

# **Photo History of the Simplesat Experiment**

Dave Skillman, P.I.

# Initial GPS tests atop Bldg 6

- demonstrated 1 degree accuracy
- typical rate noise 200 arcsec/sec



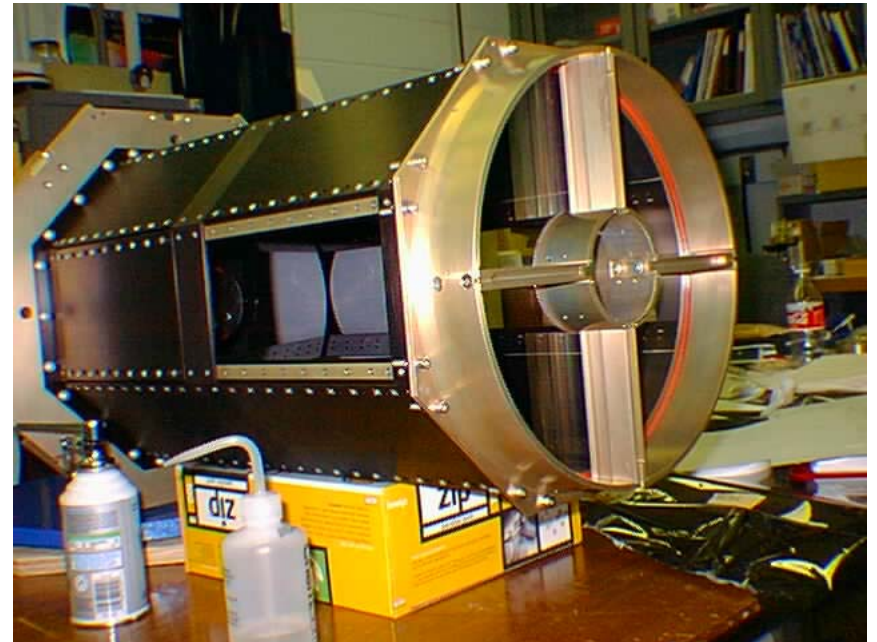
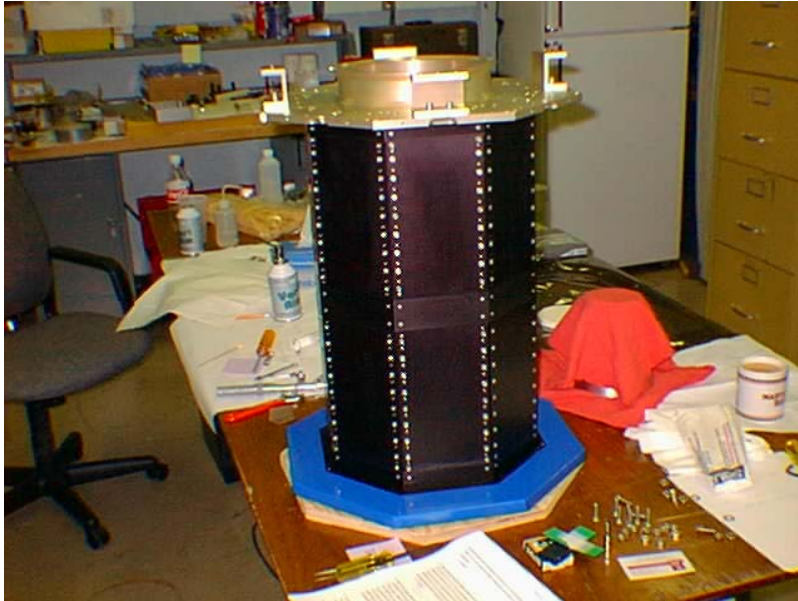
# Initial construction of telescope tube

- vertical rails framed by octagonal rings

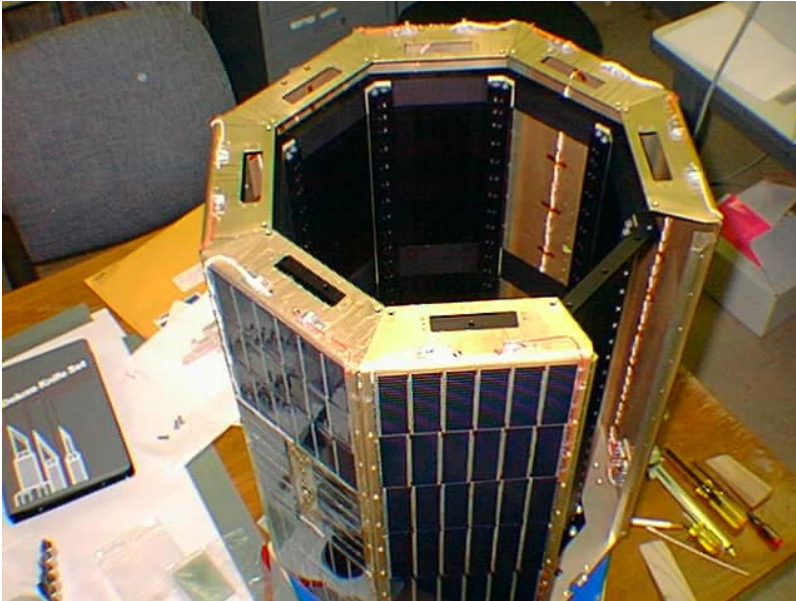


# Inner frame panels attached

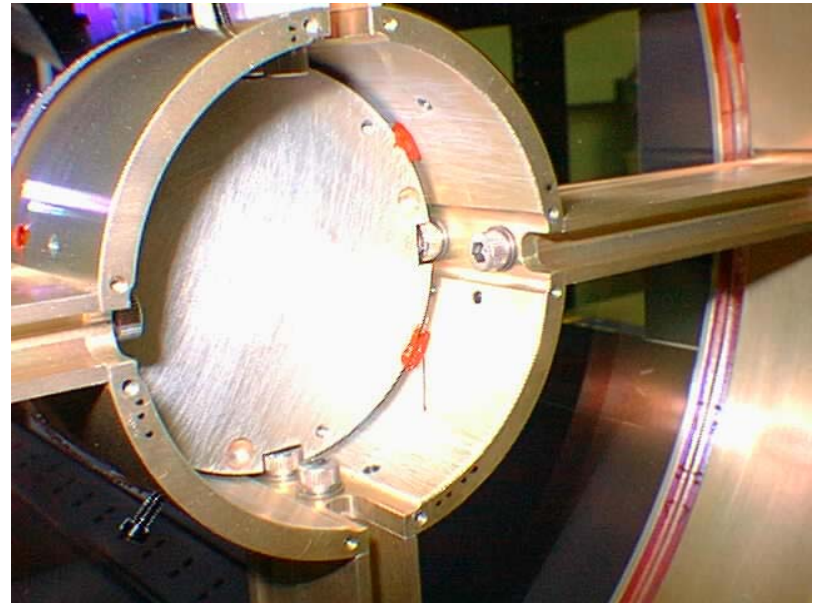
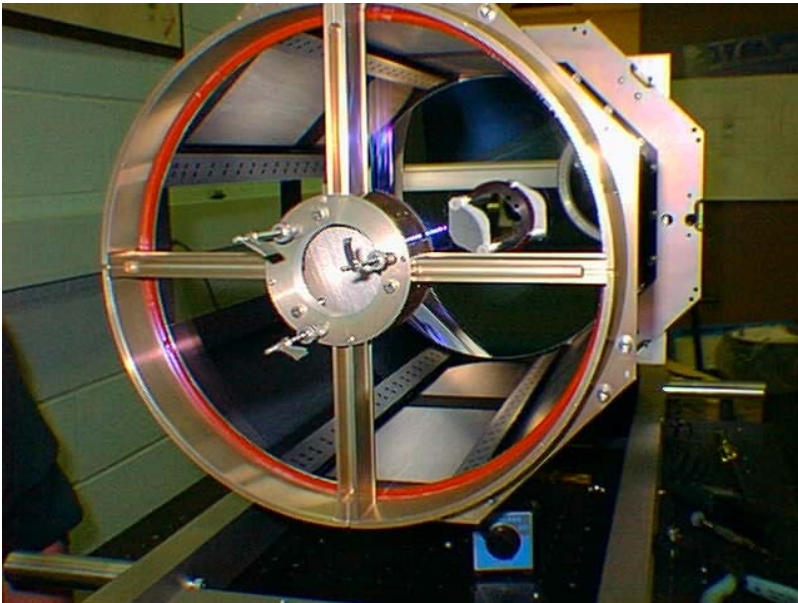
- baseplate/marmon (left)
- secondary mirror support (right)



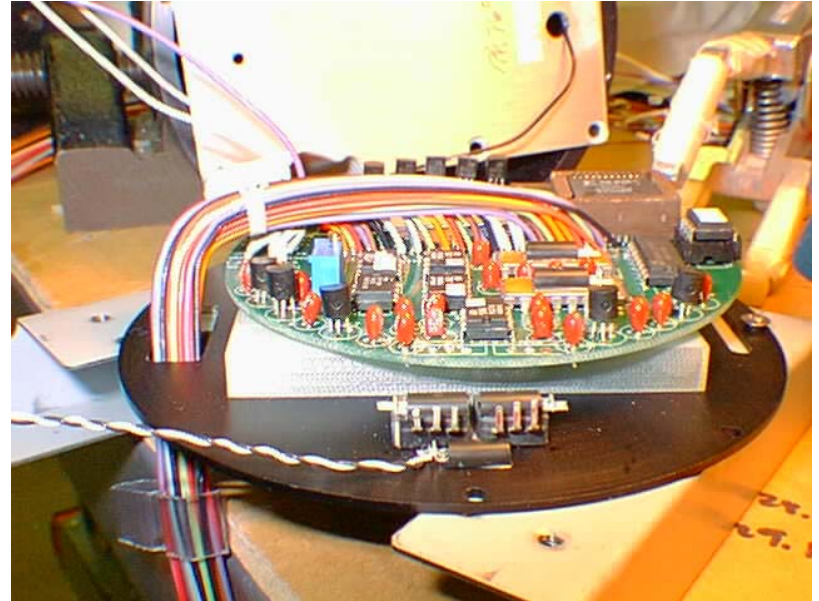
# Fit check of solar array panels, primary mirror preps



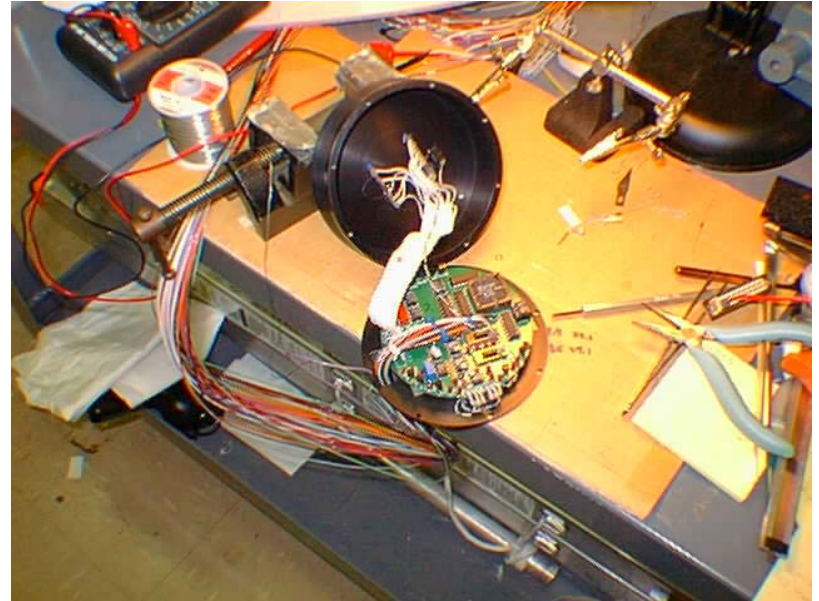
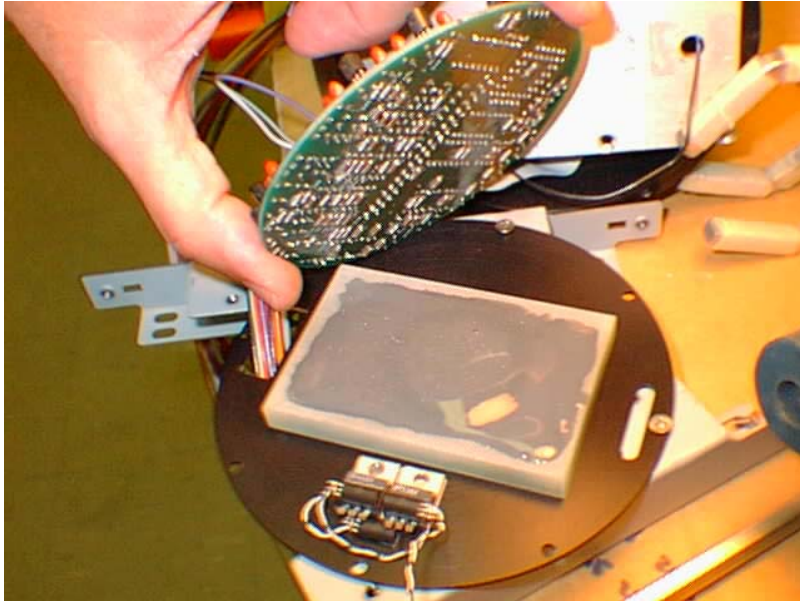
Align secondary mirror and tack into place  
- corrector plate held by RTV on outer edge



## Camera ruggedize by remounting circuit board

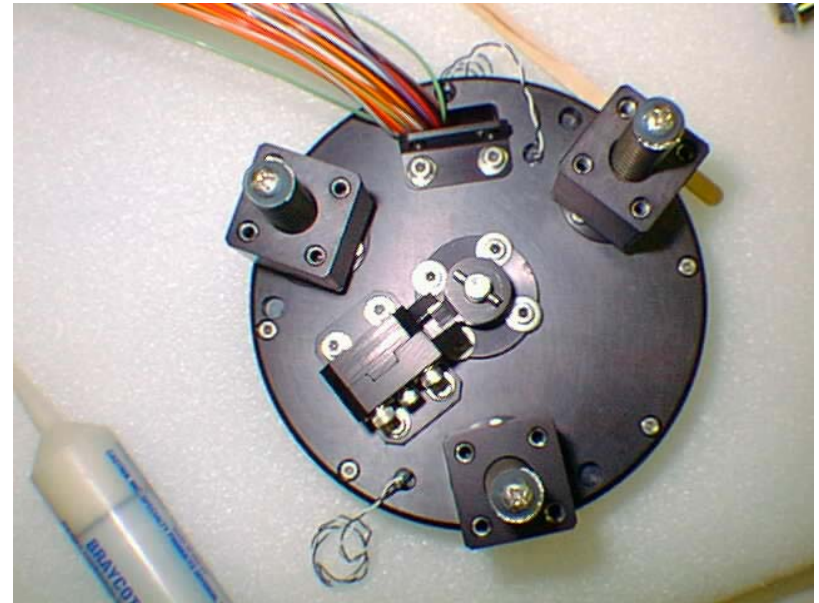


Circuit board epoxied to G-10 block (mechanical/thermal)

