
NASA Airborne Science Program
2020 Status
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Airborne Science Program
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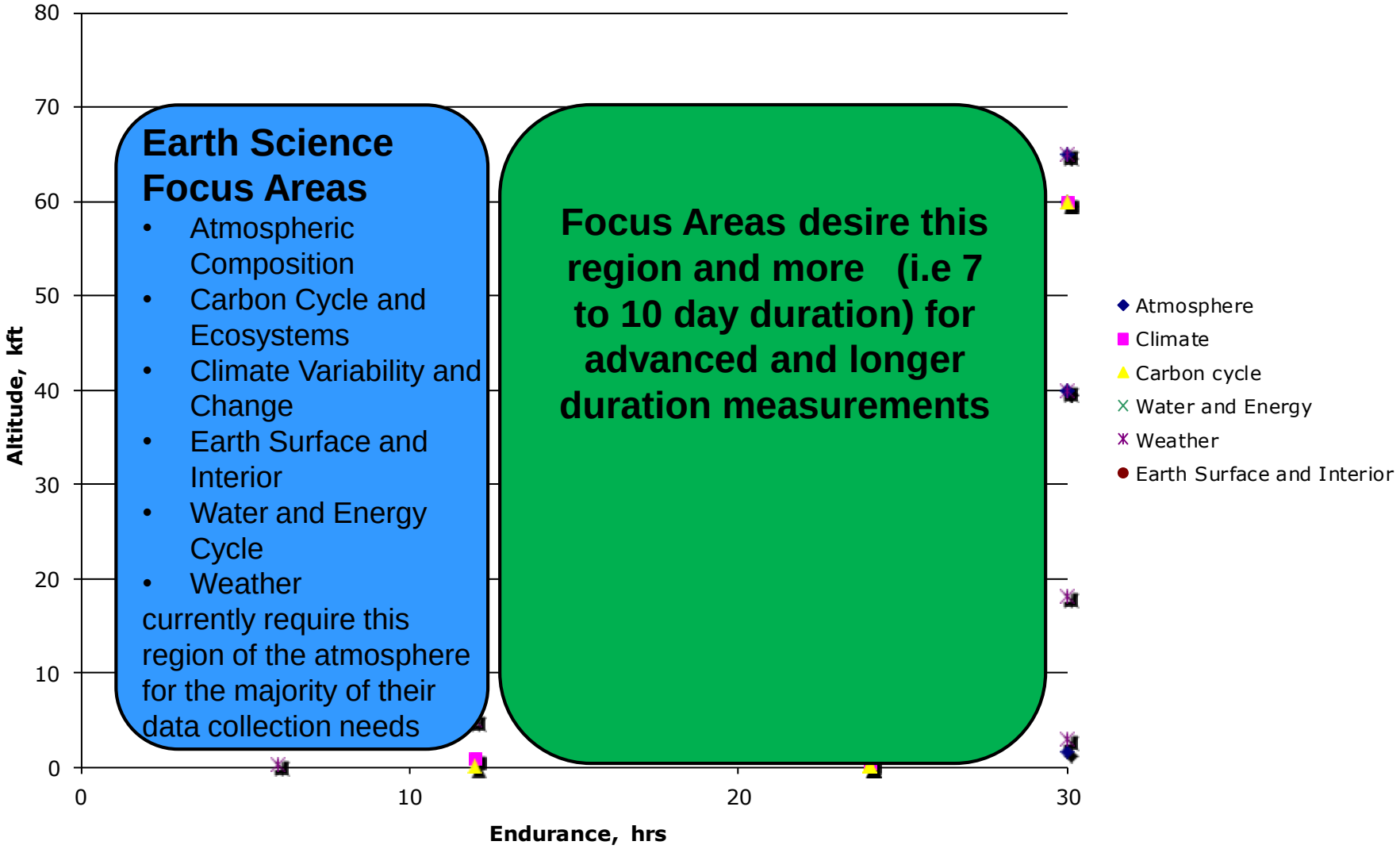
What Airborne Platforms Provide Earth Science

