R5: Partnering and (Preliminary) Flight Results

2024 Small Satellite Conference

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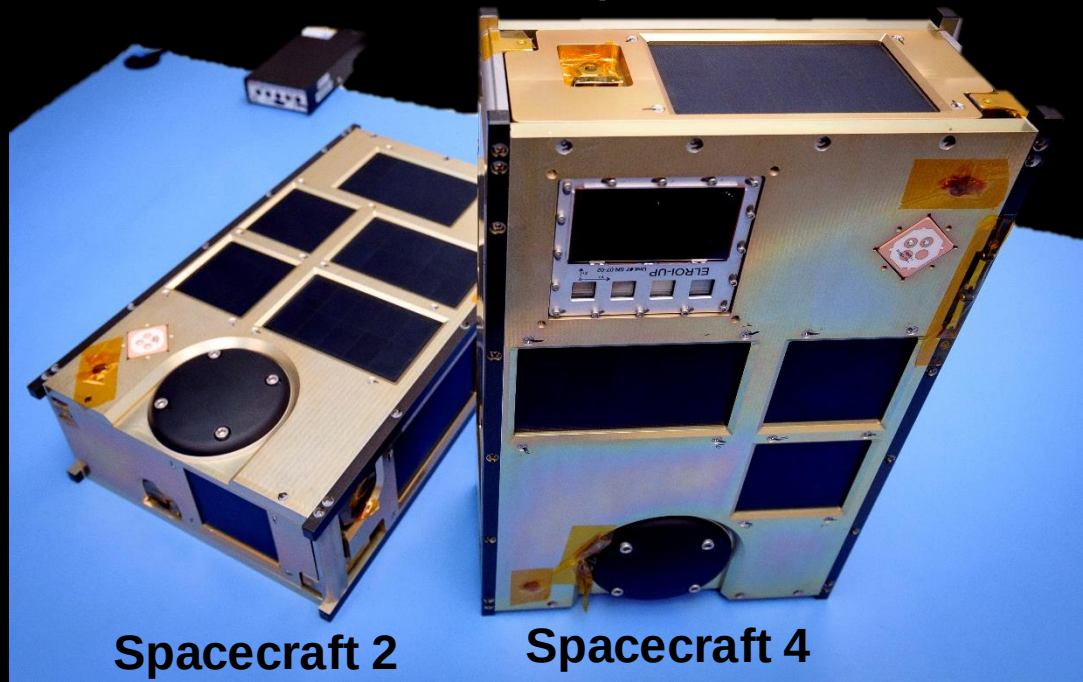
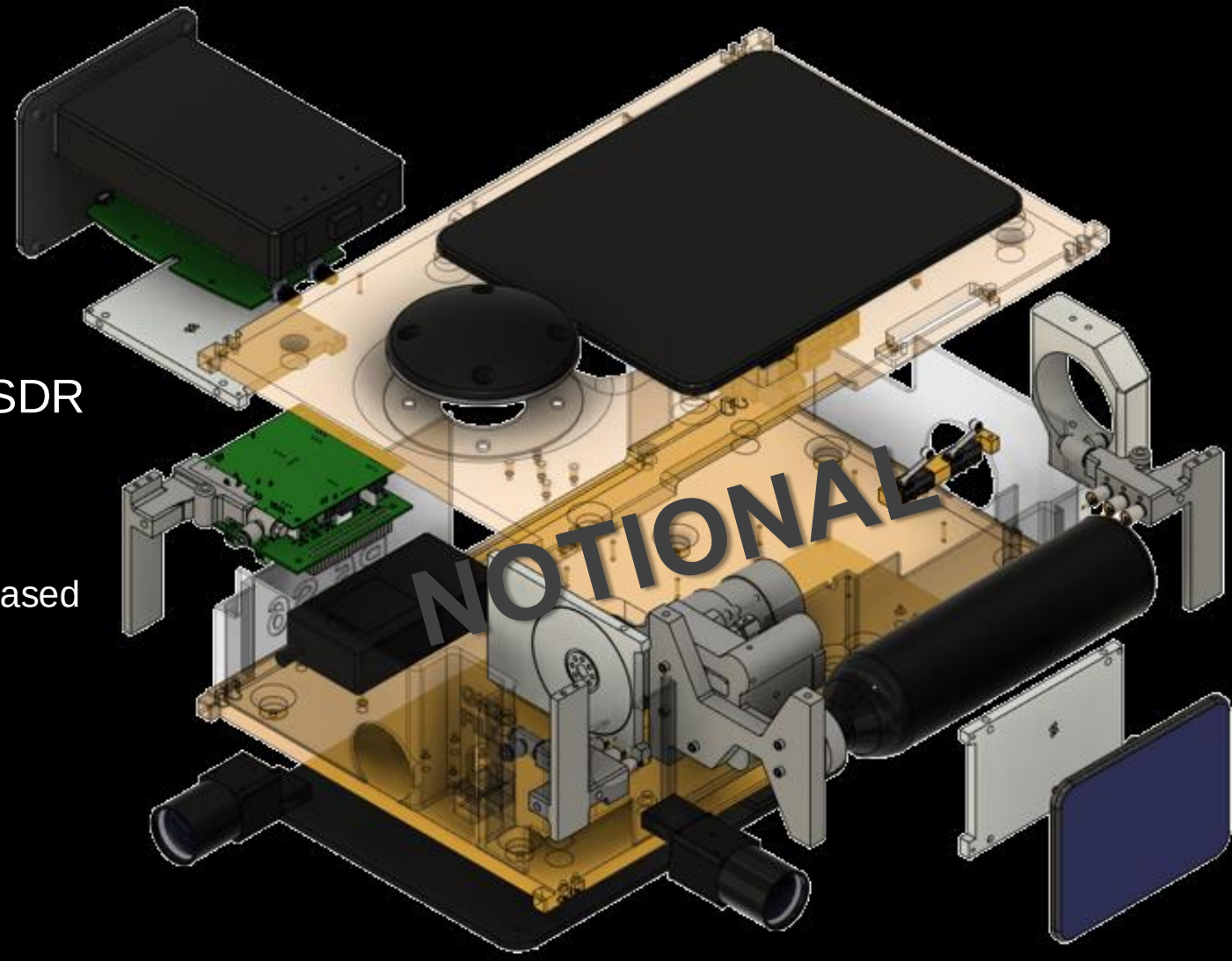
R5: Reassessing Cost and Speed