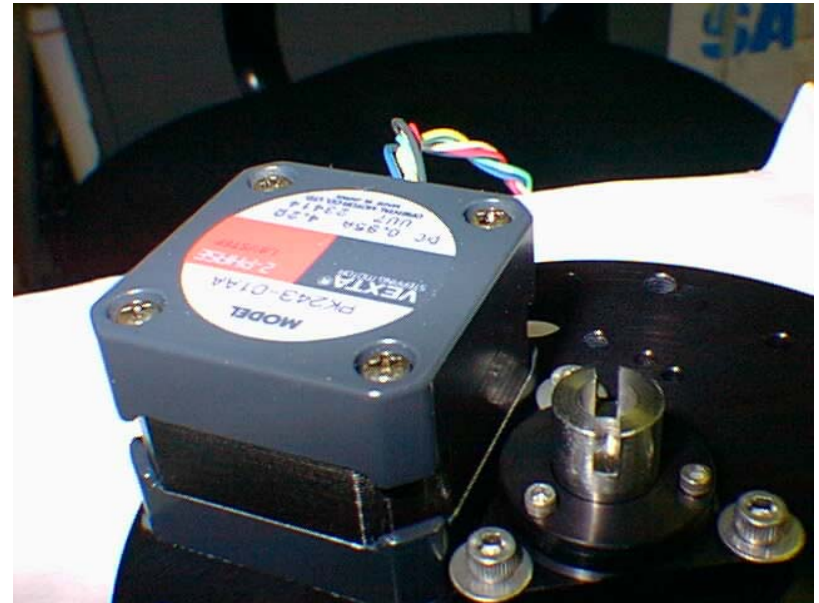




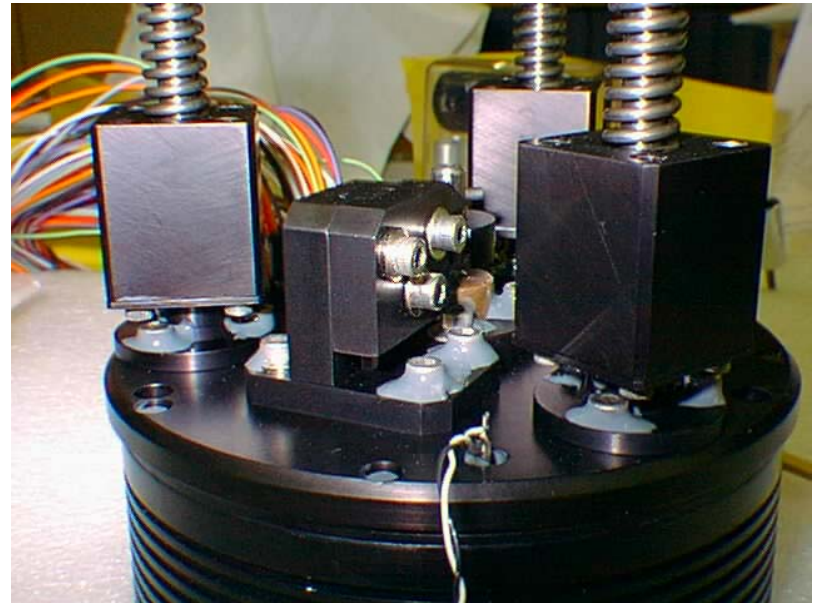
Reworked camera is mounted to focus table



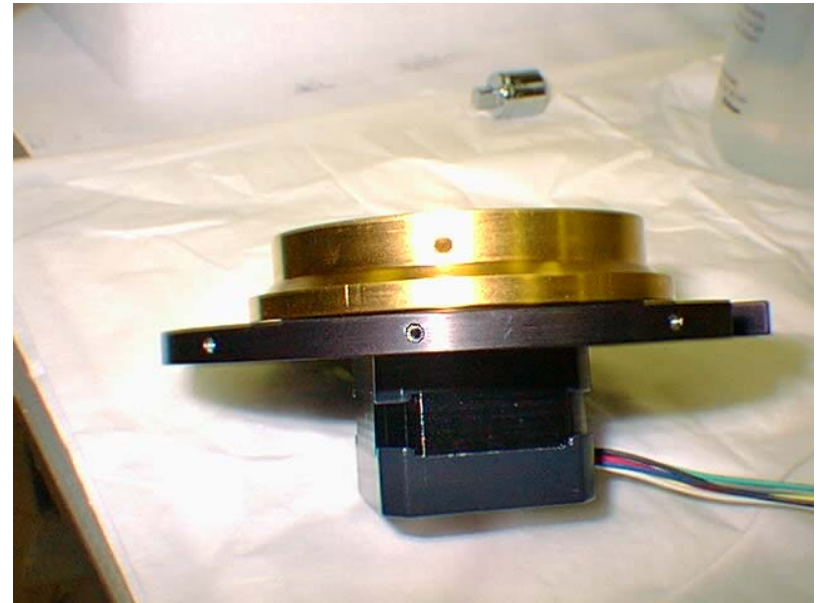
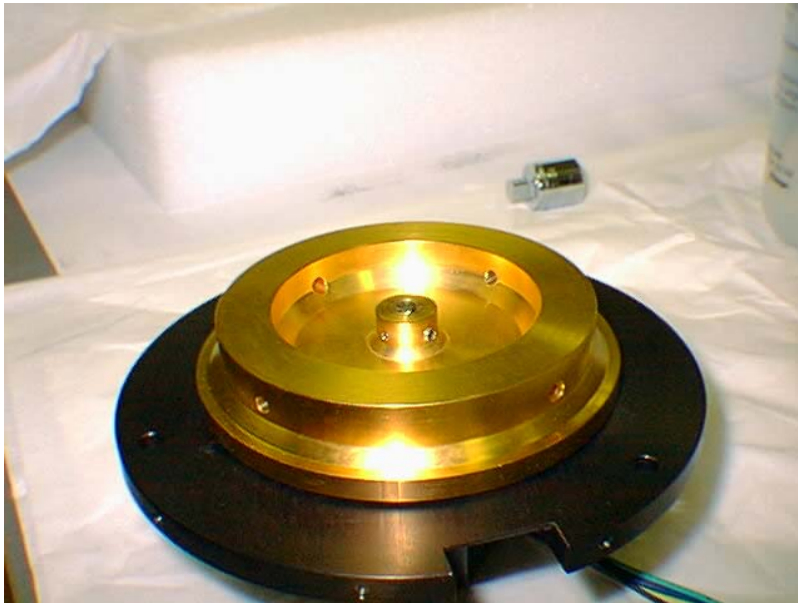
# Focus table lifting thread, limit block, preload springs and motor



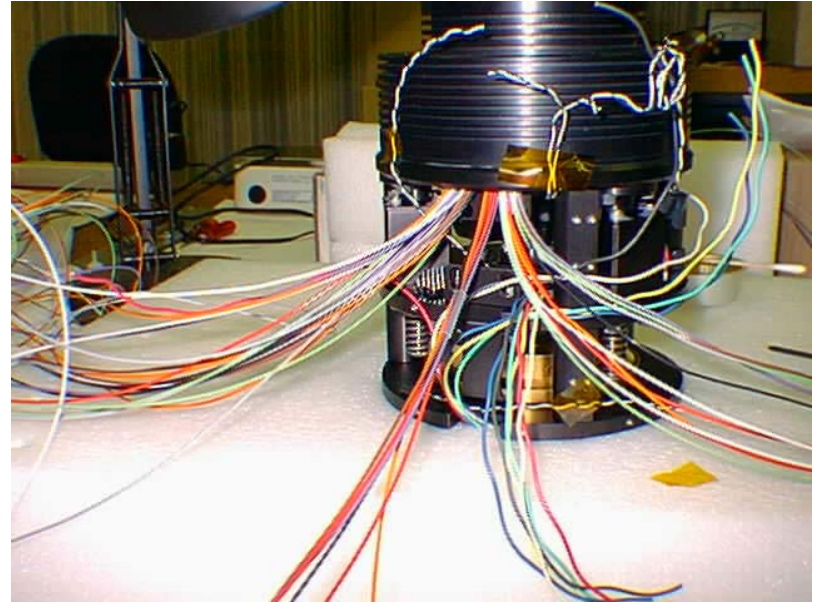
## Focus mechanism staking with flexible epoxy



# Optical (X) axis reaction wheel with stepper drive

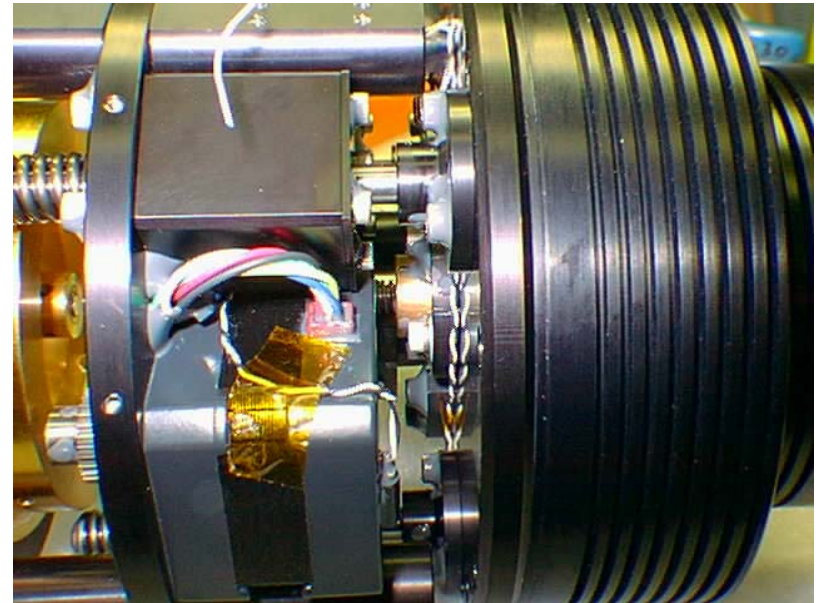
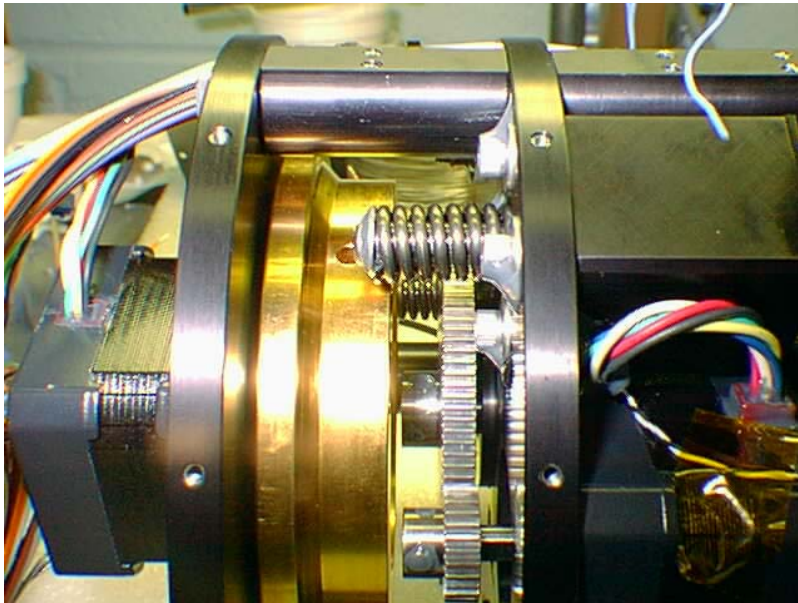


## Focus mechanism assembly

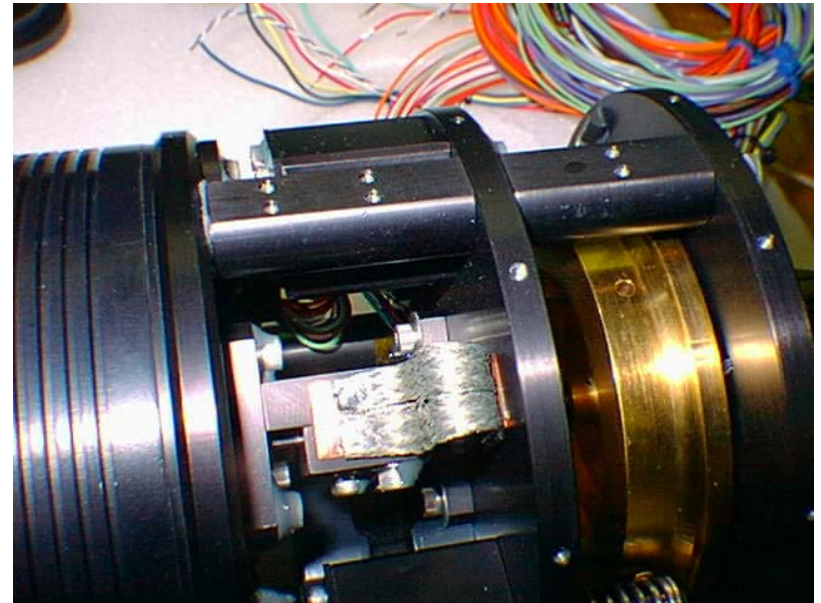
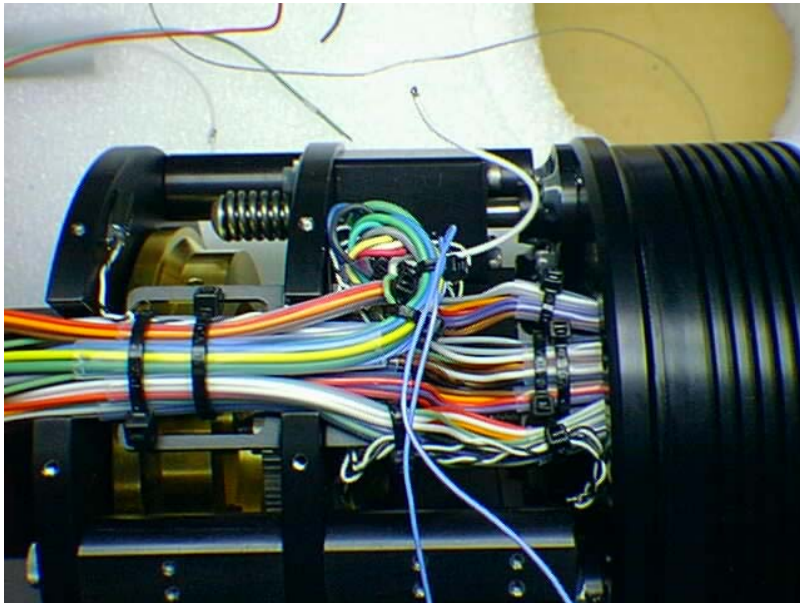