- Help bridge scales between the (typically) global scales of satellite observations and the very local observations of surface-based in situ measurements.
- Way of doing comprehensive process-oriented studies that can focus on specific regions and times of interest.
- Initial sense about Earth system parameters and their variability before satellite observations are possible.
- Focused calibration/validation observations (e.g., coincident measurements) for satellite remote sensing.
- Opportunities to test new instrumentation in an environment that can provide some similarities to space-based platforms/viewing.
- Targeted observations when needed for applications (e.g., disaster response).
- Opportunities for training of investigators who see through all phases of a project (instrument development, operation/use, analysis/interpretation, results dissemination, public communication).

https://airbornescience.nasa.gov/

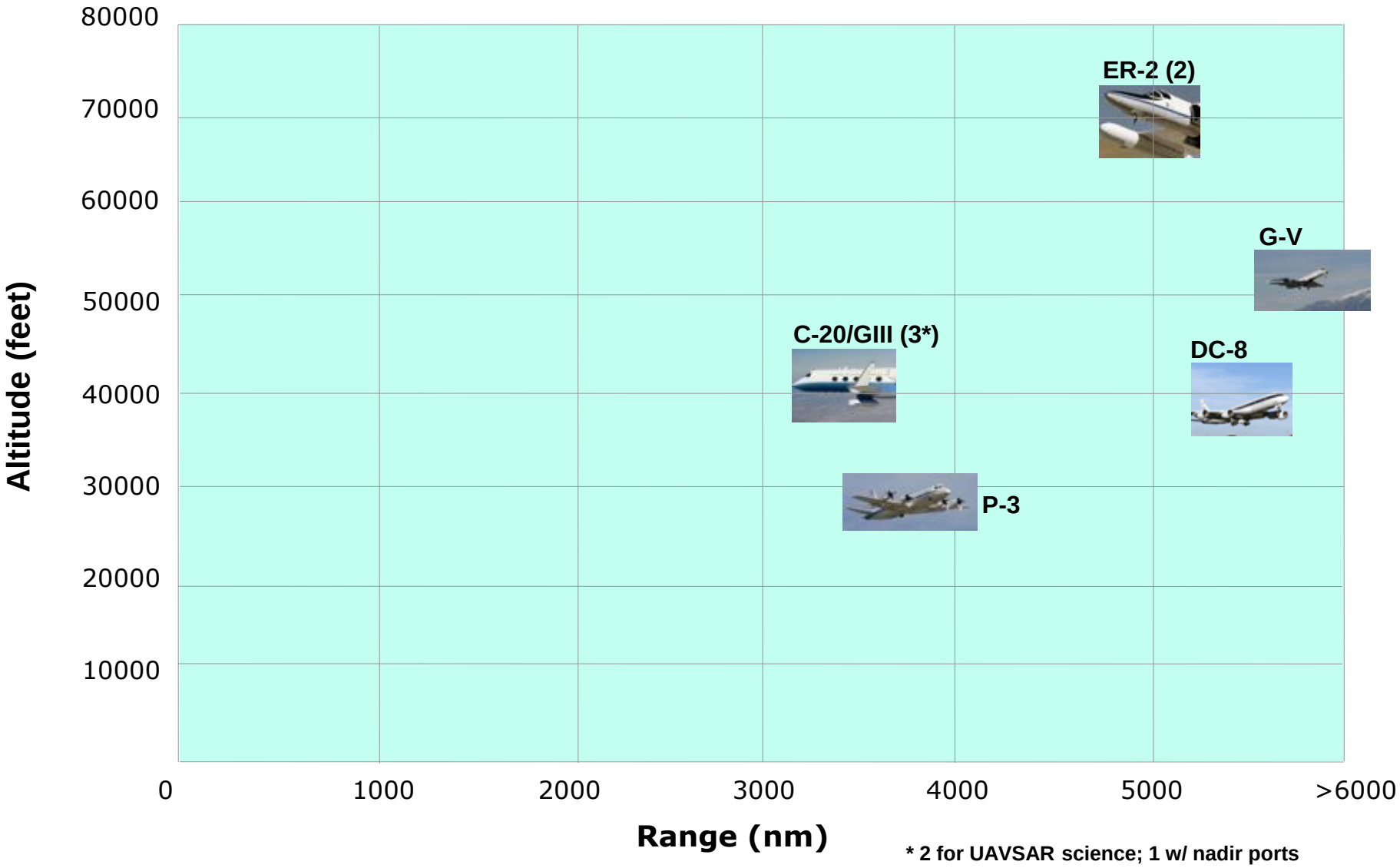
Earth Science Requirements (alt/endurance)

