

### Facility Description

- Next-generation UWKA (UWKA-2) will be available to the community in 2024
- Owned by the University of Wyoming
- Available to the NSF-GEO community through the Facilities for Atmospheric Research and Education (FARE) program as an LAOF Facility.
- Track 1A and 3 Projects

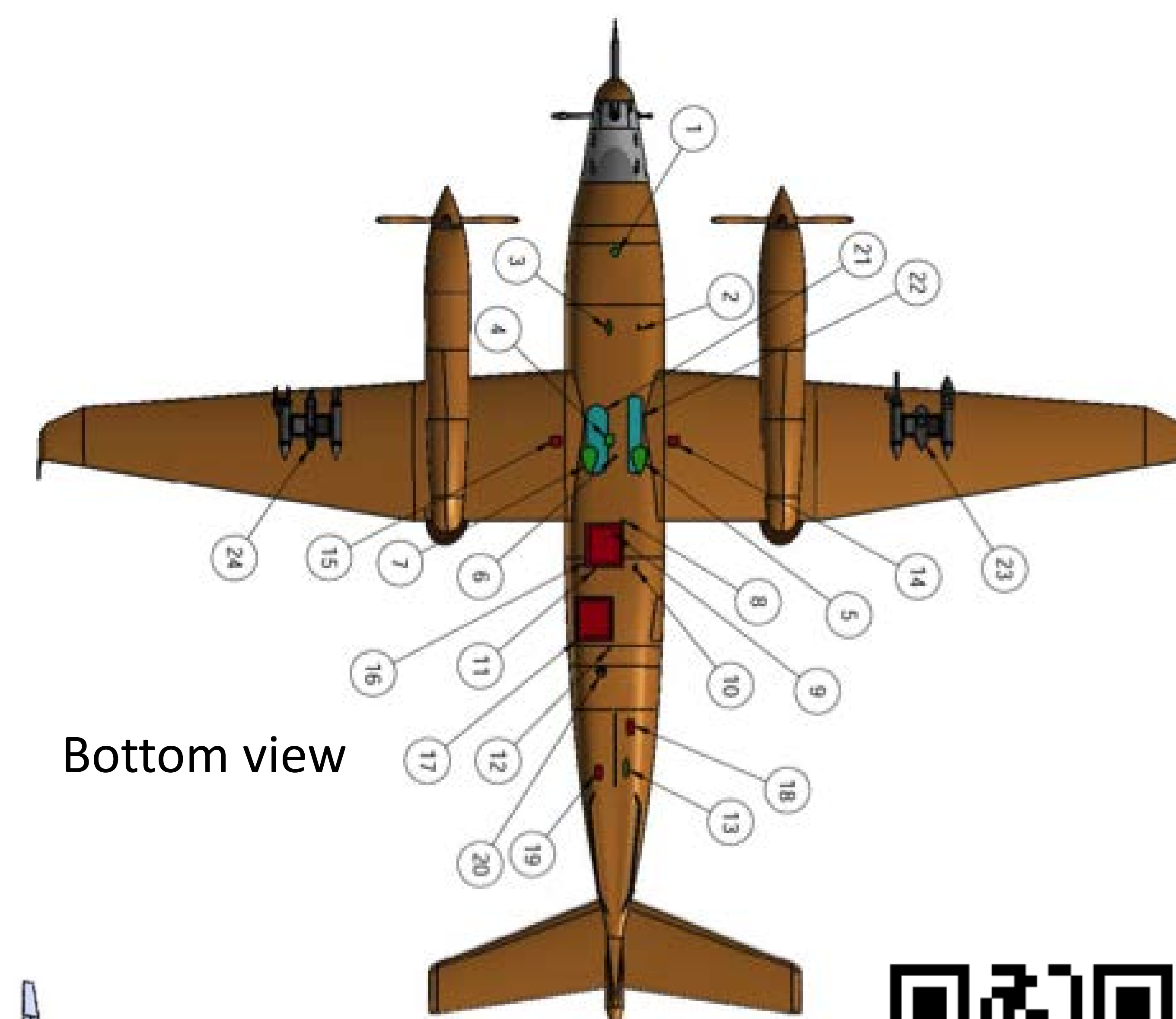
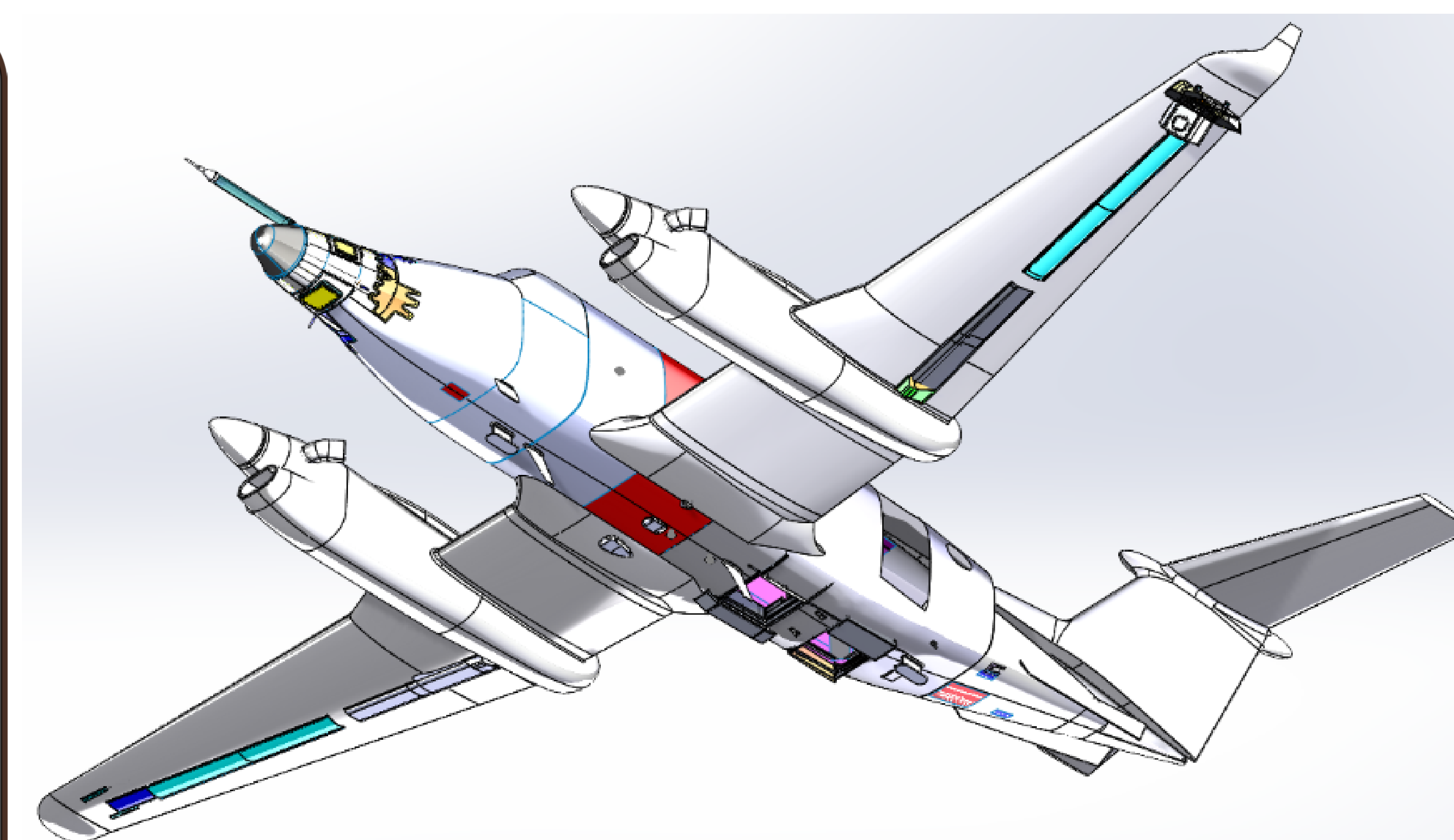