# Focus mechanism details

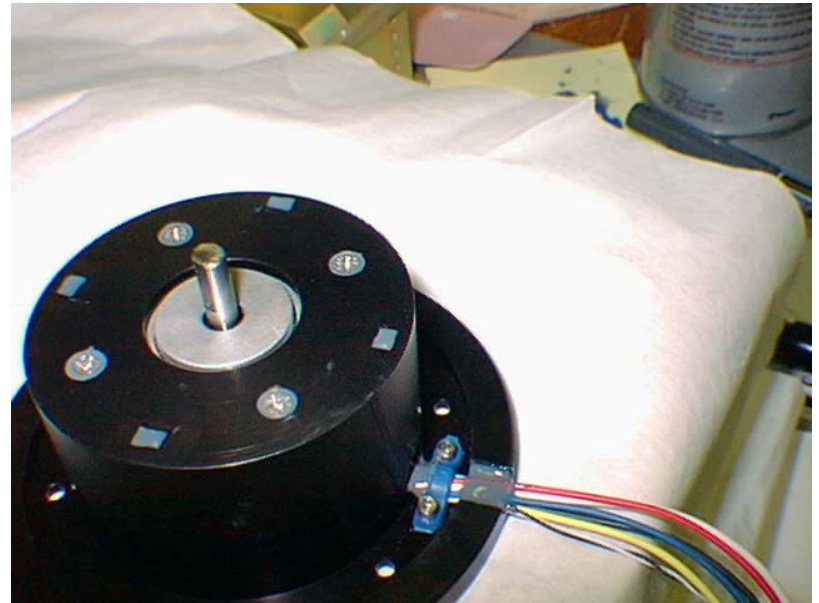
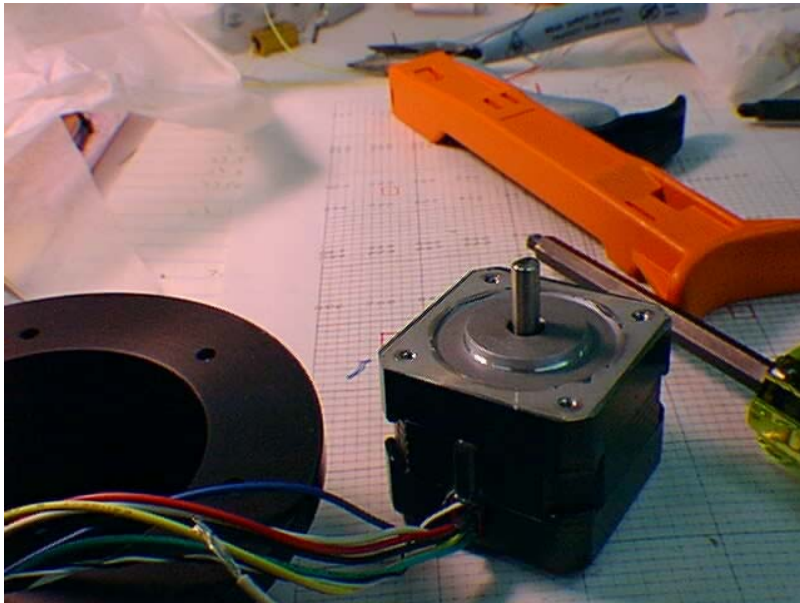
- reaction wheel and focus drive gears (left)
- focus motor, table, camera (right)



## Camera/focus wiring and thermal shunt

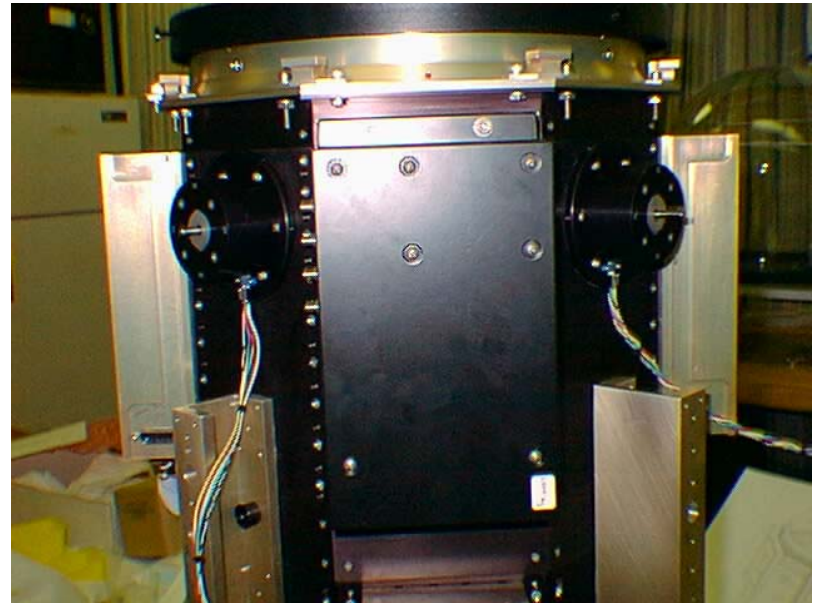
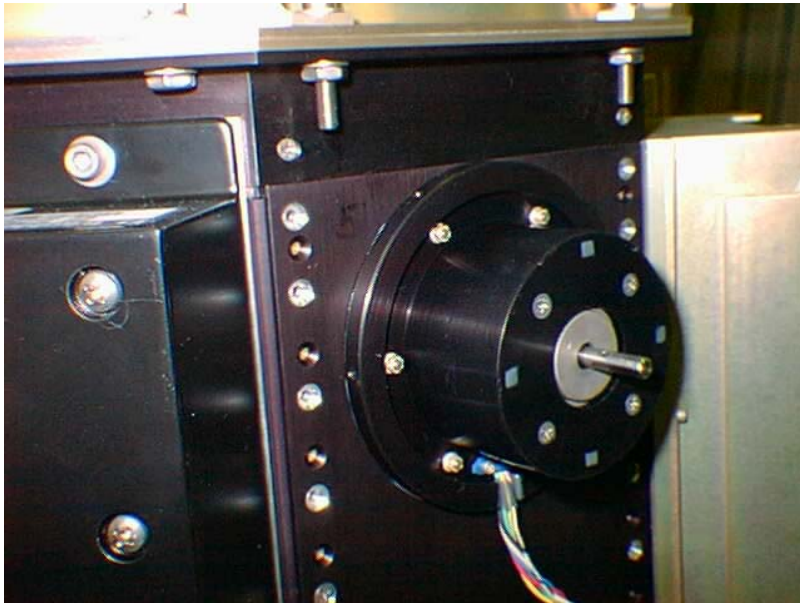


## Body reaction wheel stepper motor and mount

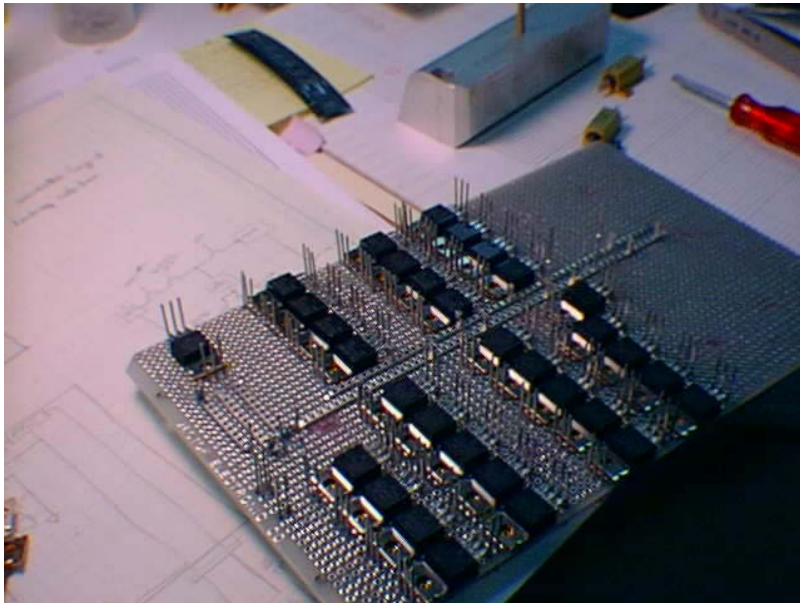




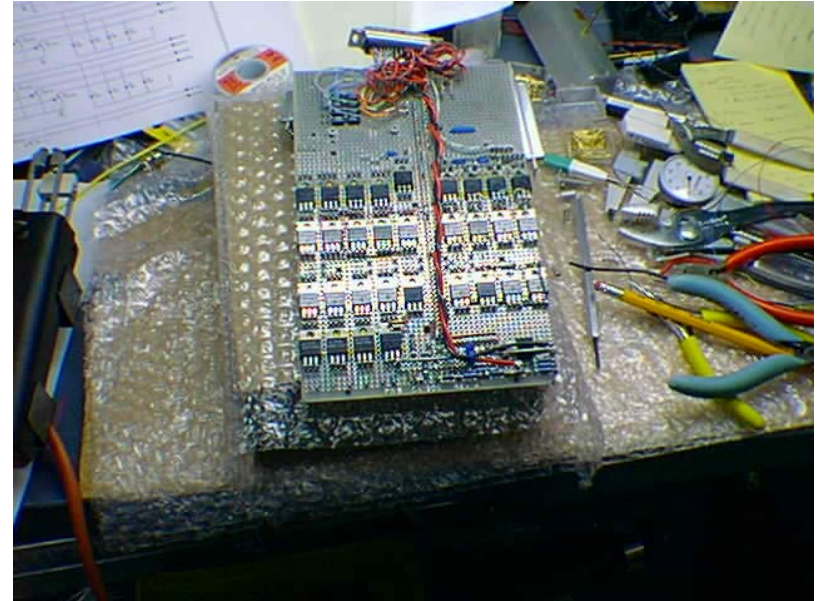
## Y and Z axis reaction wheel motor mountings



## Power distribution box and electronics board



## Final power distribution circuit board (top/bottom)

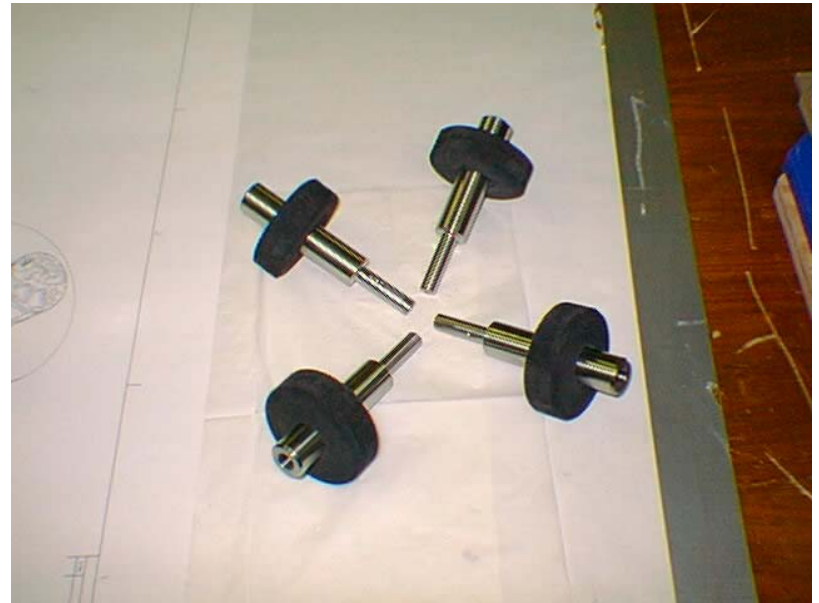
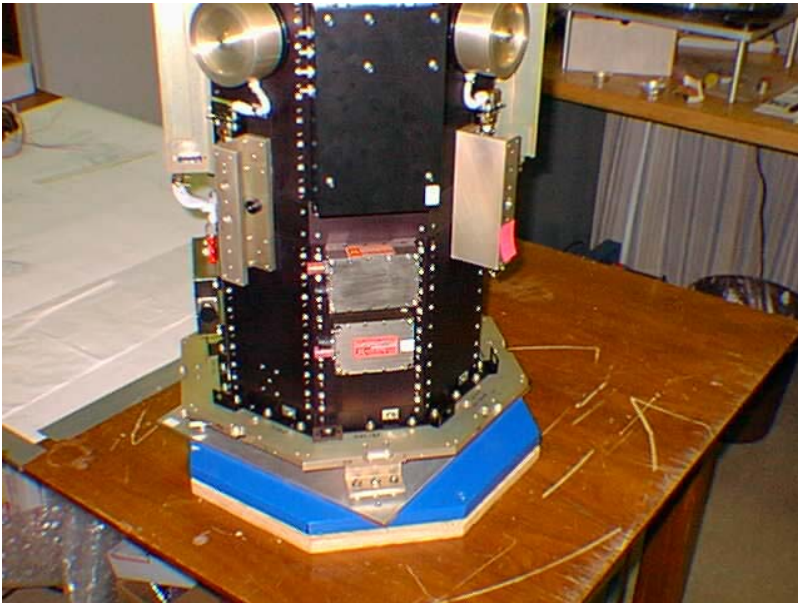


## Separation switch mounting plate

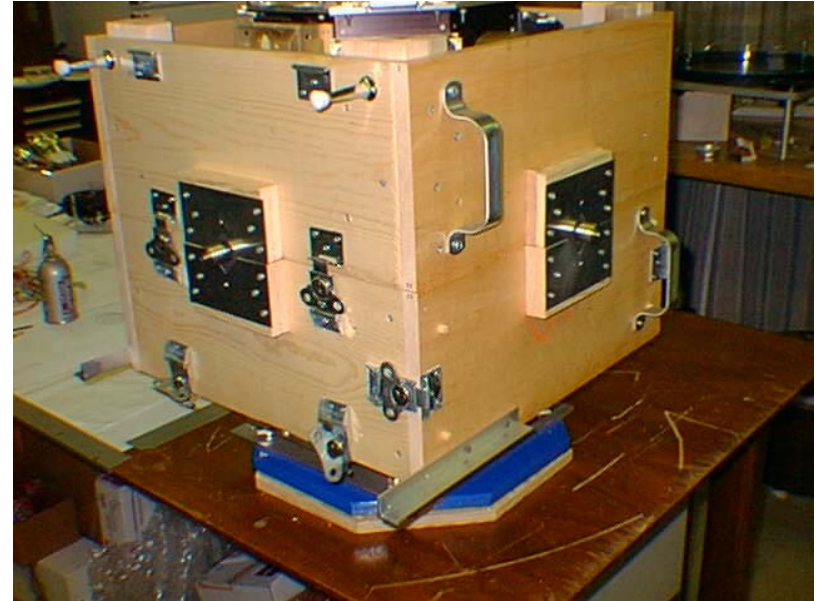
- each arm adjustable to mate with push plate