Platform performance required/desired from science community



Note: much more goes into it than just alt/endurance like costs, speeds, platform modifications, stability at altitude, etc

NASA ESD Funded Aircraft



* 2 for UAVSAR science; 1 w/ nadir ports

ASP Funded Aircraft Rationale – Short Version

- Small
  - ASP at this time does not support dedicated small aircraft, multiple aircraft exist within the Agency and are available from commercial providers (Airtec, Dynamic Aviation)
- Medium
  - AFRC C20/JSC GIII: Only aircraft modified for ESD radar systems (L/P/Ka-bands) called collectively “UAVSAR” (**centerline pod structural mods**, onboard precision autopilot (10 meter tube capability) with data systems and operator stations)
  - JSC GV/LaRC GIII: 2 of 3 business class aircraft in the US (not DoD) with modifications for ESD requirements (**two large nadir portals**, operator stations, power, etc)
- Large
  - DC-8: Large, long range, high altitude, heavy lift aircraft in the US with modifications for ESD requirements (nadir portals, radar accommodations, ability for external probes, onboard data systems, power, etc) for up to 30 to 40 scientists in shirt sleeve environment
  - P-3: Large, long range, medium altitude heavy lift aircraft with modifications for ESD requirements (multiple nadir portals, wing pods, attachment points for radar installations, on board data systems, communications, etc) for up to 20 scientists in a shirt sleeve environment
- High Altitude
  - ER-2: High altitude, long range aircraft in the US with modifications for ESD requirements (superpods, Q-bay, nosecone areas, communications systems, power, etc)

2020 Recap

- COVID-Impacted Annual Campaign
  - Scientific investigations returned this summer at a reduced pace following spring shutdown
  - Patchwork set of COVID mitigations strategies and protocols: center-by-center, project-by-project, government-by-government
  - Still flew ~1100 flight hours in 2020
    - ~700 on NASA aircraft, remaining flown with Dynamic Aviation, Twin Otter International, and Kenn Borek Air
  - Aircraft utilized to support other requirements
    - ~700 Gulfstream hours transporting key personnel around the world to support mission critical activities during pandemic
  - Missions flown: ACTIVATE, IMPACTS, numerous UAVSAR objectives, SnowEx, hurricane recovery studies, VIPR, WDTS, COVID methane mapping, OMG sonobuoy

Summary of COVID-19 impacts for EVS-3

COVID-19 Schedule impacts

ACTIVATE: Deployment 1 concluded 2.5 weeks early due to COVID-19 travel and work restrictions. Impacts on science results are not yet known. Deployment 2 conducted mid-Aug to Sept 30, ~ 3 months delayed and shortened duration.

DCOTSS: Test flights rescheduled to 2021
All three science deployments (2020/2021) rescheduled to 2021/2022.

Delta-X: Spring 2020 and Fall 2020 campaigns rescheduled 2021. The high discharge and low discharge campaigns have both been rescheduled to March and September 2021 respectively.

IMPACTS: Deployment #2 delayed till Winter 2022.

S-MODE: Pilot campaign has been delayed until 2021: pilot campaign in April 2021 and the first full campaign in October 2021.