- STMD-funded, intended to provide **rapid, low-cost, high-risk method to get TRL 4 payloads to TRL 8**
  - Evaluating **ultra-lean, COTS-based approache**s to define new thresholds for cost and schedule
  - Hosting **payload/technology demonstrations** onboard each spacecraft
- **Broadly share experience and lessons learned** to accelerate/enable the small spacecraft community
- Status: 3 spacecraft launched, 2 operating, 2 approaching fabrication, more in planning



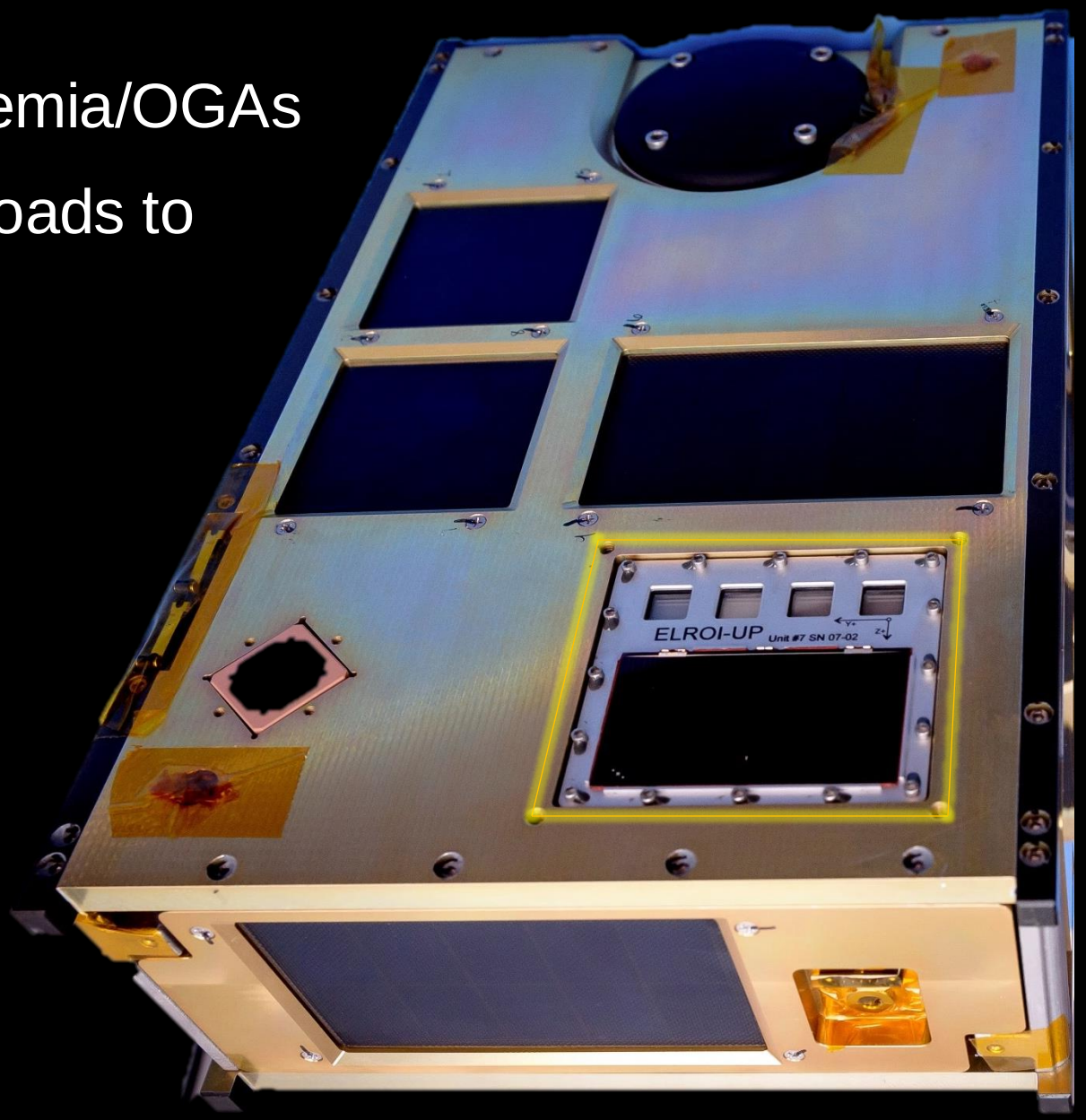
R5 Baseline

- Bus baseline:
  - Form factor: 6U (2x3U)
  - Energy: 70+ W*hr
  - Prop: 6DOF cold-gas
  - Comm: Iridium beacon, COTS-based SDR
  - Compute: “High performance” COTS
  - GNC: Full inertial, basic relative
    - Star tracker, IMU, reaction wheels, vision-based bearing
- Operations baseline
  - Ops autonomously executed onboard
    - Limited ground control possible
  - Resulting data autonomously and asynchronously downlinked