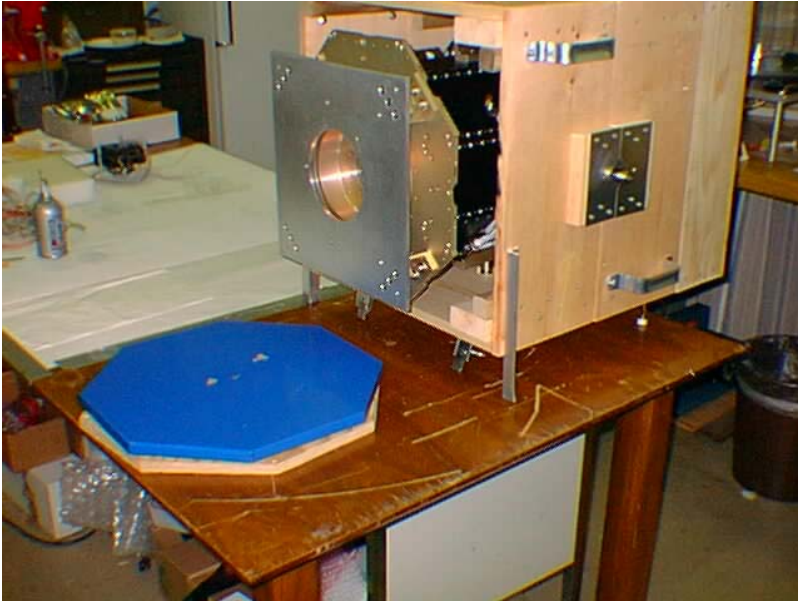
## Array spacer blocks and support pins



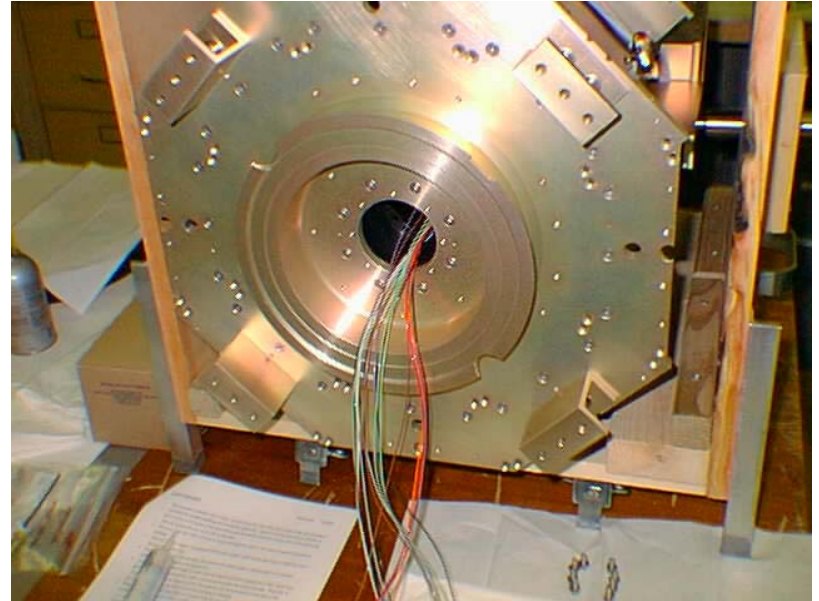
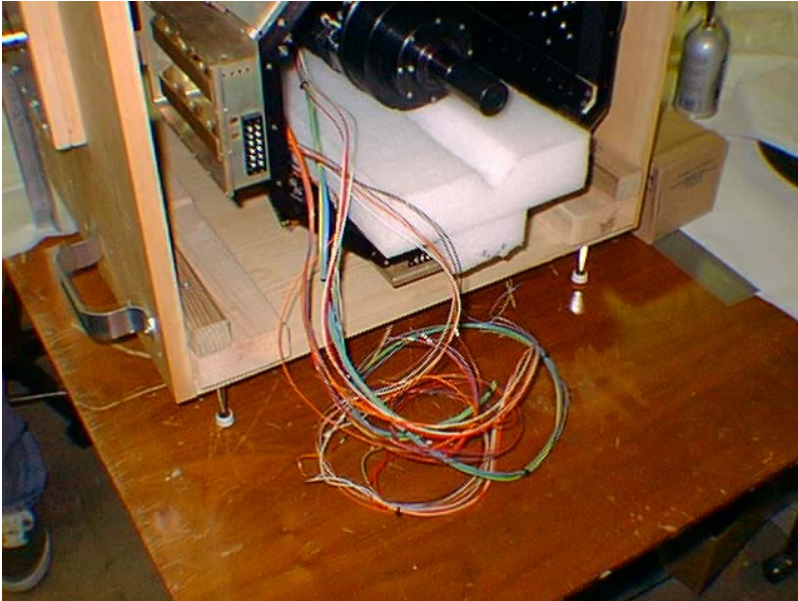
# Spacecraft handling box and general purpose fixture



Box rotated right to attach lower end closure

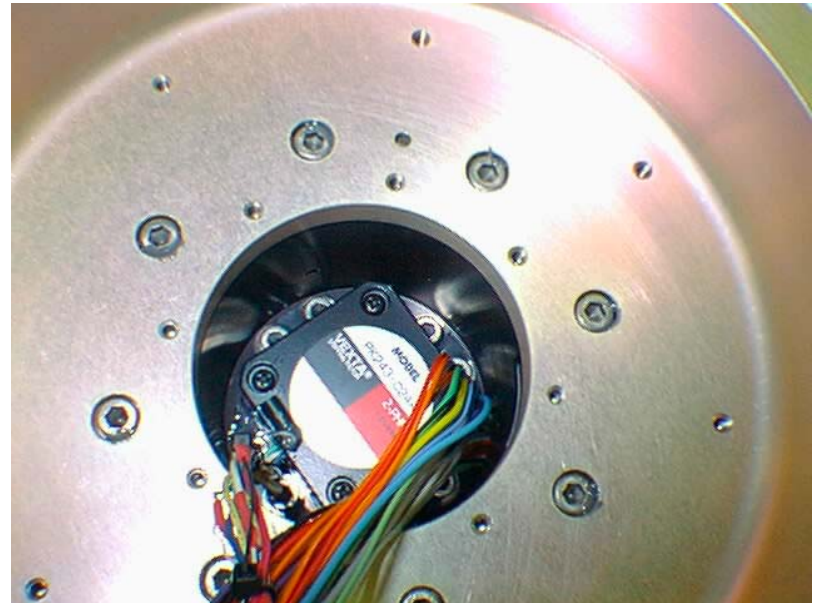
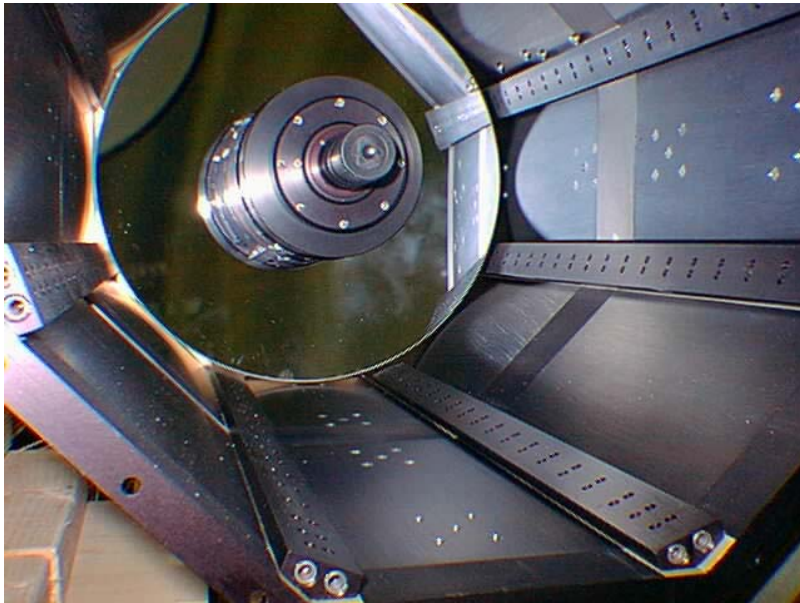


# Box used to support spacecraft during camera installation

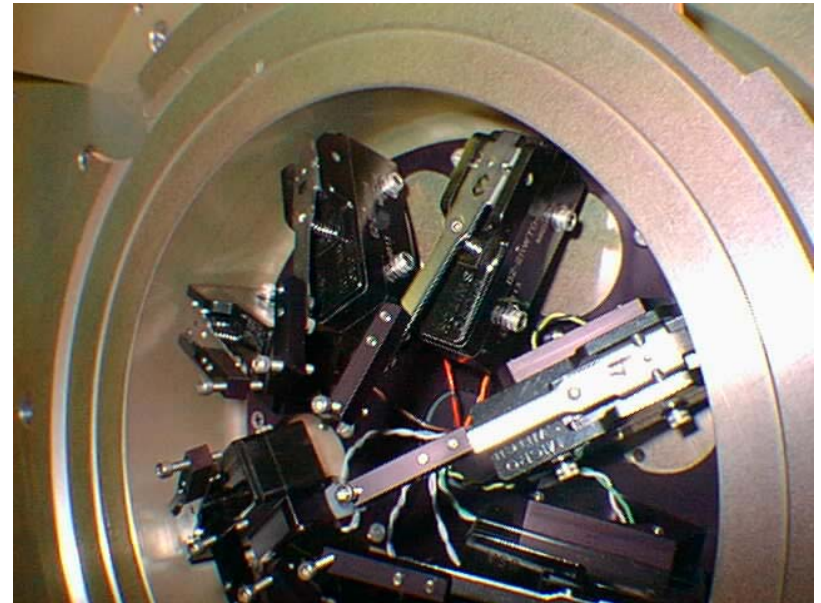
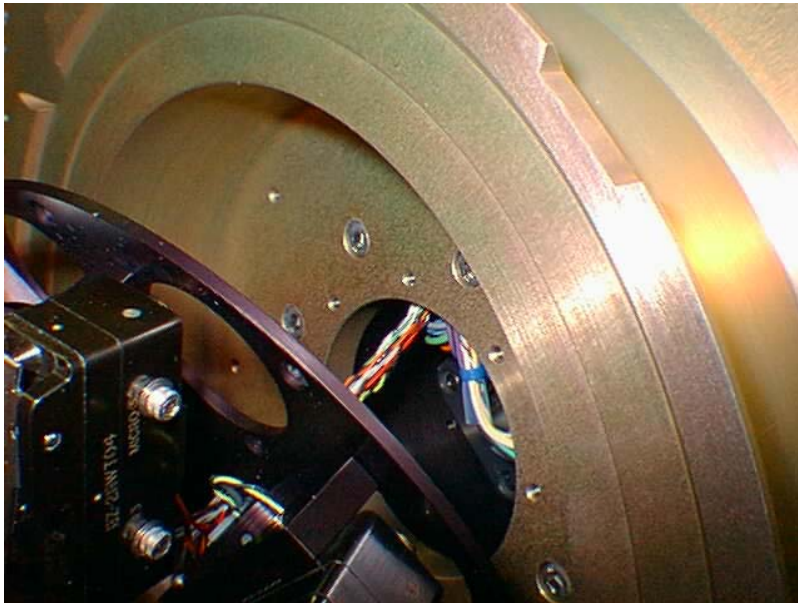




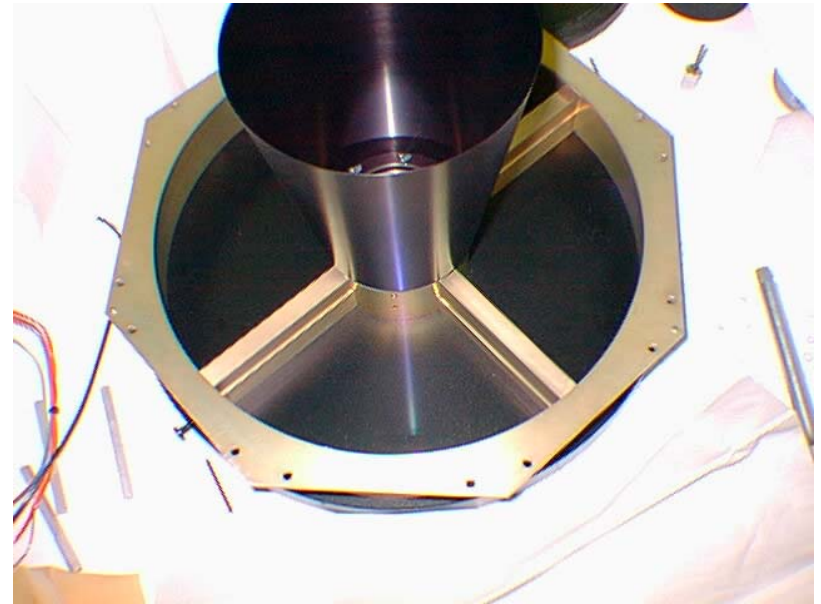
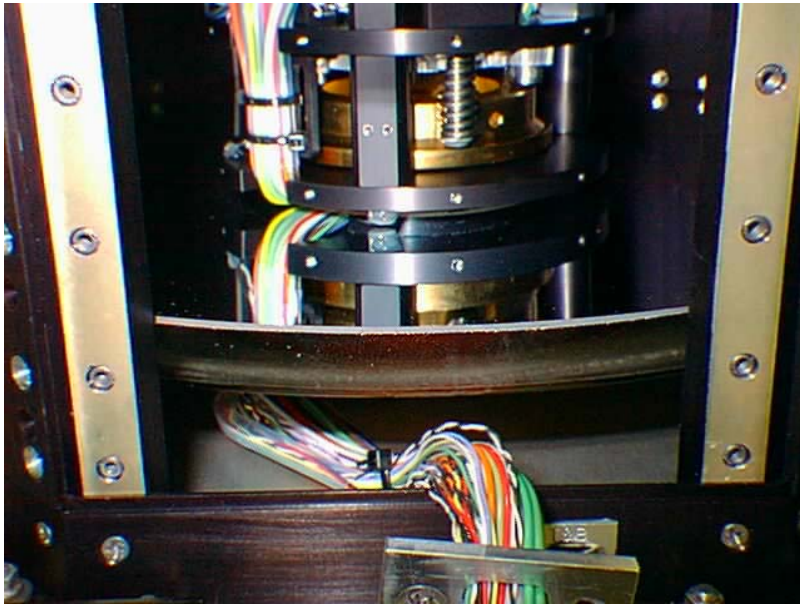
Camera installed, reaction wheel motor visible through baseplate