2020 Recap

- Newly appointed NASA airborne science deputies (2)
- Virtual Student Airborne Research Program (SARP) for interns
  - At-home air sampling canisters
  - CEAMS sensors
- DC-8 engines repaired after significant damage was found in all four
  - Aircraft due heavy maintenance before executing 2021 science missions
- GV currently down for display modification and major corrosion repair
  - Horizontal tail removed from aircraft for complete re-skinning
- Partnered with NOAA to use GV as backup aircraft for hurricane dropsonde mission

2020 Recap

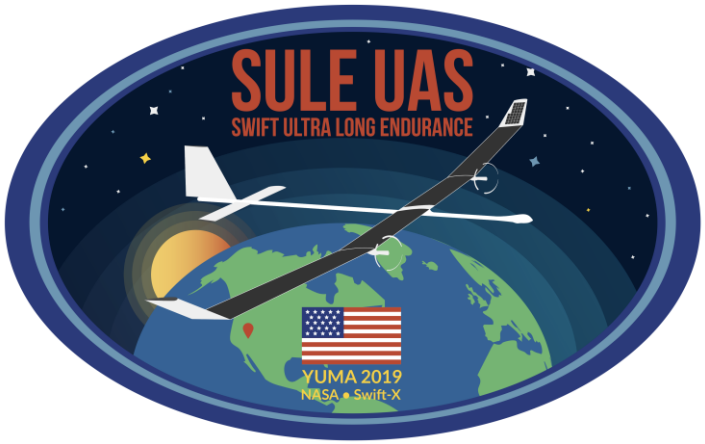
- Fleet modernization efforts
  - Investigating acquisition of G-IV to support large, annual carbon dioxide/methane mapping mission
    - Replace an aging G-III
  - National Academies study on-going assessing the long term need of long range, large volume aircraft to meet science objectives
    - DC-8 and P-3 face potential obsolescence issues within a decade

- Mission Tools Suite (MTS) Version 2 has been released

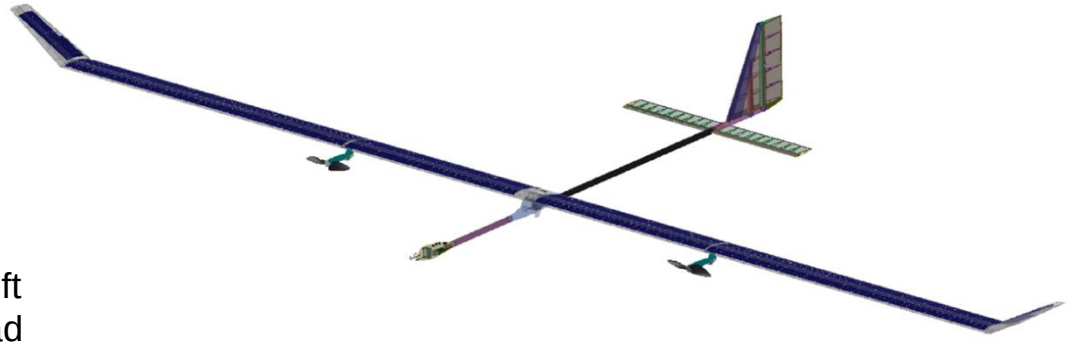
- Next generation onboard IT systems architecture team launched – prototype 6-channel Iridium system prototyped on SHARC

- All core aircraft are “down” (except for disaster response) as teams prepare to support 2021 missions