### The new N2UW Aircraft

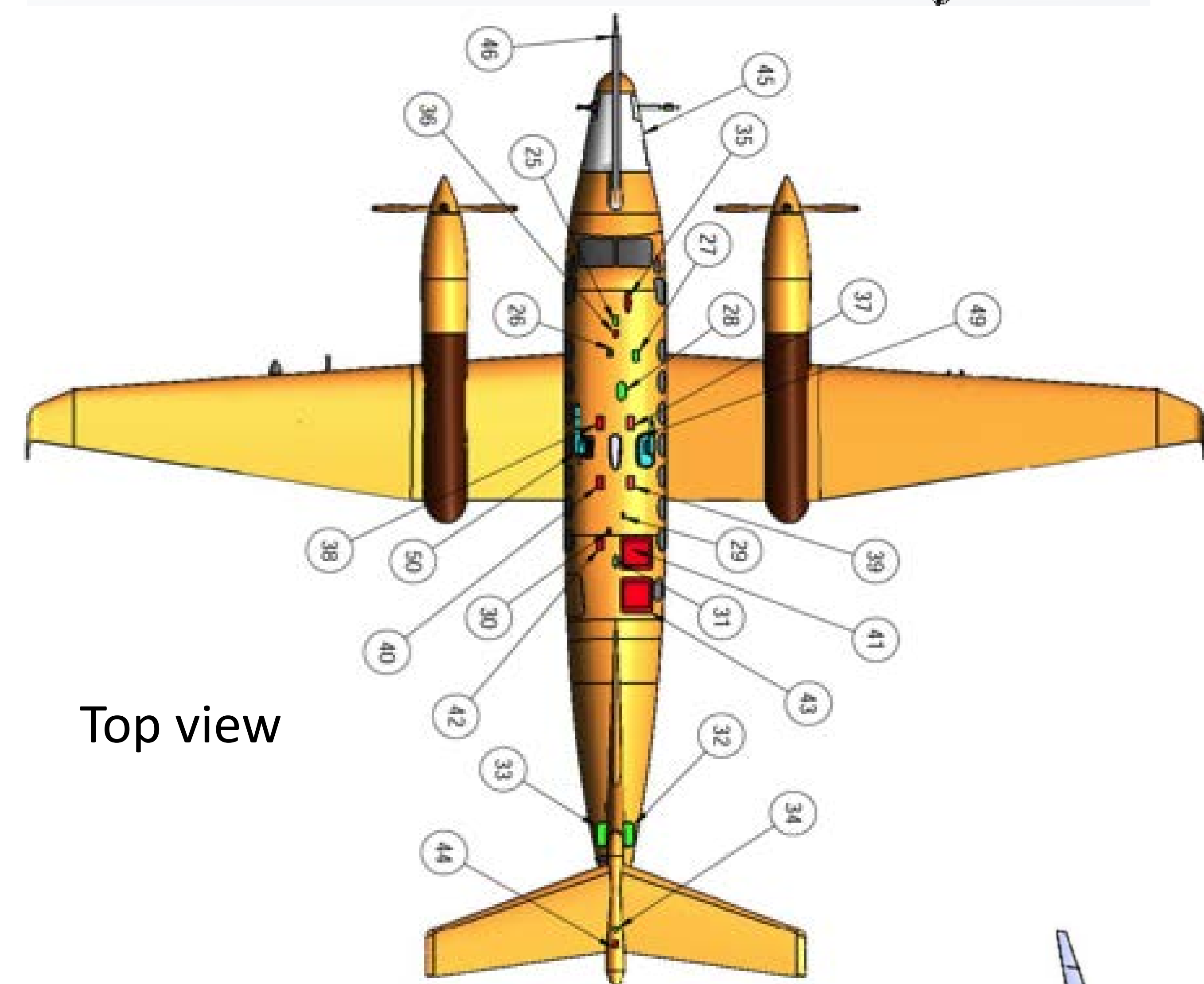
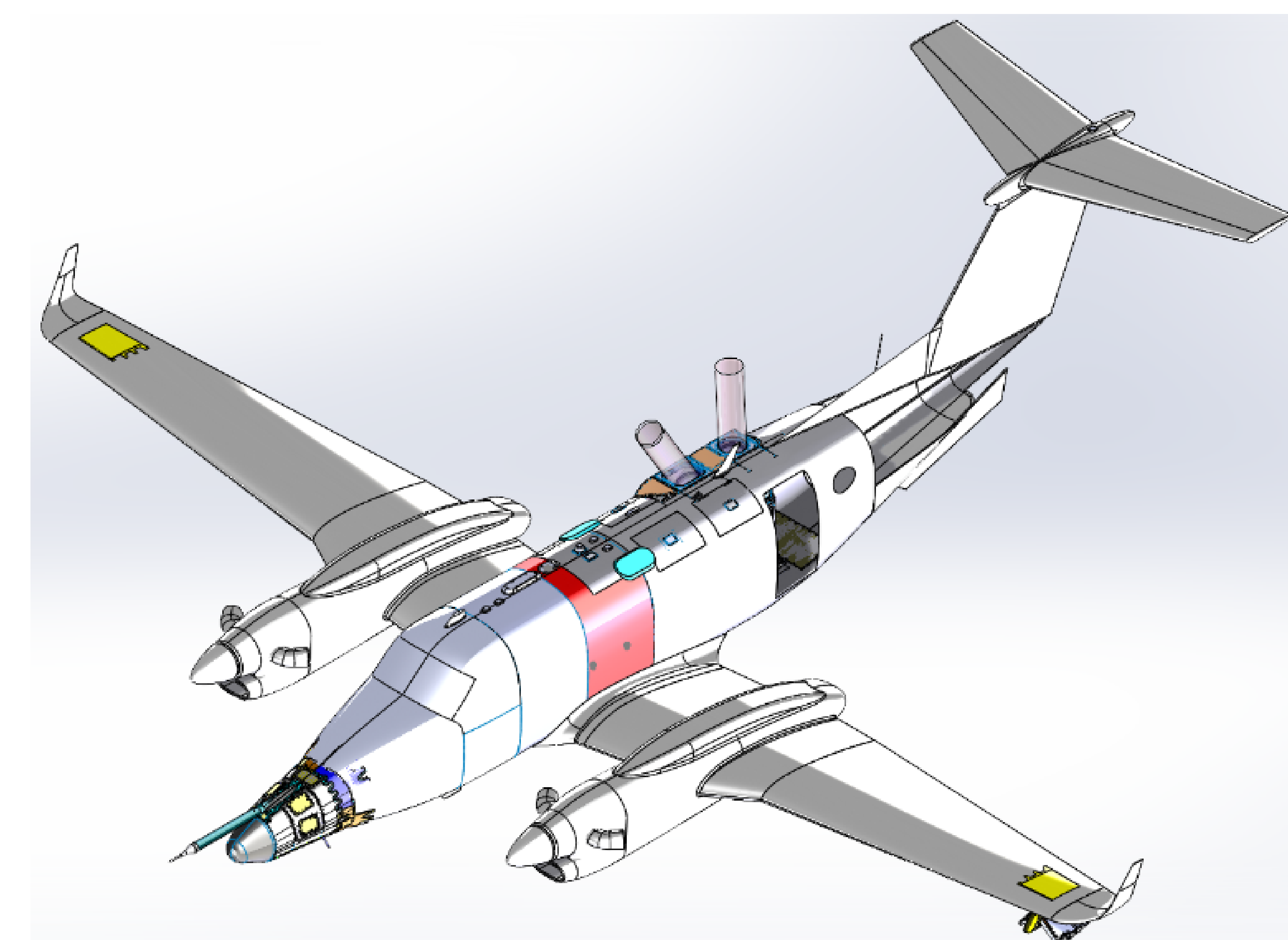
- 2013 Beechcraft King Air 350i
- Blackhawk XP -67A Conversion
- Garmin G1000 Avionics
- Heavyweight Gear Modification
- 16,000 lbs MTOW
- 3-4 Scientific Crew
- 3.1 to 5.4 hr duration
- Up to 2100 nm range (1-way)
- 3100 lbs max Scientific Payload
- Service Ceiling 33,000-35,000 feet