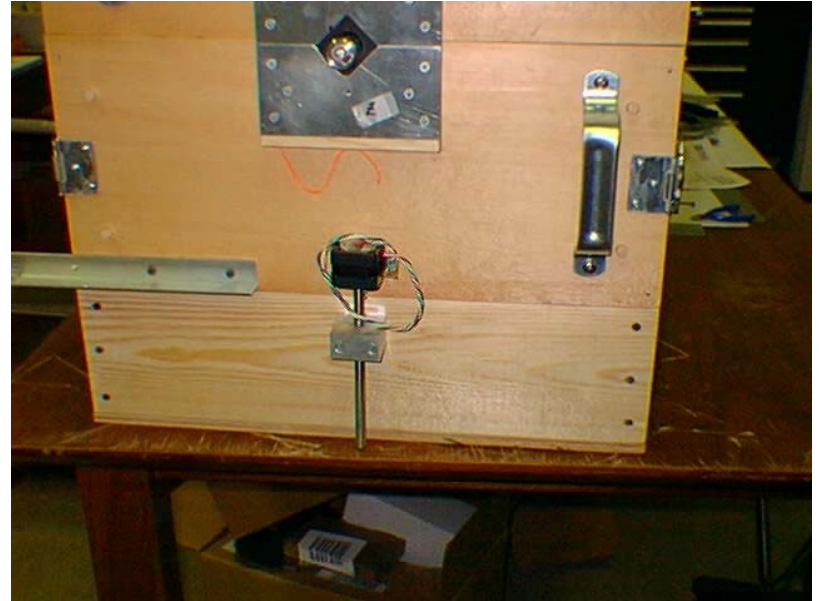
## Fit check of separation switches



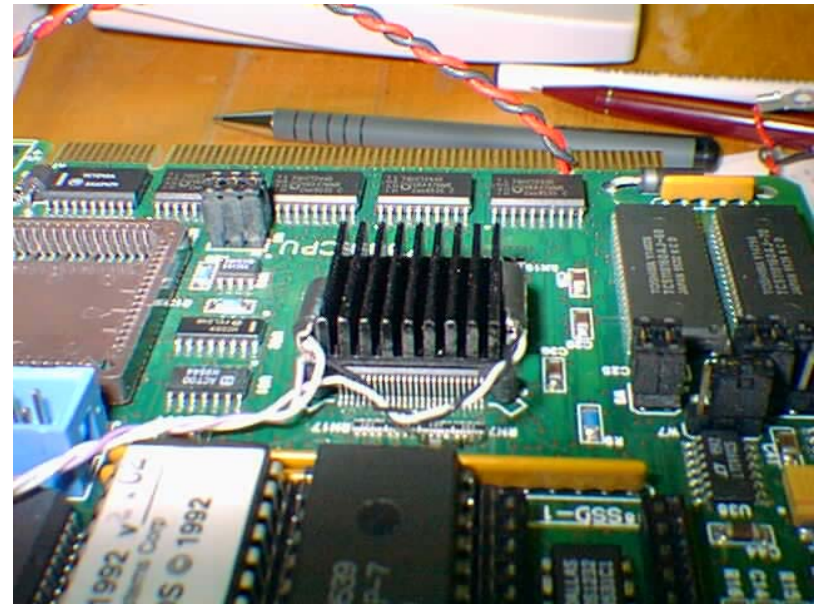
## Camera/focus-mech and secondary baffle installation



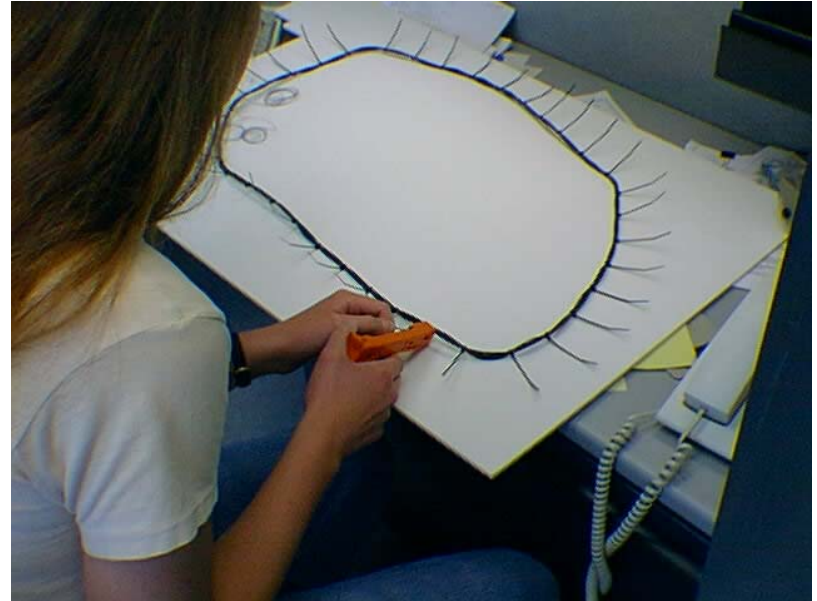
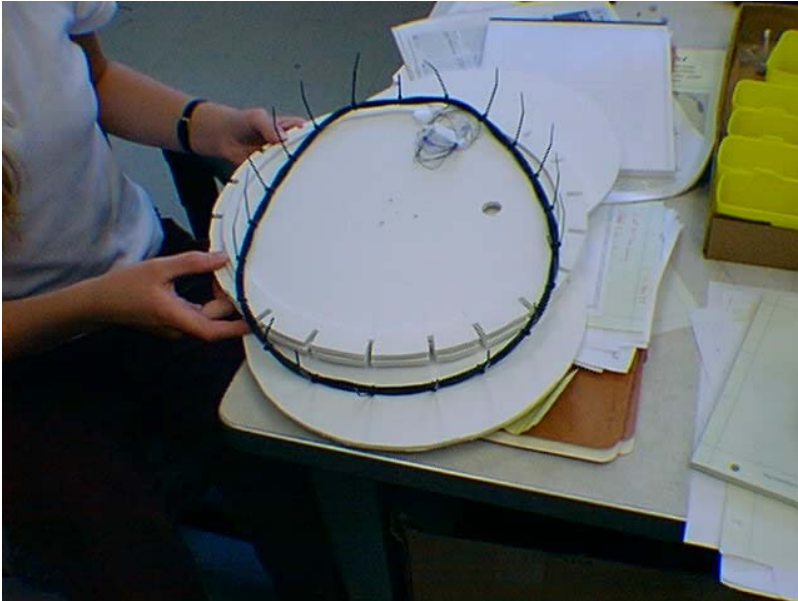
# Star-imaging test through roof hatch with sidereal drive



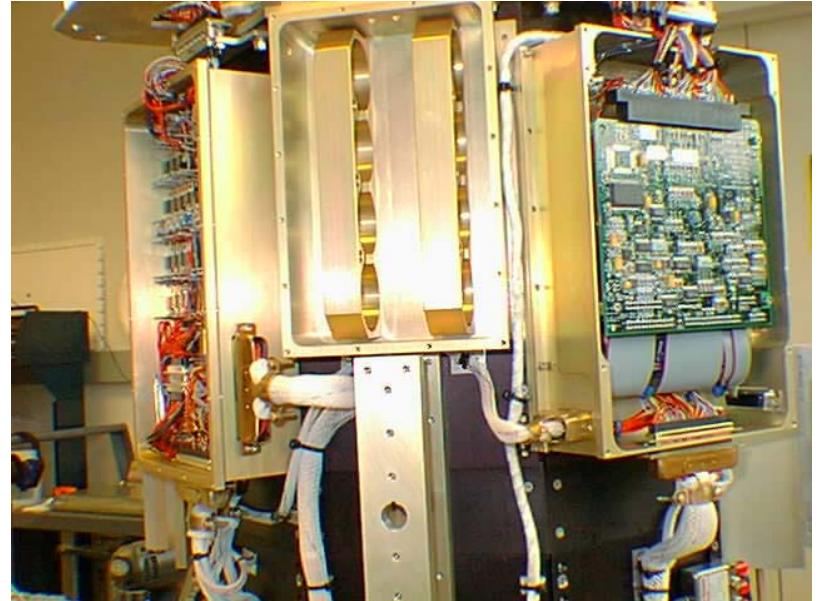
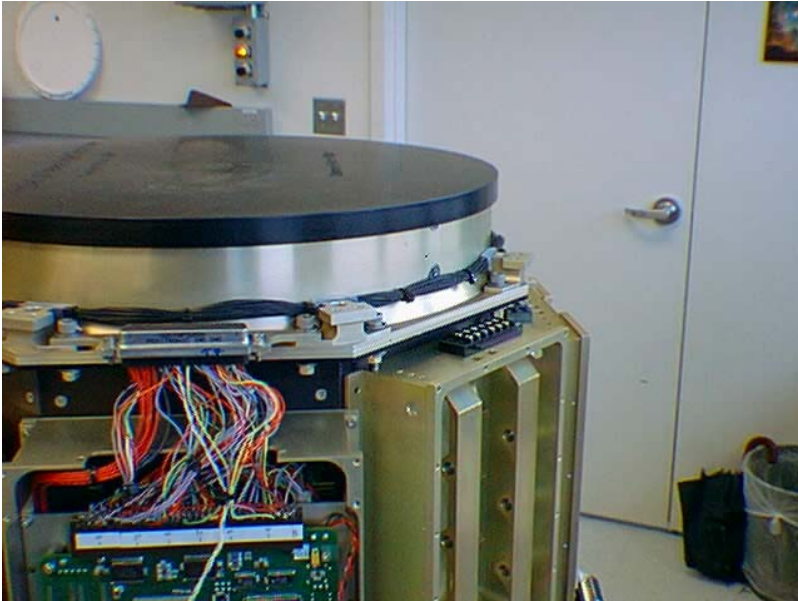
# Typical temperature sensor mounting on electronics



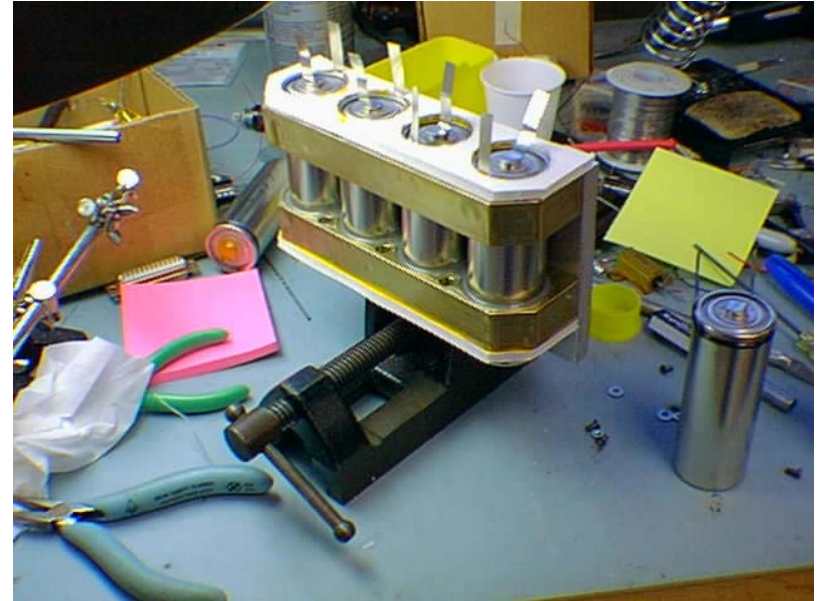
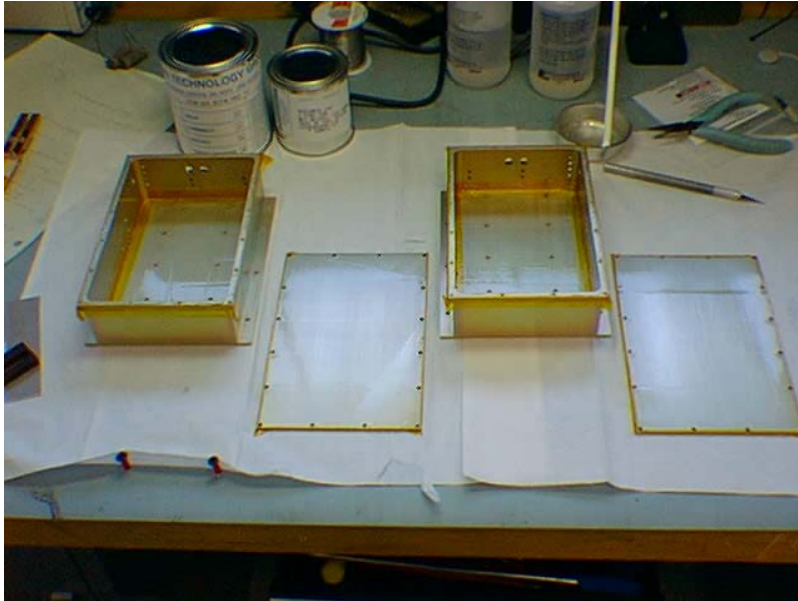
## Summer student winding torque coils



X-axis torque coil mounting (left)  
Battery box fit check (right)