2020 Highlight



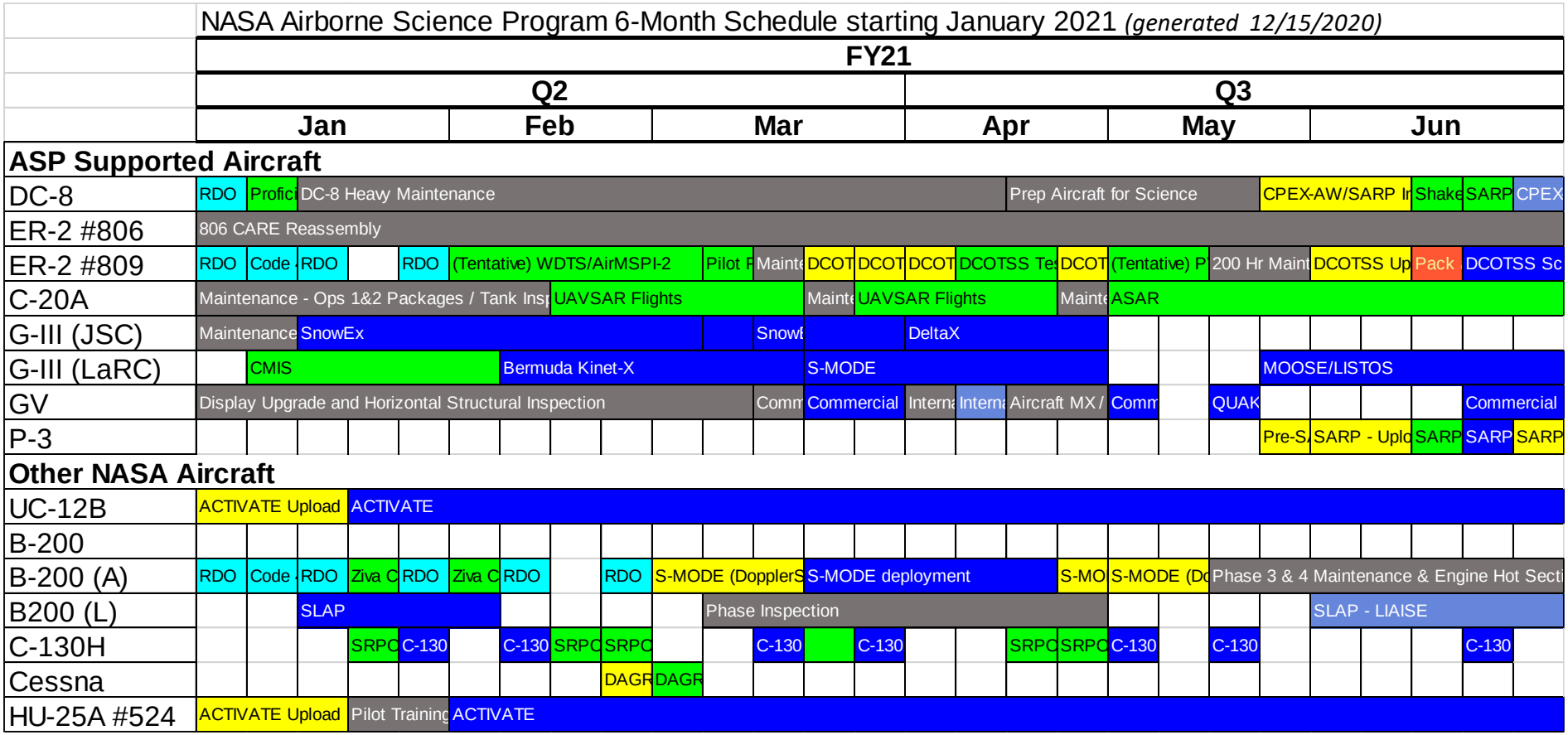
- NASA SBIR funded Swift Engineering to design, build, and test a prototype solar electric platform flying at 70kft for weeks to months with smaller payloads (15-20lbs)
- Provides observations similar to geostationary satellites and can serve as cubesat testbed
- Successful first flight July 2020
- Fire mapping demonstration in Jun-July 2021 jointly with USFS and NASA Ames



