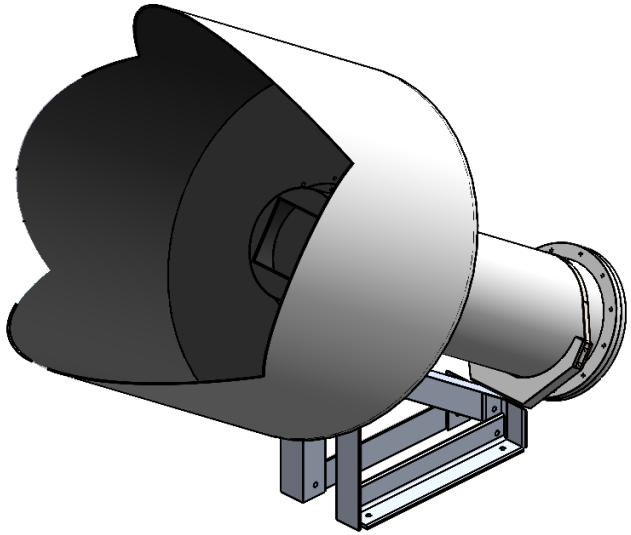
- **Description**
  - Cylindrical sealed container containing detector (camera), with baffle and sun-shade
- **Previous Flight History**
  - Instrument utilizes same container from PMC-Turbo (Sweden) mission with new baffle and sun-shade
- **Overview/Dimensions**
  - Cylindrical camera housing & baffle, attached to CSBF mount at viewing angle ~33° above horizon



Materials & Critical Hardware

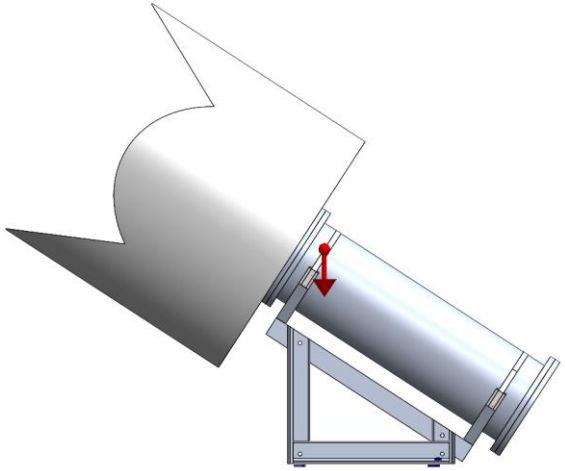
- **Critical Structural Members**
  - None defined as “critical”
- **Structural Materials**
  - BALBOA & CSBF provided mount primary structure is 6061-T6 aluminum extrusion/plate
    - Fty = 35 ksi
    - Ftu = 38 ksi
  - Mount Fasteners
    - 5/16-24 Hex Bolts, Grade 8
  - BALBOA to Mount Interface
    - ¼-28 SHCS, 180 ksi
    - Hose Clamp, SS (as flown previously for PMC Turbo)
      - Recommend supplementing with CSBF webbing tie down straps
- **Mass Estimate**
  - BALBOA: ~50 lbs
  - Mount: ~10 lbs
  - TOTAL: ~60 lbs

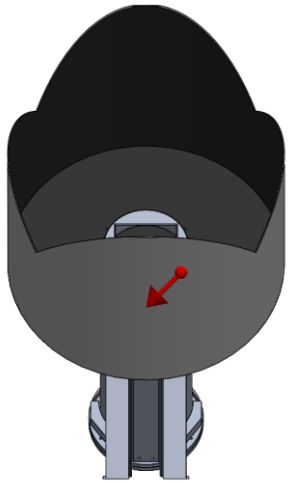


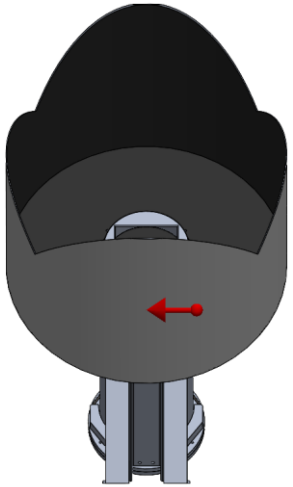


Stress Report

- **Load Cases**
  - 8G Vertical
  - 4G @ 45°
  - 4G Lateral
- **Boundary Conditions & Assumptions**
  - Mount members analyzed as bonded
  - BALBOA components analyzed as bonded
  - Virtual wall with foundation bolts constrain base of mount
  - Mass included in model, therefore inertia loads are only external force