### Scientific Payload Capabilities

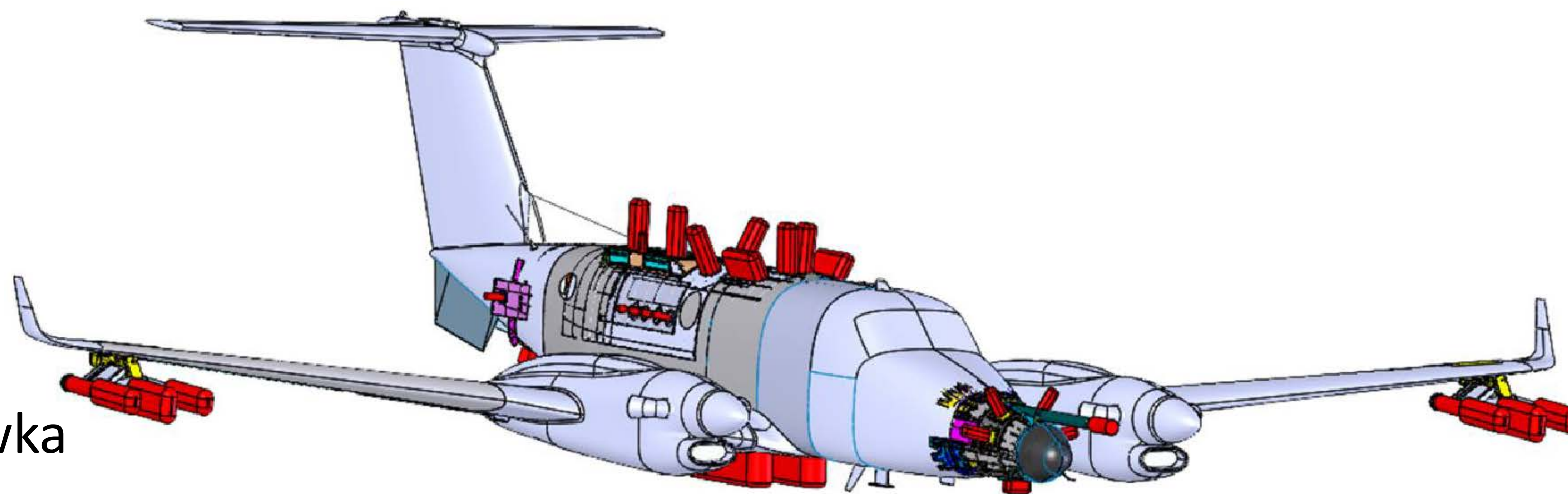
- **Mechanical**
  - Max payload: 2,970 lbs. (3 crew) or 2760 lbs. (4 crew)
  - Payload Volume: 344 Cu Ft
  - Six "PMS" Canisters, 3/wing (center position max 70 lbs.)
  - Two Nadir ports (22" x 19" clear apertures)
  - Two Zenith Ports (13" dia and 18" x 13.5" clear apertures)
  - Six "minor" Zenith multi function ports (5.25" x 3.375")
  - Two zenith aerosol inlet ports (19" x 9")
  - Four belly hardpoints (two pair or in combination)
  - Extended nose w/ radial mounts & nadir compartment
  - Four starboard multi use ports
  - Dropsonde port (2.9" x 6.9")
- **Electrical and Communications**
  - 400A 28VDC 11.3kw Electrical Power
  - 10kw 120VAC 60Hz (max, DC reduced proportionally)
  - Global Satcom (200-700Kbps)
  - 5G data services >4 kft (Domestic)
  - Gate-to-gate WiFi



Bottom view



Top view





# Next-generation University of Wyoming King Air Research Aircraft Facility

## Standard and Requestable Instruments, Data and Display, User-Supplied Instrument Support



### Standard Instrumentation

- True Wind: Rosemount 0858
- Static Pressure: Mensor CPT & Weston
- Temperature (heated): Rosemount 102
- Temperature (fast response, unheated): Reverse Flow PRT
- Humidity: EdgeTech 137 Vigilant
- Humidity: Buck Research 1011C
- Surface Temperature: Heitronics KT15.85
- Liquid Water (hot wire): DMT LWC-301
- Aircraft Position– L1/L2 GPS (opt ~30cm RT corrections)
- Aircraft Attitude – Applanix POS AV 410 v6 w/ IMU-64
- Aircraft state – ARINC 429 & 717 data buses
- Time – EndRun RTM3205 (<10 ns RMS to UTC(USNO))
- Video and Still Imagery: forward & nadir (20FPS)

### Data and Display Capabilities

- Standard 25Hz and 1Hz data products
- NetCDF file support
- 1000Hz Analog (+/- 10VDC) sampling
- Serial and Network sampling
- NTP/IRIG-B/PPS Timing
- IWG1 data broadcast and reception
- Remote connections (VNC, RDP)
- Windows environment for user instrument apps
- PI and Operator displays stations
- Realtime data telemetry (200k, 700k, 5G)
- Cockpit/crew intercom with voice ground link and IRC
- Satcom and realtime position tracking
- Traceable calibration and test equipment

