



University of Wyoming START 2014

Student Training in Airborne Research and Technology

March 26 - April 9, 2014

Photo Courtesy of Erica Diels, dust storm north of Winslow

- [ERAU Summary Report](#)
- [Data and Forms](#)
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- [Flight Track](#) (probably doesn't work under Windows Internet Explorer)
- **Blank Engineering Forms**
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Date/Gnd Notes	Flight # (* .kml)	Status	Times (UTC)	Hours	Crew/Notes
<i>Research Flights</i>					
					T Drew

Apr 08	RF09	Same Pattern as RF08, Worked 5 leg ladder pattern with N-S lines over Prescott. Repeated ladder pattern twice, 10000 and 12000 ft. Conducted sounding at beginning and Low approach at beginning and end. No known instrument problems.	1655 - 2025	3.6	C James L Oolman D White A Wardall
Apr 06	RF08	Worked 5 leg ladder pattern with N-S lines over Prescott. Repeated ladder pattern twice, 10000 and 12000 ft. No known instrument problems.	1701 - 1943	2.8	T Drew T Sestak L Oolman M Powell Z Barkell
Apr 05	RF07	Worked convective clouds on N-S line west of Flagstaff radar from 9000 ft to 18000 ft. Then focused on one cloud cluster making repeated penetrations from 19000 down to 15500. Meridian did not come up on startup (defaulted to Laramie); 4th seat computer did not boot properly--fixed on re-boot. No known instrument problems.	2110 - 0016	3.1	T Drew A Taylor J French T Nguyen K Parsons
Apr 03	RF06	Focussed on comparison between Heiman and Heitronics Surface Temperature measurements. Flew over snow- covered surfaces, lava field, Lake Havasu, desert, and Ponderosa Pine. Also made aerosol measurements downwind of Copper mine/smelter, and conducted Rodi wind calibration maneuvers. No known instrument problems.	1658 - 2029	3.6	T Drew K Parsons J French T Swaggerty T Gaines
Apr 02	RF05	Worked clouds on cross wind legs from 12000 to 18000 ft. Convective bands with ~70% coverage along a given leg. 2DP was down first couple of legs. No other known instrument problems.	2048 - 0048	4.2	T Drew B Davis L Oolman A Kriete G Wachenheim
Apr 01	RF04	Flew missed approach following takeoff--then conducted 12 legs extending from just upwind of the Bradshaw Mountains over the valley to the mountains near Sedona. Focused on sampling trapped lee wave between top of BL and about 15000 ft. No known instrument problems.	1826 - 2303	4.7	T Drew C James J French C Moreno A Herzog
Mar 31	RF03	Flew missed approach following takeoff--then conducted sounding upwind of Granite Mountain from 500 AGL to 26000 MSL. Began Granite Mountain legs, decided to cut flight short during second leg. No known instrument problems.	1725 - 1840	1.3	T Drew L Puckett J French D Ivanova D Baker
Mar 30	RF02	Flew missed approach following takeoff--then proceeded to area of small fire n. or Sedona--3 ladder legs downwind of fire; then sampled clouds between 14500 and 15500 at 3 different altitudes; flew multiple layers to sample dynamics of wave over San Francisco Peaks (15000 to 26000 MSL); last conducted sounding upwind of Granite Mountain from 26000 MSL to about 500 AGL. No known instrument problems.	1623 - 2034	4.3	T Drew E Diels J French M Kibby S Scott
		First research flight--to capture high wind event and clouds. First ~1/3 flight focussed on winds over prescott valley/airport -- flew 5 along wind legs from west of Granite Mtn.			T Drew