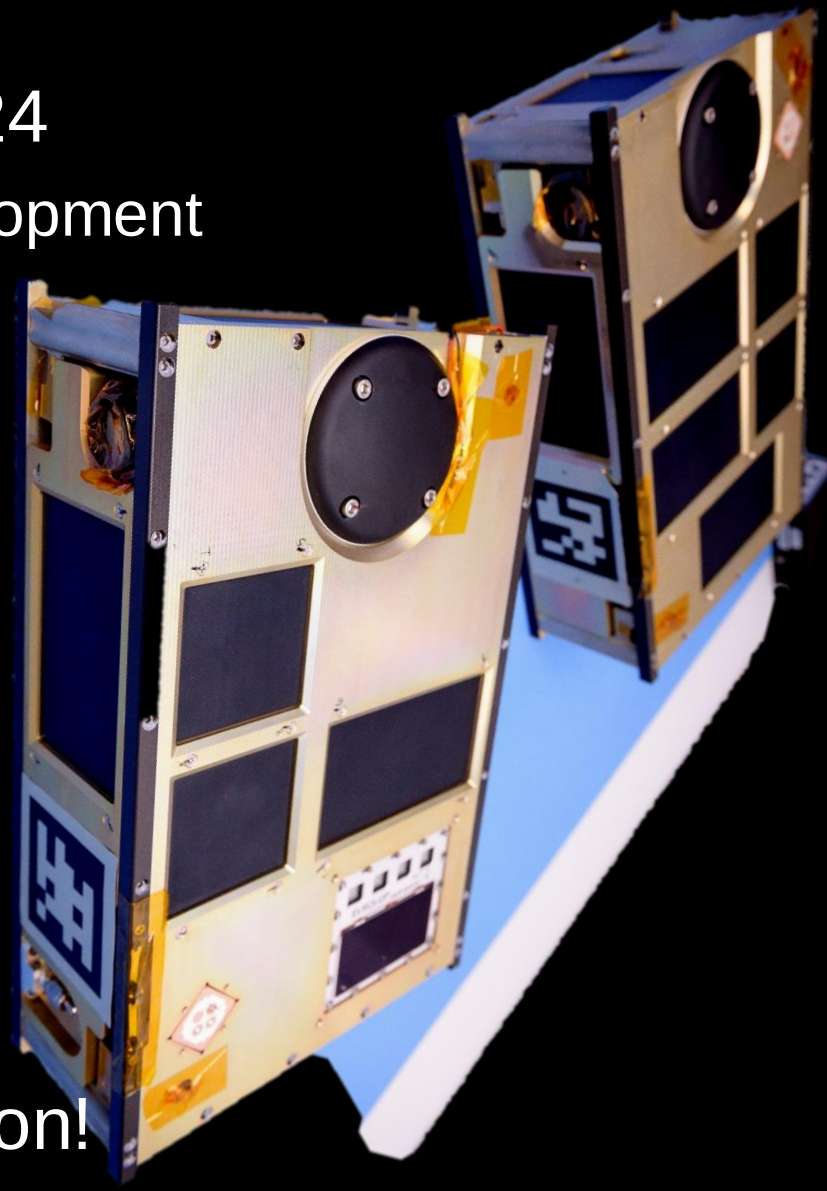
Partnering with R5

- Current partners include industry/academia/OGAs
- Able to flexibly onramp secondary payloads to existing missions
  - 3.3v, 5v, and 12v power baseline *(able to add others)*
  - Variable internal geometry *(not constrained to “U” form factors)*
- Beyond payloads
  - Sharing software, data, best practices
  - Interested in technologies/processes that reduce cost/schedule and/or enhance capabilities



Spacecraft 2 and Spacecraft 4

- Completely redesigned and rebuilt 10/23-03/24
  - Applied lessons learned, onramped parallel development
- Launched July 3, 2024 on Firefly FLTA005
- Spacecrafts deployed, powered on, started beaconing and quickly exceeded minimum mission success criteria!
  - Nominal propulsion performance
  - 1000B messages repeatedly achieved via Iridium
  - Star tracker performance poorer than expected
- **Operations/data gather/analysis ongoing**
- Additional information/publications coming soon!



Thanks!

- Spacecraft 2 and Spacecraft 4 lessons learned and detailed flight data and performance coming soon…
- We're interested in collaborating with you, especially in:
  - "Easy-to-license" RF comm
  - Optical comm
  - Proximity operations
  - Reducing cost
  - Reducing schedule
- Tentatively planning multiple missions in CY25

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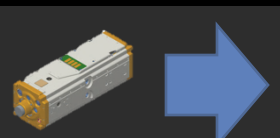
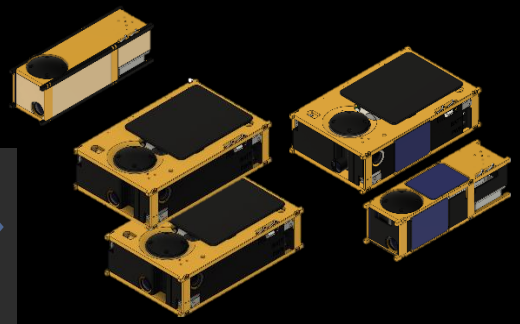
Backup

R5 [Notional] Evolutionary Path

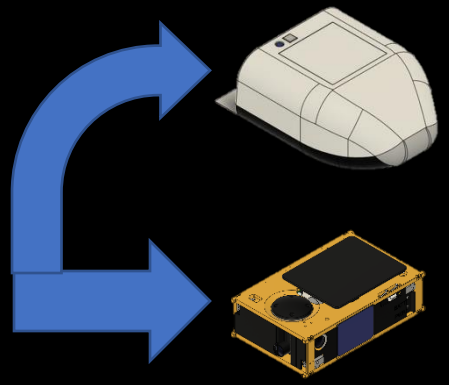


Seeker 1
Demonstrated form factor and process feasibility



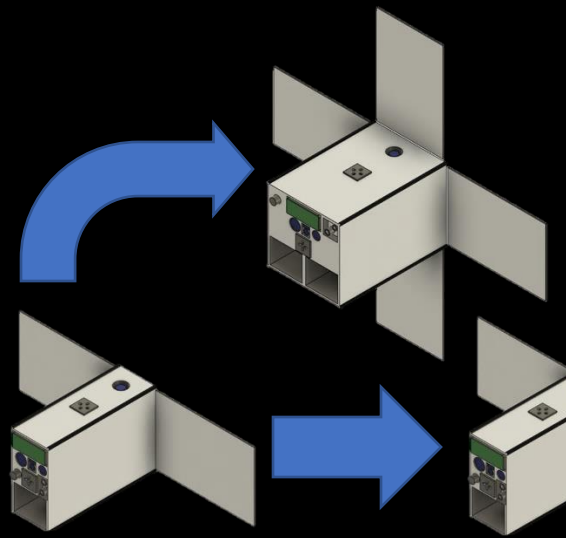
R5 (VCLS-2 Flights)
- Demonstrate new process
- Demonstrate core avionics
- Demonstrate responsive call-up
- Demonstrate first user payloads

Reentry Vehicle [Notional]
Core avionics and new process enables subscale suborbital demonstration of reentry platform



R5 (Operational Target)
Execute multiple payload demonstration flights, advancing human spaceflight and SST technologies

Rendezvous Inspector [Notional]
Enable inspection of any client



Seeker 2 [Notional]
- Provides critical in-space inspection capability for crewed and uncrewed vehicles
- Far faster and cheaper after prior efforts

Seeker 3 [Notional]
Evolve inspector to servicer

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