### Requestable Instrumentation

- **Remote Sensors, all fixed antenna, looking up and down**
  - Wyoming Cloud Radar, fixed antennas, nadir & zenith (see separate poster)
  - Wyoming Cloud Lidars, fixed view, nadir & zenith (see separate poster)
  - Ka-band Profiling Radar \*
- **Air Chemistry / Trace Gas**
  - CO<sub>2</sub>/H<sub>2</sub>O (closed Path): LI-COR LI-7000 (20Hz, suitable for fluxes)
  - CO<sub>2</sub>/H<sub>2</sub>O (open path): LI-COR LI-7500 (20Hz, suitable for fluxes)
  - CO/CO<sub>2</sub>/CH<sub>4</sub>/H<sub>2</sub>O: Picarro 2401-M (20Hz)
  - CO/N<sub>2</sub>O: Aeris Ultra\*
  - CH<sub>4</sub>/C<sub>2</sub>H<sub>6</sub>: Aeris Ultra\*
  - H<sub>2</sub>O/NH<sub>3</sub>/NO/NO<sub>2</sub>/O<sub>3</sub>/CO<sub>2</sub>/CO/CH<sub>4</sub>/H<sub>2</sub>O/SO<sub>2</sub>: MIRO Analytical MGA10-GP\*
- **Aerosol Size Spectra / Composition**
  - 0.004 - 3µm: TSI 3775 Ultrafine CPC (1Hz)
  - 0.06 - 1µm: DMT UHSAS (20Hz)
  - 0.13 - 3 µm: Handix POPS (1Hz)
  - 0.1 - 3+ µm: TSI 3010 CPC (1Hz)
  - 0.1 - 3µm (ambient/in-situ): DMT PCASP-100X (25Hz)
  - Inlet (Isokinetic): Brechtel IsoKinetic 0.005-10um, 300LPM @ 100m/s
  - Black Carbon: DMT SP2-XR (100-500 nm Scattering, 50-800 nm Incandescent, mass)
- **Solar Radiation / Albedo**
  - 295 to 385 nm: Eppley UV
  - 285 to 2800nm: Eppley PSP (Nadir and Zenith)
  - 4000-50000 nm: Eppley PIR (Nadir and Zenith)
  - Radiometric IR 7500 - 13500 nm (Nadir): FLIR Vue Pro-R\*
- **LW / Droplet Spectra / Cloud Physics**
  - 2-50 µm DMT CDP
  - 25-1550 µm DMT CIP
  - 0.01-1.28mm SPEC 2DS
  - 0.3-19.2mm SPEC HVPS
  - LWC/TWC: Sky PhysTech Nevzorov Hot Wire
  - 3-50 µm LWC, PSA, Re: Gerber PVM-100A
  - SPEC 3V-CPI\*

\* In Development

### PI Mission-Specific Instrumentation

- **Facility support for:**
  - **Modifications to user-supplied instruments to make them aircraft ready**
  - **Aircraft certification of instruments (Mechanical and Electrical DERs)**
  - **CNC Machining and electrical fabrication**
  - **Racking**
  - **Inlet and sample system development**
  - **Environmental testing**
  - **Project specific data products**
  - **STC enabling lidar installations**
- **User-Supplied Instrument Collaborations**
  - MARLi & CRL (Raman lidar T, q profiles) -- Zhien Wang, Stonybrook
  - PTR-TOF-MS -- Hu, UMt
  - CIMS (Br<sub>2</sub>, Cl<sub>2</sub>, BrO) – Pratt UMich
  - PILS / Impactor – UMich, CSU
  - Flask Sampling – UW
  - CVI – Lance, SUNY
  - Ammonia – Fisher, CSU
  - Ozone – Rheem, Pitt
  - SOF – Volkamer, CU
  - Holodec – UMich
  - MTHP – Lim, JPL
  - Multispectral Imaging – UW

### NCAR EOL Partnerships

- **AVAPS Dropsondes -- Hock**
- **Field Catalog**
- HARP -- Hall
- CO – Campos
- HIMIL Inlet – RAF
- “Chat”

EOL instruments and services require a separate PI request

### Science Mission Capabilities

- |   |                                     |                            |                         |
|---|-------------------------------------|----------------------------|-------------------------|
| • O&G / CAFO Emissions                      | • Eddy Covariance                   | • Atmospheric dynamics     | • Boundary layer        |
| • Air mass composition and characterization | • Wildfire / smoke                  | • Air chemistry & Aerosols | • Air-sea interactions  |
| • Fluxes                                    | • Land Use / Agriculture            | • Severe Weather           | • Atmospheric Radiation |
| • Particulates / Black Carbon               | • Cloud physics, cloud microphysics | • Tropospheric profiling   | • Water Resources       |