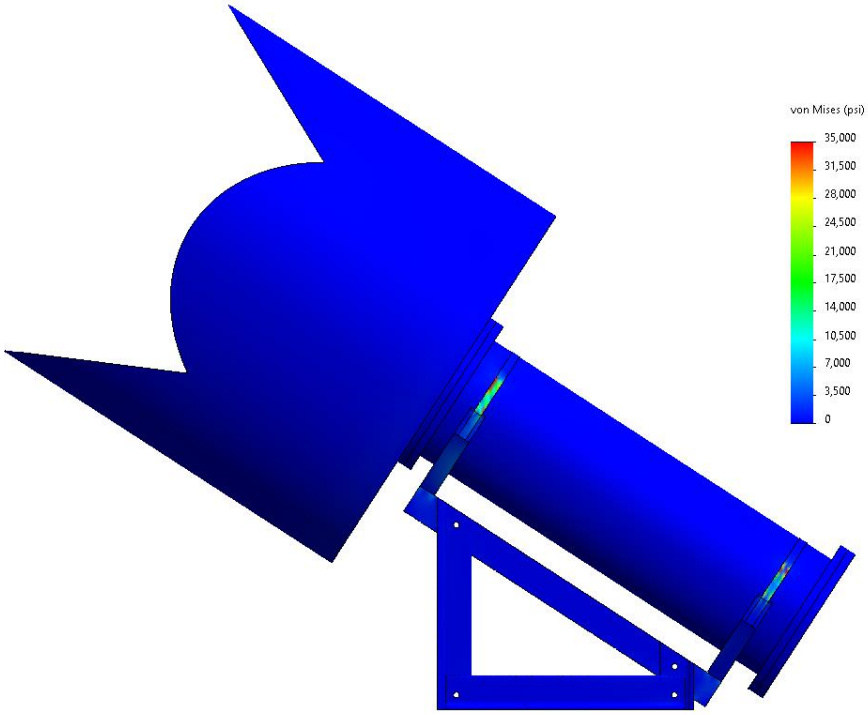


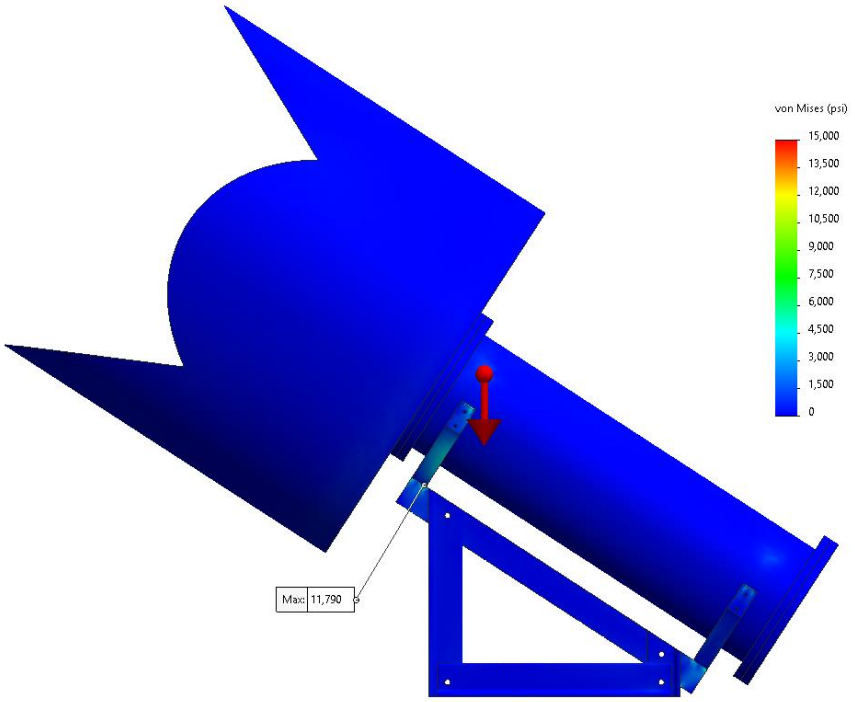




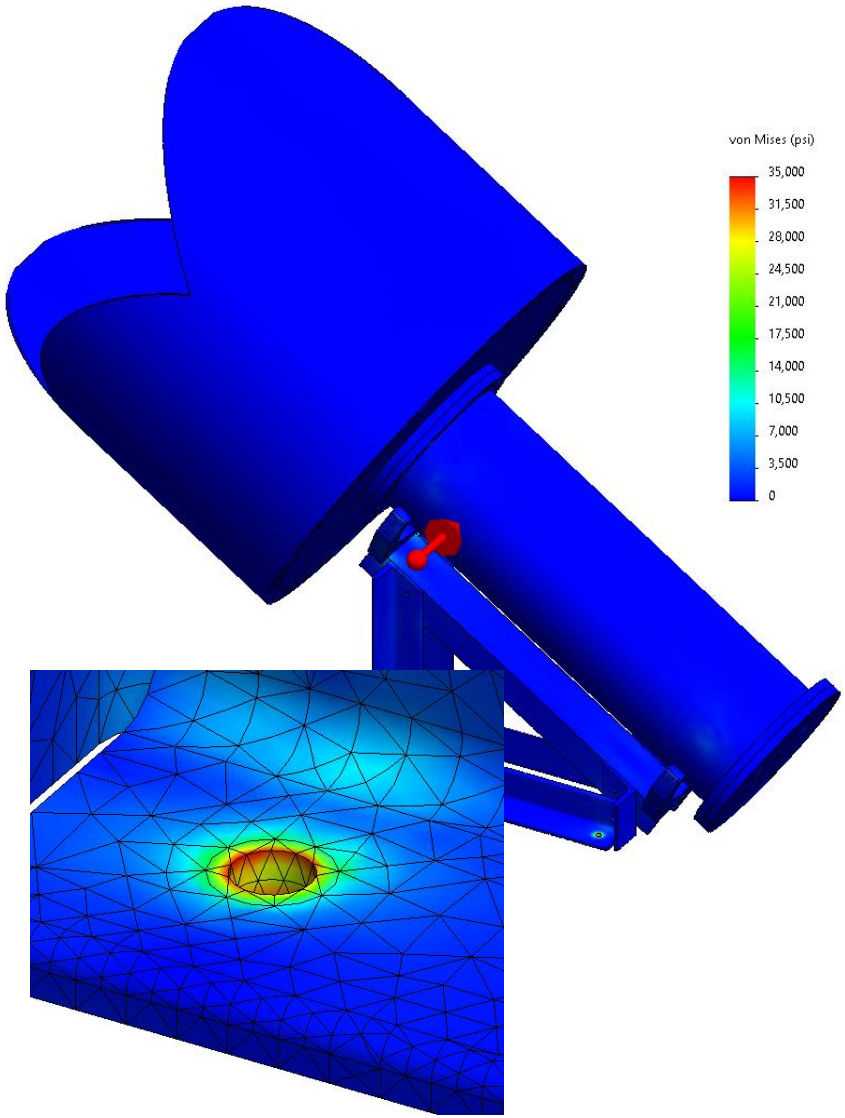
Stress Report

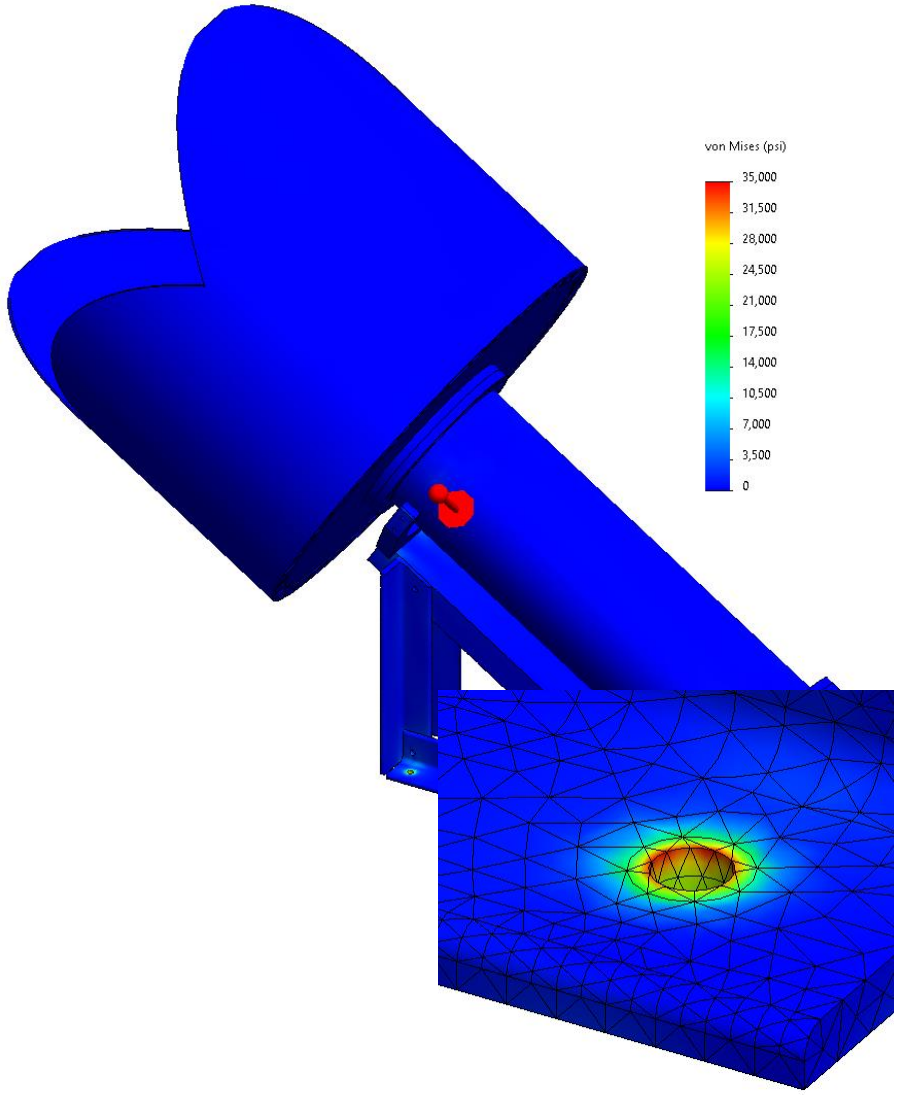
- **Summary**
  - Each load case suggests high stress on hose clamp attachment
    - Successfully flown in past
    - Suggest supplementing with webbing straps (x2) around cylinder & frame
  - Remaining structure has generally low stress and high margin
  - Highest stress generally seen at floor interface for off-axis load cases





Stress Report





Margins

Fty	35000 psi
Ftu	38000 psi
Yield Allowable	28000 psi
Ultimate Allowable	27143 psi

Load Case	Max vM Stress [psi]	MOS_yield	MOS_ult
8G Vertical	11790	1.4	1.3
4G @ 45°	13811	1.0	1.0
4G Lateral	16139	0.7	0.7

- **BALBOA & Mount show positive margin for load cases analyzed**