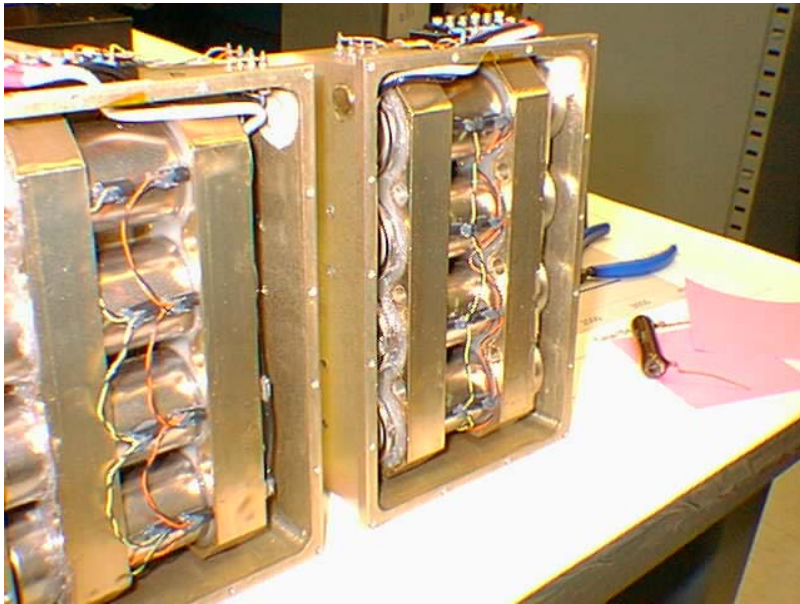


# Battery box coatings and cell mounting

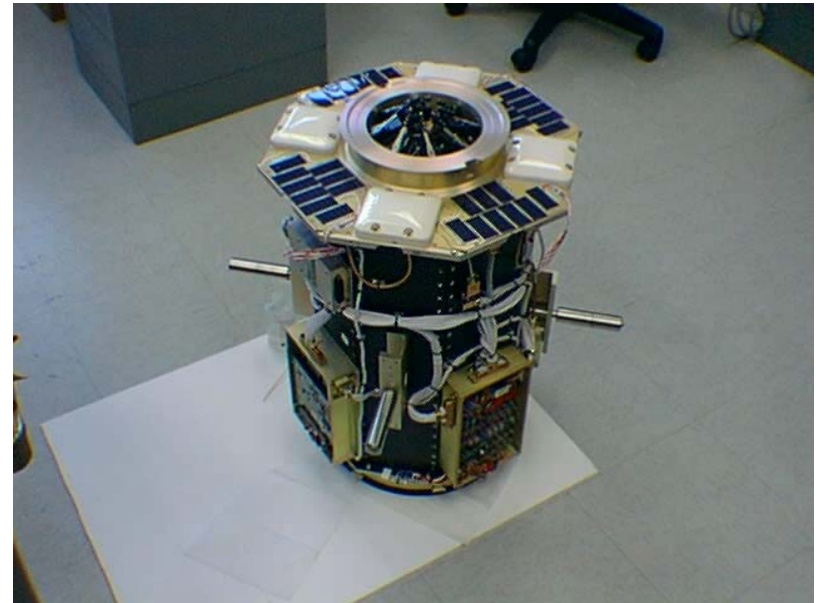
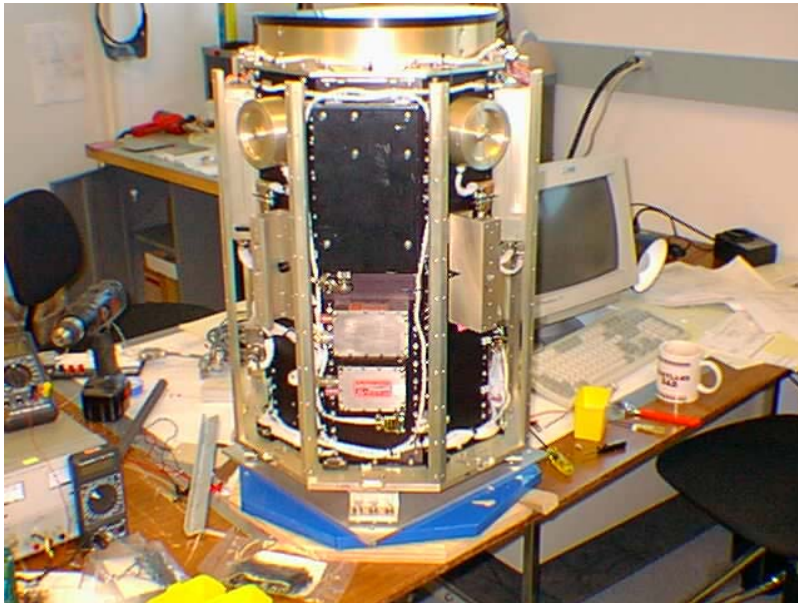




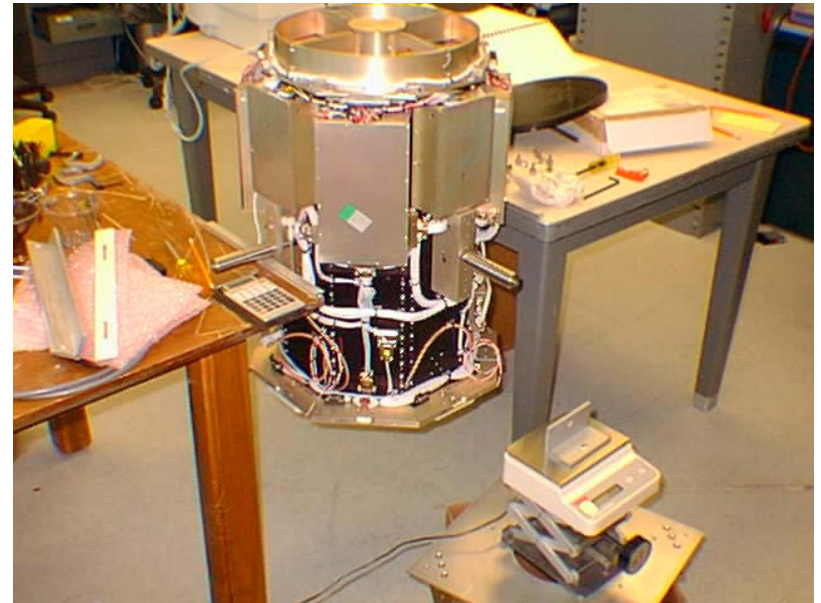
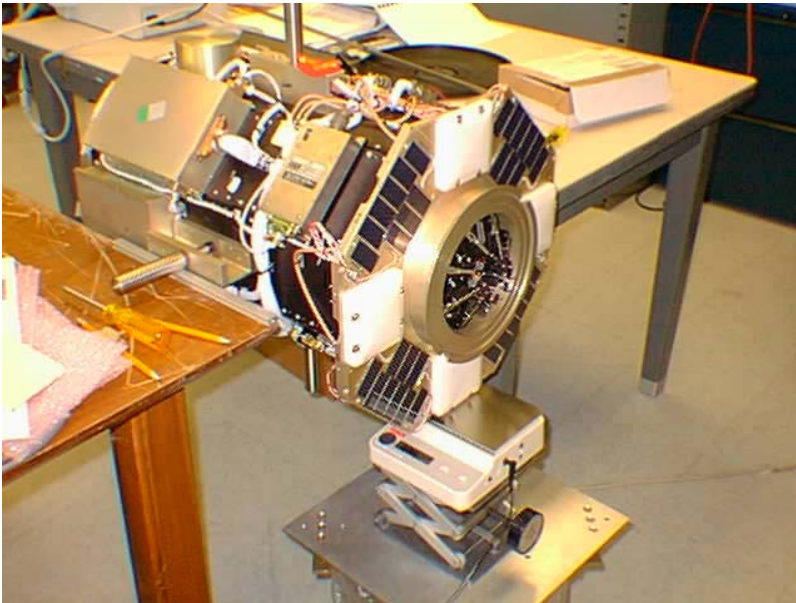
## Finished battery boxes and KOH absorber installation



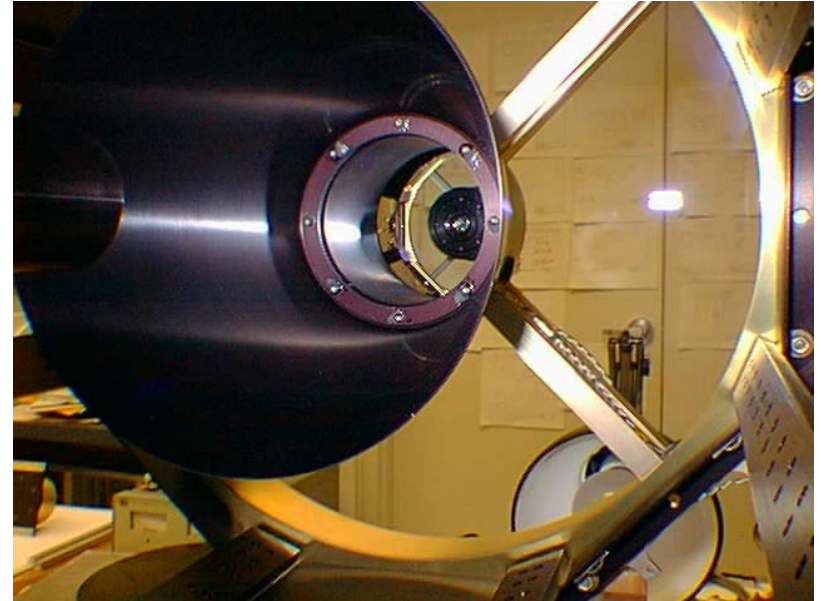
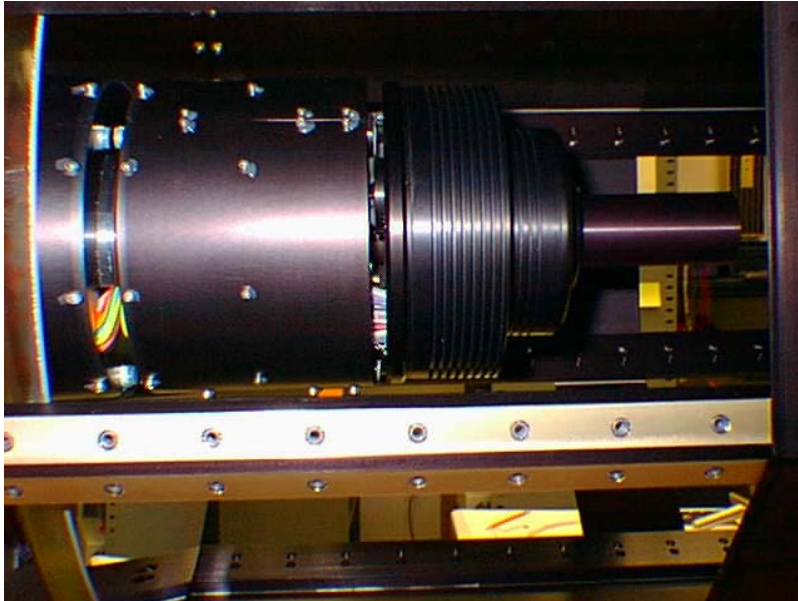
## Getting ready for first balance test (no arrays)



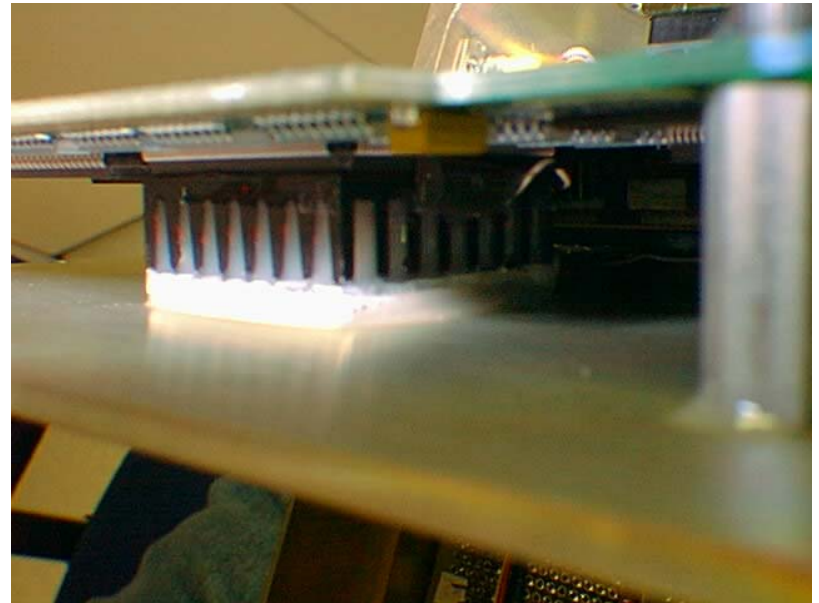
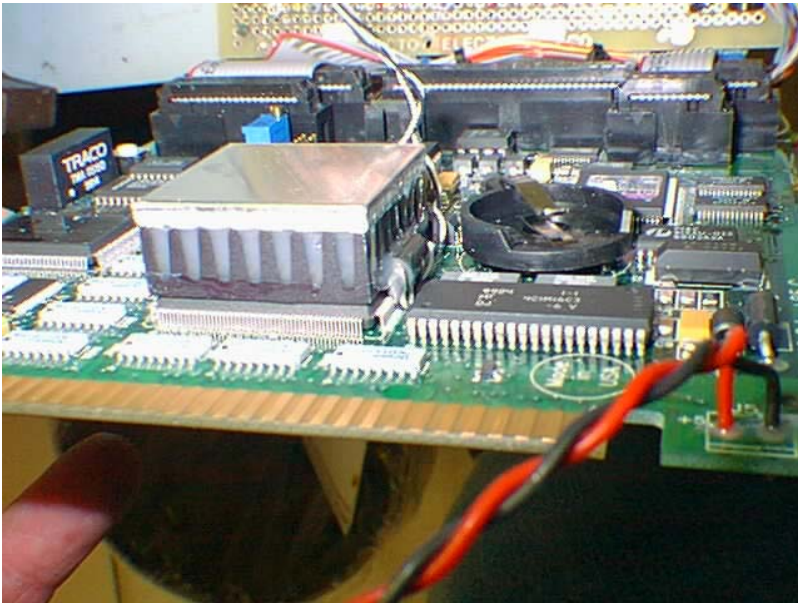
## Balance tests locate center-of-mass



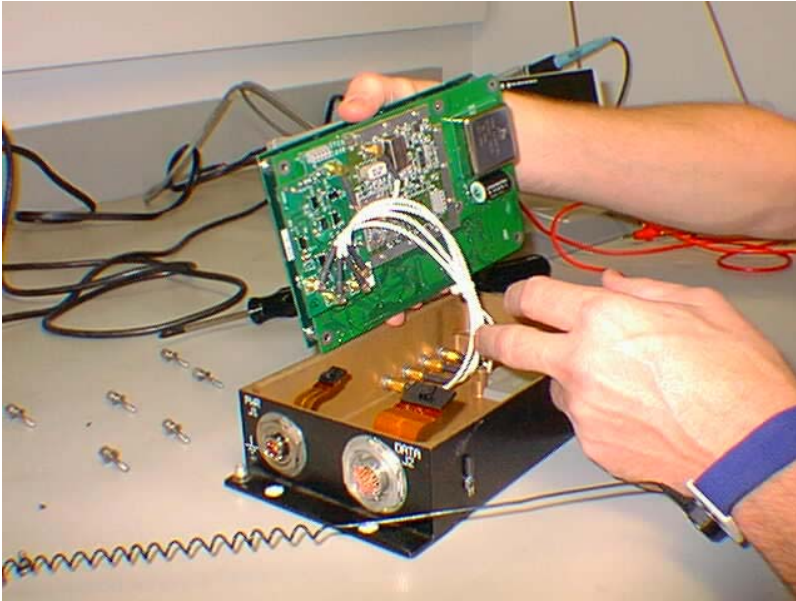
## Camera/Focus-mech shrouds and baffles installed