# Next-generation University of Wyoming King Air Research Aircraft Facility

## Mission Performance and Planning

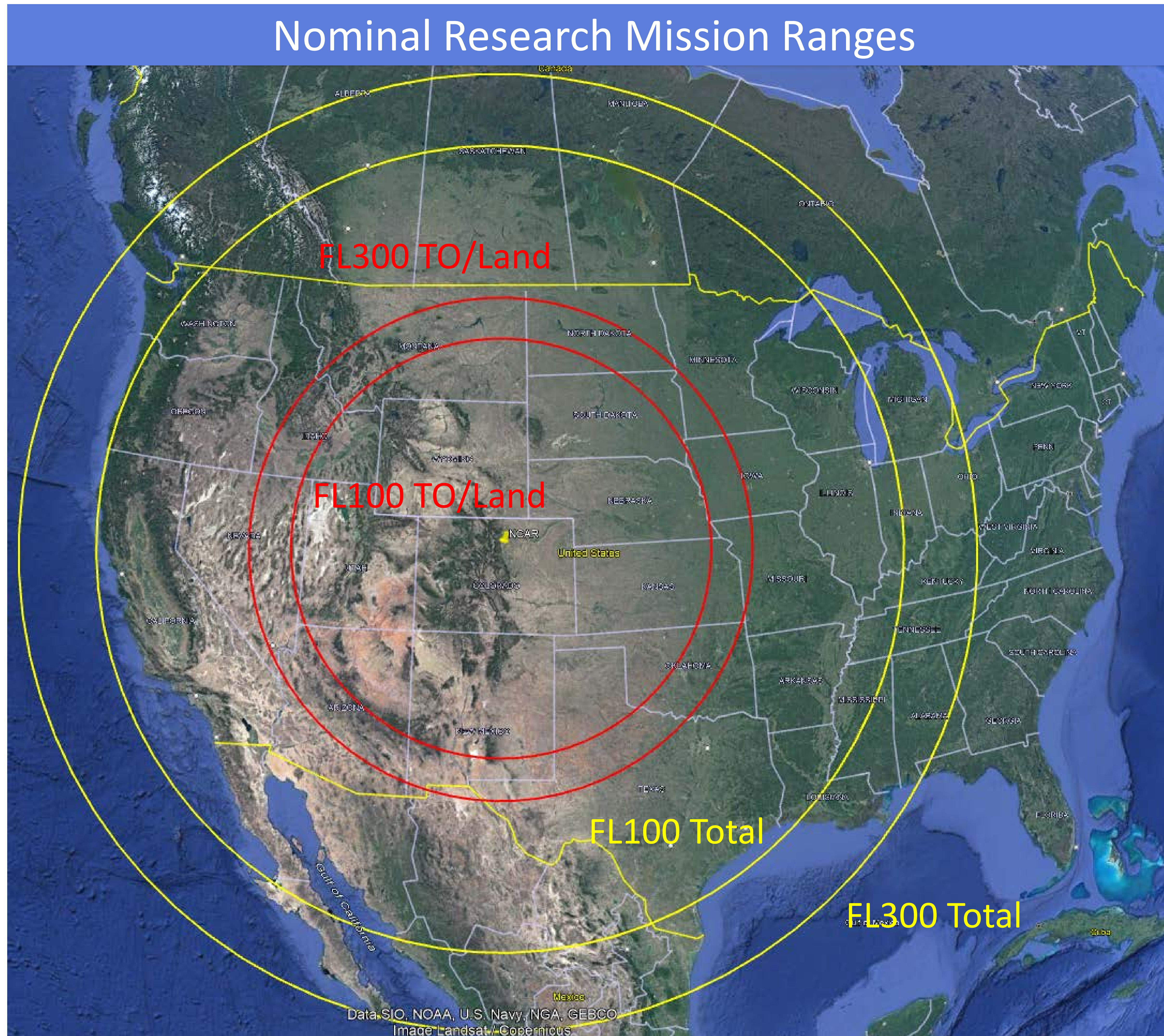


### NSF Projects Supported: 2004 -- 2023

- 37 projects
- 2100 flight hours
- 79 PIs and co-PIs
- 14 states
- 4 countries
- 2 non-UW aircraft

### Aircraft operations

- Domestic
- International
  - Atlantic & Pacific Ferry Possible
- 33,000-35,000 ft ceiling
- 200 ft AGL min operating altitude (w/ waiver and risk assessment)



Performance Metrics (2300# payload, 3900# fuel)*			
ALT [Ft]	Tot. Time [Hr]	Tot. Dist. [nm]	Max Dist. TO/Land [nm]
SL	3.3	677	339
2000	3.4	710	355
4000	3.5	739	370
10000	3.9	866	433
14000	3.9	780	390
18000	3.9	800	400
22000	3.9	840	430
26000	3.9	980	490
30000	3.9	1050	525
34000	3.9	1100	550

• Anticipated mission performance based on manufacturer charts and pre-delivery flight testing. External stores / instruments will reduce these values. These examples are for informational purposes only and should not be relied upon for any formal use. Contact UWKA Facility personnel for project specific guidance.