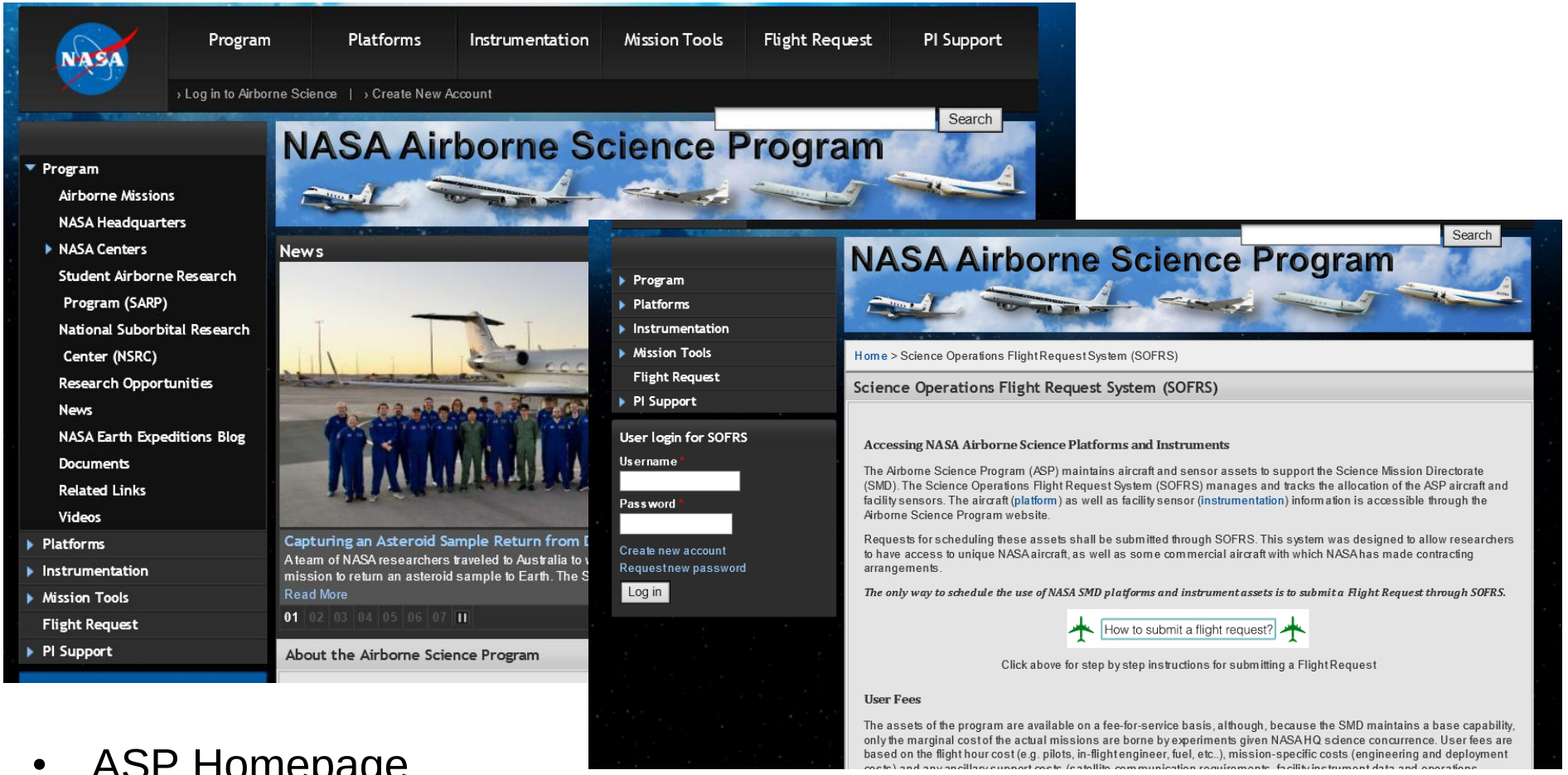
- 30-day @ 65k ft
- 10-15lb payload
- Solar-electric

POC: Andrew Streett (Swift Engineering)

2021 6-Month Flight Schedule



Online Resources



- ASP Homepage
  - https://airbornescience.nasa.gov/
- Flight Request System
  - https://airbornescience.nasa.gov/sofrs/