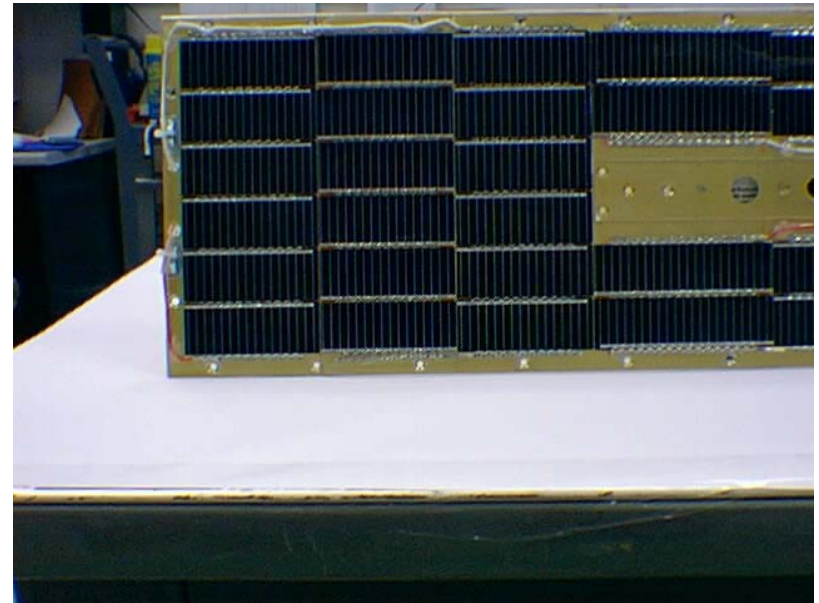
## CPU thermal mounting



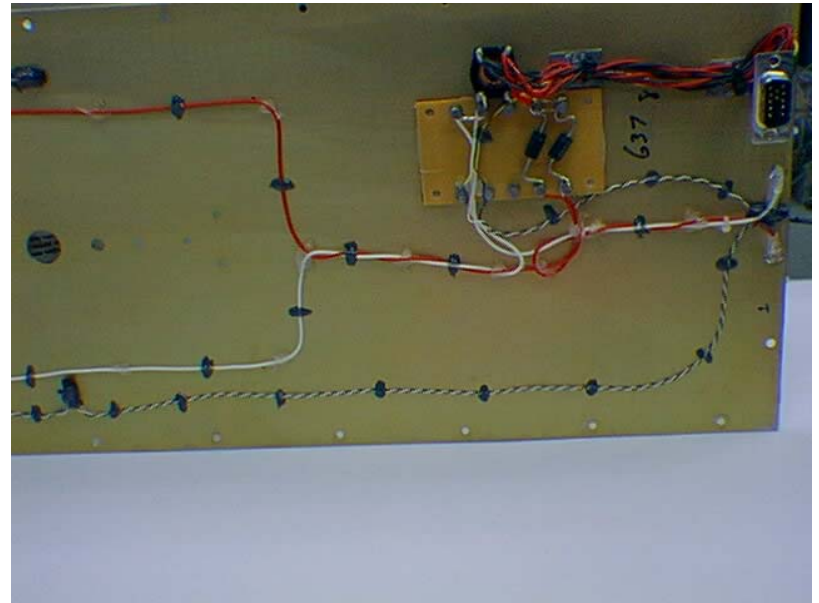
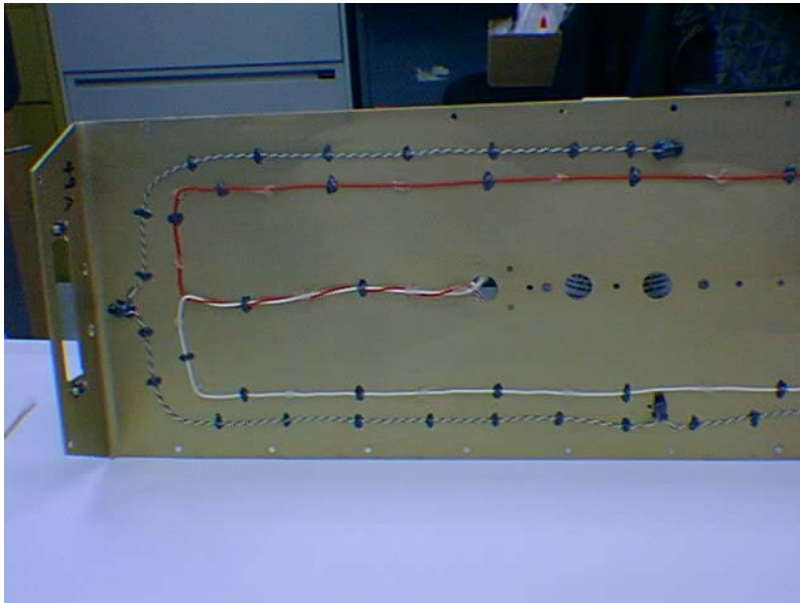
## Removal of GPS lithium battery and thermal vacuum test of CPU boxes



# Summer student mounts thermal sensors on array panels

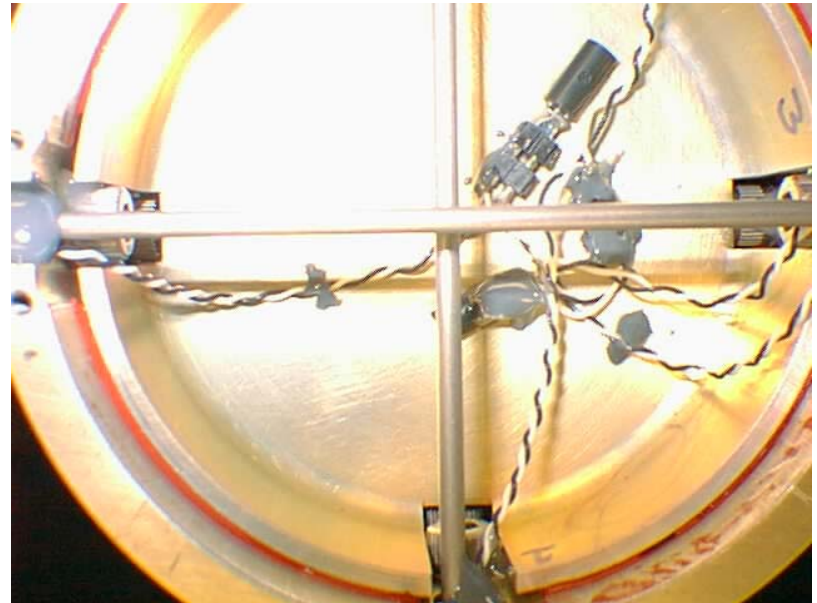


Arrays are back-wired to cancel magnetic fields



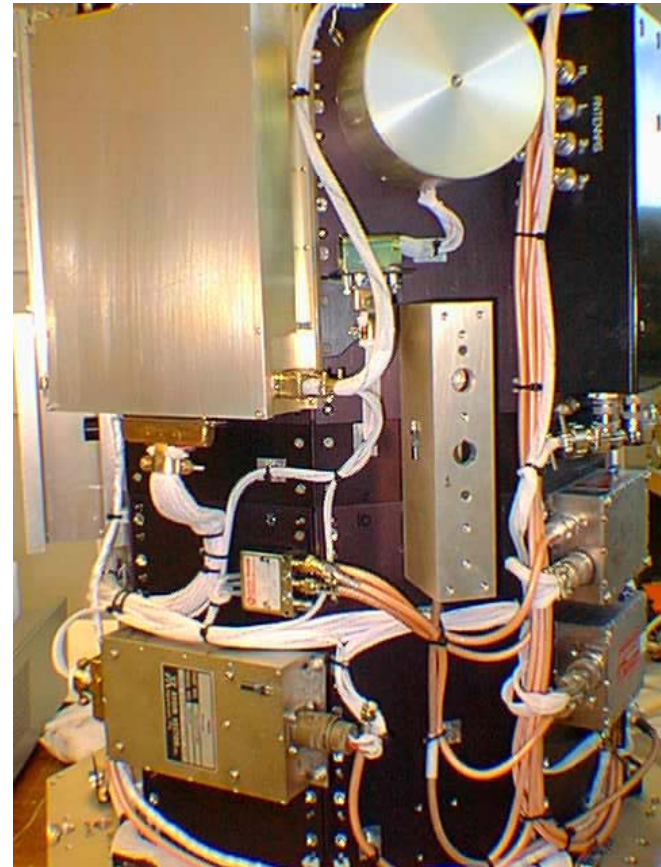
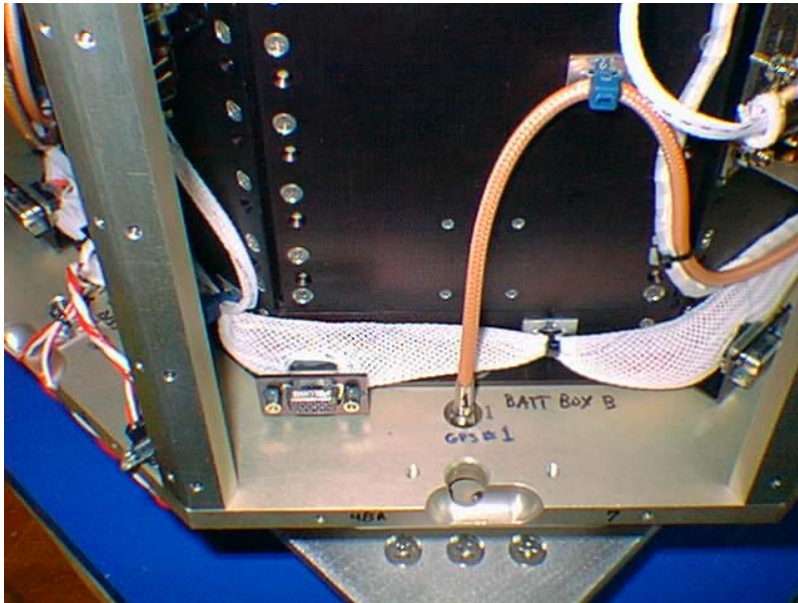


Power distribution box RF dc/dc converters (left)  
and Y/Z hysteresis rods (right)

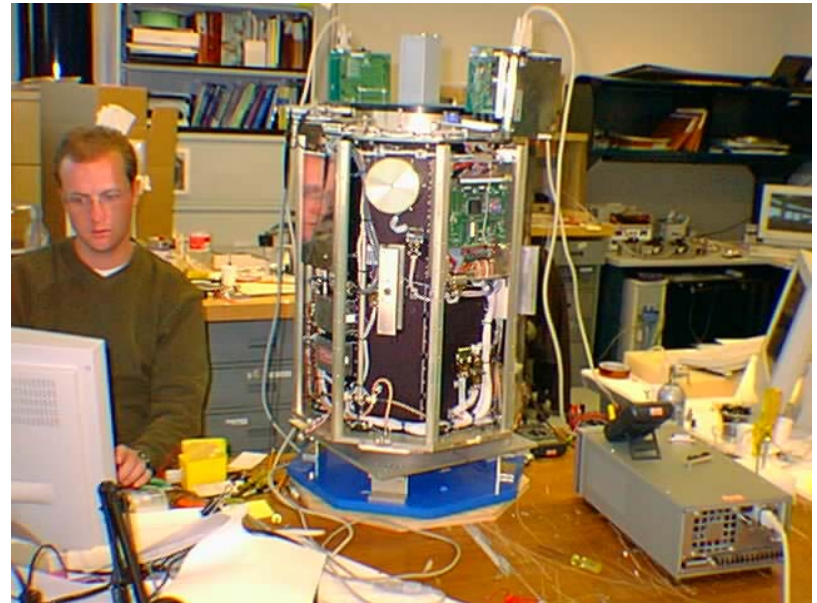


# Harness tie-down details

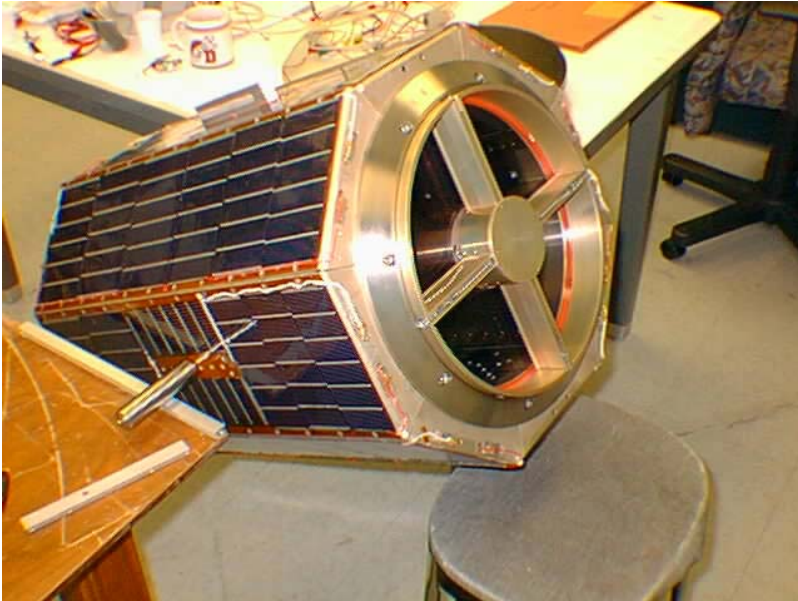
- note reaction wheel cover (right)