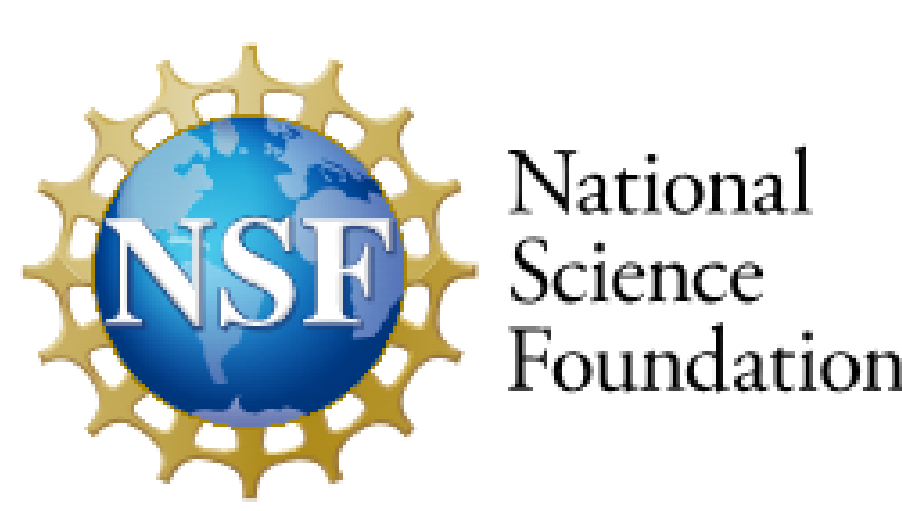
Mission Configuration Performance Metrics*			
	Mission A: Typical Research Payload	Mission B: Maximum Endurance	Mission C: Maximum Research Payload
Payload [lb.]	2300	1300	3100
Fuel [lb.]	3900	4900	3100
Duration w/ Res. [hr.]	4.1	5.4	3.1
Range SL/FL330 [nm.]	760/1560	860/2100	580/1120



[www.uwyo.edu/atsc/uwka](http://www.uwyo.edu/atsc/uwka)

This material is based upon work supported by The National Science Foundation under Grant No. 1917369 & 1935930





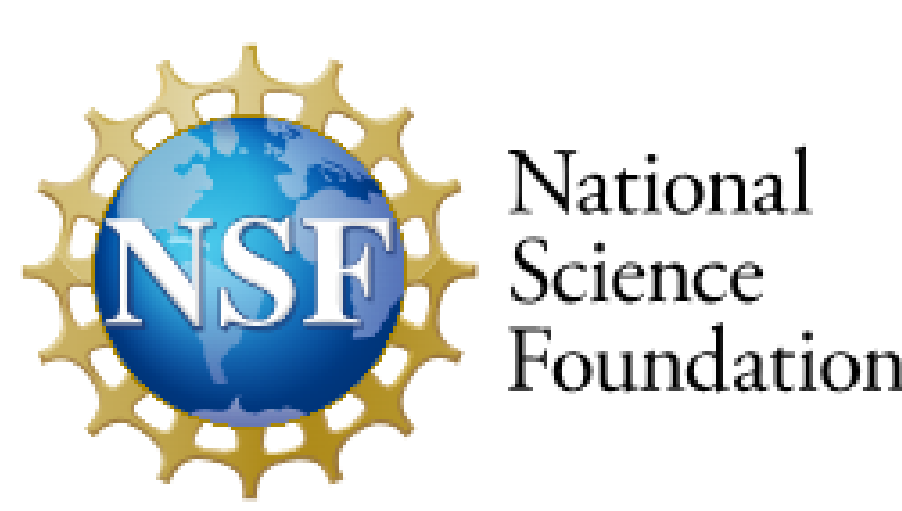
### WCL Nadir-Pointing "Down Lidar"

### WCL2FOV Zenith-Pointing "Up Lidar"

### Lidar Collaborations

*\* In Development*





Example ISO and x-section of cabin with rack and instrument highlights

**IMAGES TBD BY 09/14/2023**