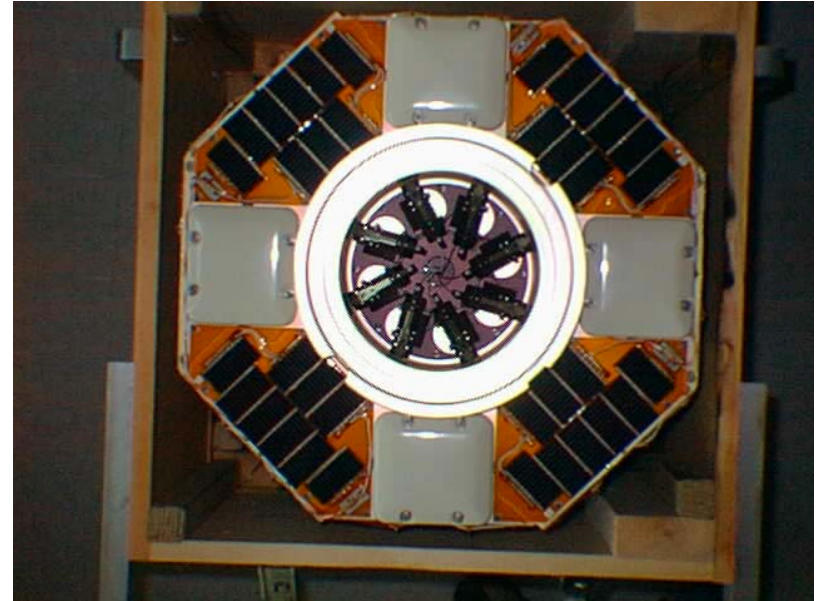
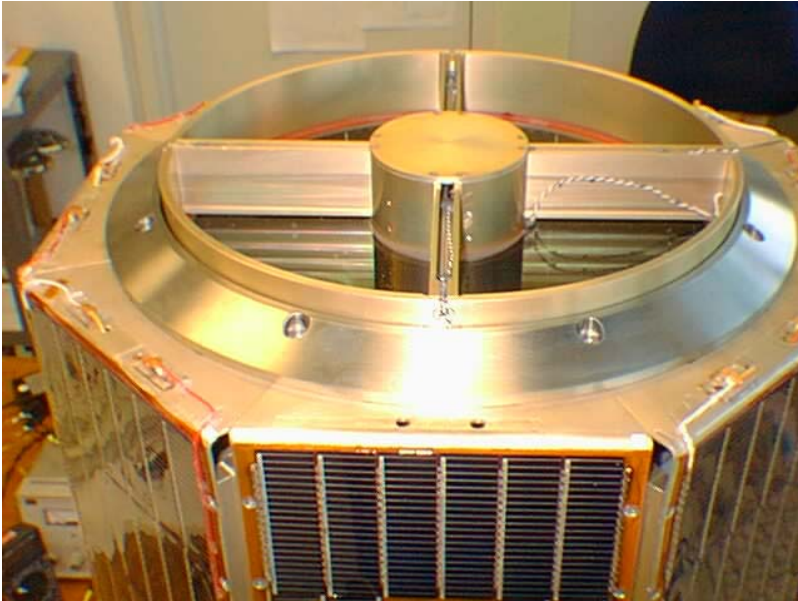
## Pre-vib checkout with CPU peripherals attached



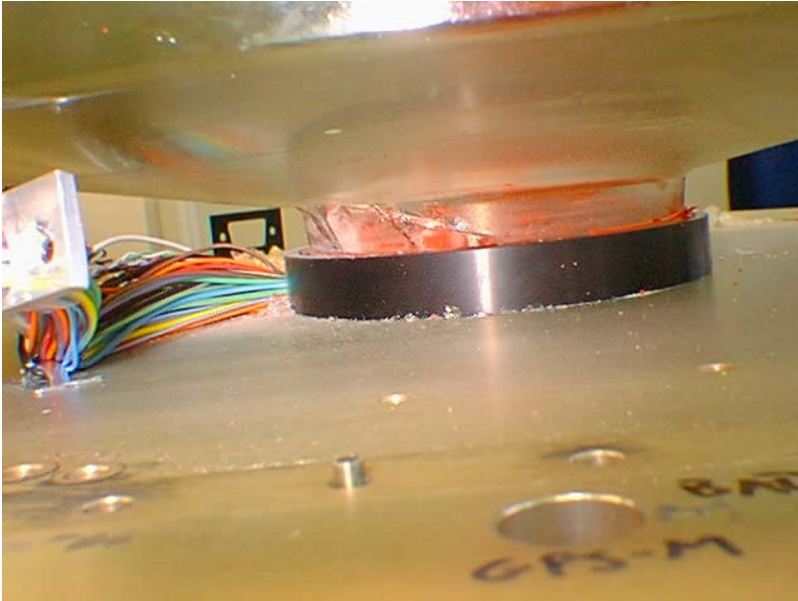
## Pre-vib CG check (inertia moments by model)



## Pre-vib packing into carrying box



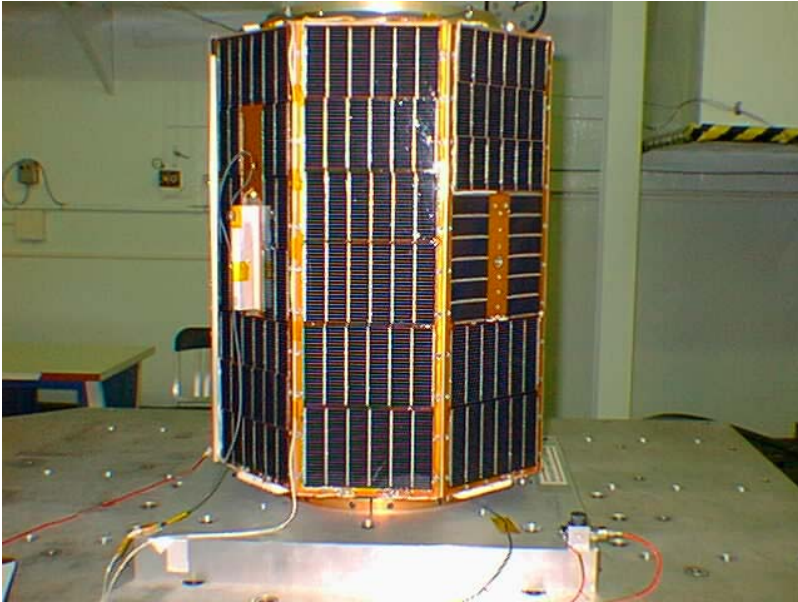
## Primary mirror bond failure during vib test



## New primary and rebuilt support structure

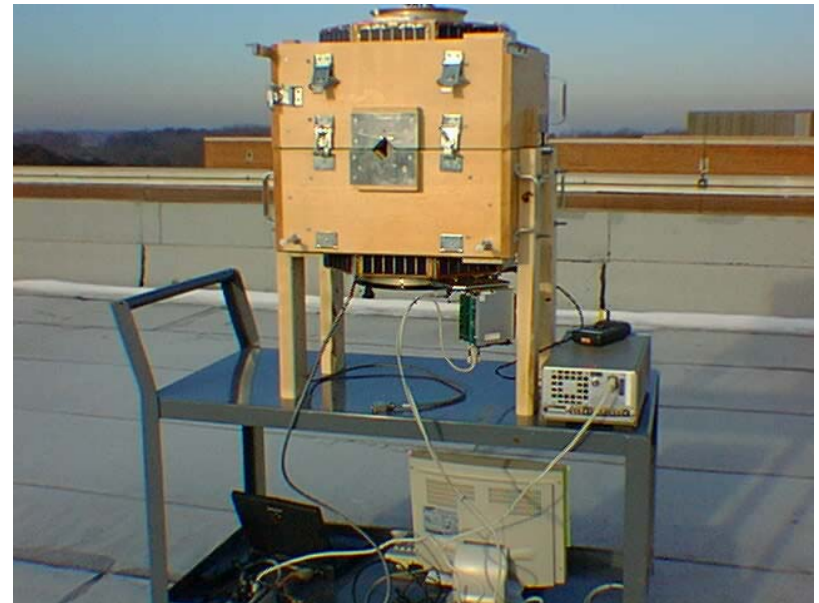
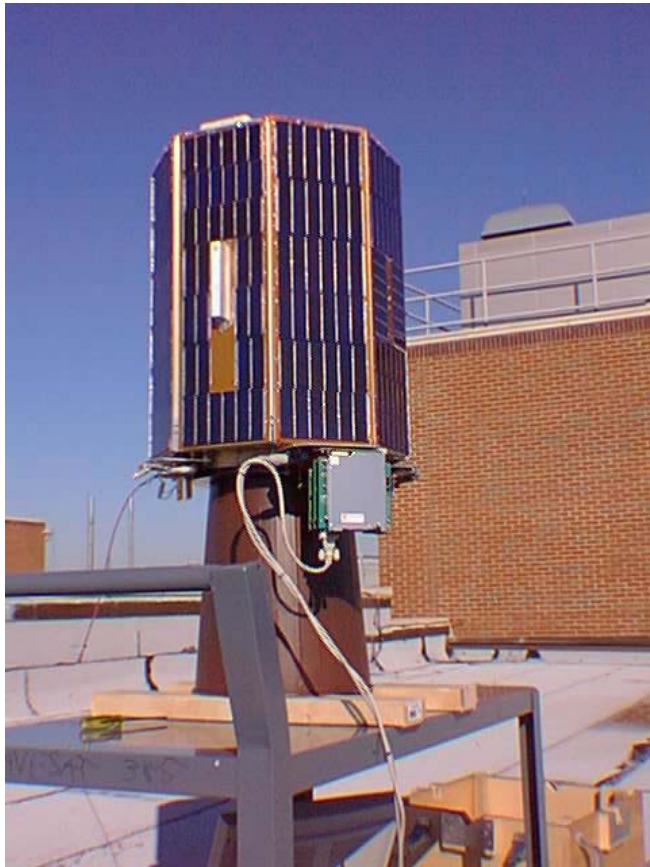


## Final vib test successful

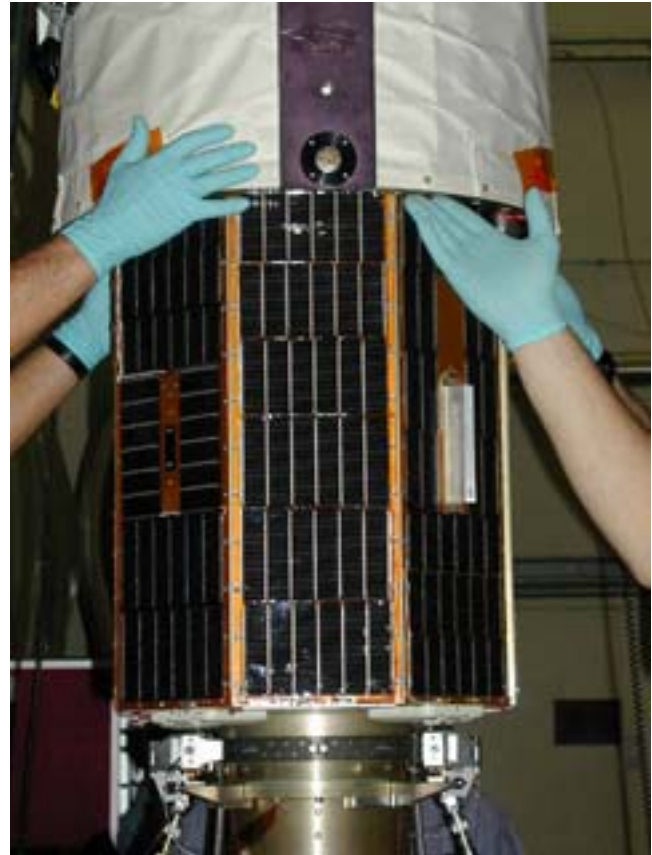




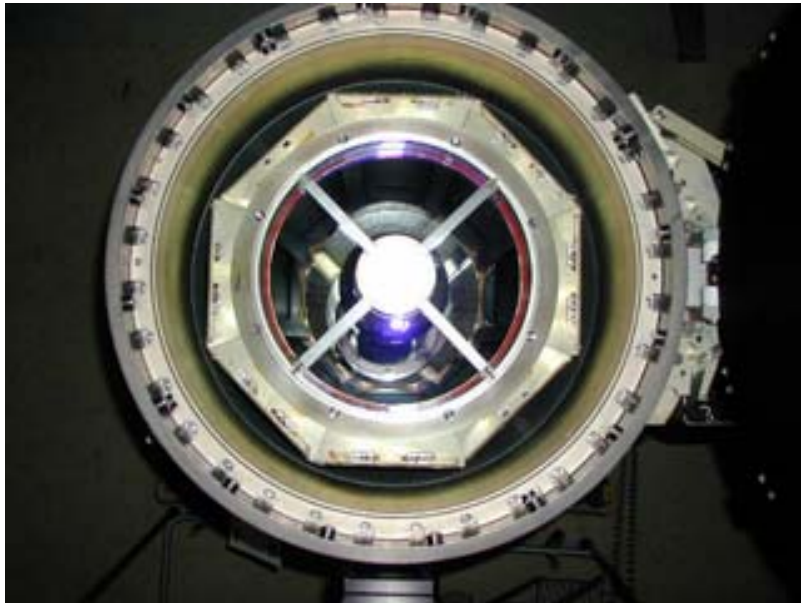
## Solar array checkout and GPS self-survey



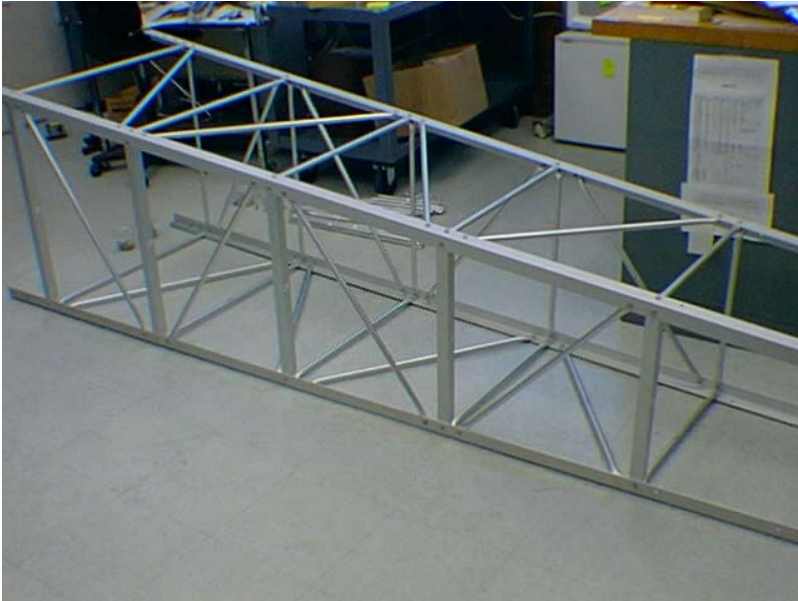
## Simplesat on ejection system, canister installed



# Simplesat ready-to-ship, installed in Discovery (STS-105)



## Ground station tower and RF gear



## Ground station tower and Yagi antenna atop Bldg33



Ejected into orbit 20 Aug 2001 over Lake Michigan