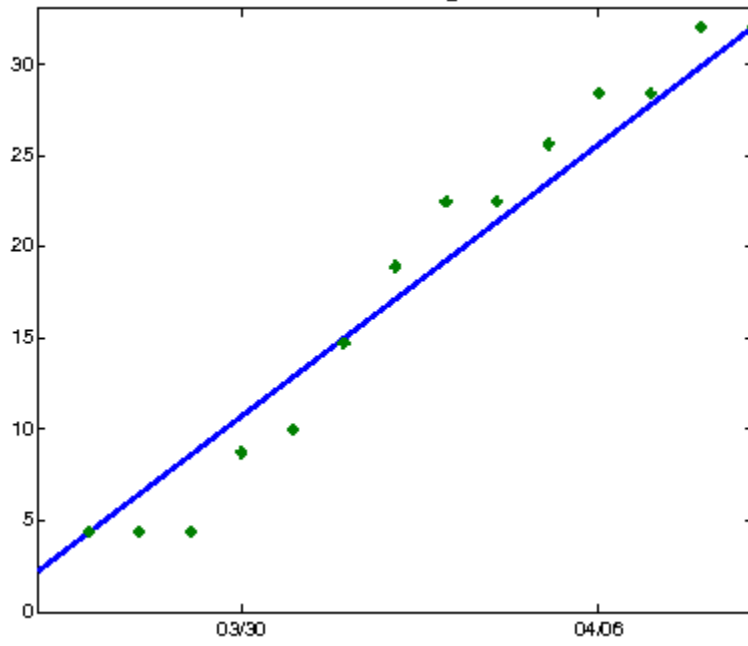
Mar 26	RF01	extending to east of valley. Second 1/3 flight focussed on cloud measurements NW of Prescott. Some cumuliform clouds--quite 'messy'. Third 1/3 of flight focussed on dust storm east of Flagstaff--5 cross wind legs at various altitudes. LICOR inop for first ~15 minutes flight. No other known instrument problems.	1727 - 2144	4.4	M Wetzel J French D Meress D Tabarracci
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Test Flights

Mar 25	TF02	First test flight in Prescott area. Tested airspace/controllers--went good. Tested ground radio comm. Flew S/L legs at 9000 and 11000 MSL s. of Flagstaff. Flew through cumulus buildup and Virga between S/L runs. Too windy/turbulent to conduct Rodi maneuvers. No CIP data recorded (operator error). No other known instrument problems.	1931 - 2025	1.0	T Drew J Testa J French C James L Oolman
Mar 24	FF01	Ferry Laramie to Prescott. INS was off for entire flight (operator error). Ashtech GPS did not provide a good position for the first 15-20 minutes of flight.	1446 - 1647	2.1	T Drew J French L Oolman
Mar 10	TF01	First (and only) test flight in Laramie. All instruments operated OK. (Normal) issues with intermittent 2DP housekeeping variables. No Rodi maneuvers due to high wind.	1636 - 1733	1.1	T Drew P Wechsler L Oolman Z Little

Flight Hours	As of Apr 08, 32.0 out of 32 research hours were flown, 0.0 remain.	Test: 2.1
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START 2014 Flight Hours



4/8/2014 START 14 Pilot notes (Flight 9)

Crew: Tom Drew, Curtis James, Larry Oolman,

Flight Time: 3.6

Objective: Wind/turbulence survey around KPRC

Planned: Low approach at KPRC, Sounding to 17,500 MSL at the west end of leg 1. Then a 5 leg pattern with leg 1 centered on the Prescott airport. First pattern flown at 10,000 ft. MSL, second pattern at 12,000 MSL. Low approach at KPRC and then land.

Actual: Departed KPRC 21, low approach at KPRC on runway 21, then departed to west to do the sounding to 17,500 MSL at the west end of leg 1. Started 5 leg pattern with leg 1 centered on the Prescott airport on west end of leg 1. First pattern flown at 10,000 ft. MSL. Repeated pattern in reverse at 12,000 ft. MSL. Low approach on runway 3 and then land.

START RF09 (2014-04-08)

Tom Drew, Curtis James, Larry Oolman, Davis White, Austin Wardall

Mission: Fly a grid pattern over the Prescott area at 10,000 and 12,000 ft.

1656 Take off, Applanix ok

1700 Low approach on RW21L

1706 Start sounding west of Granite Peak

1712 Slight stable layer at 700 hPa, 10500 ft.

1714 Stable at 650 hPa, 12,300 ft

1723 Done with sounding at FL175

1731 Line 1, FL100, Heading 70 deg mag, T=6 C, DP=-16 C, wind=255 deg true @ 3 kt

1744 Done with line near Sedona

1747 Westbound line 2 five miles to the north, T=6, DP=-20, wind=270 @ 12 kt.

1802 Done. Updrafts tend to be correlated with negative temperature perturbations.

1804 Eastbound, line 3. T=6 C, DP=-17, wind=300 @ 8 kt

1818 Done

1821 Westbound, line 4, T=6 C, DP=-21 C, wind=270 @ 7 kt.

1835 Done, there is consistently a little turbulence at the west end of the lines.

1837 Eastbound, line 5. T=6 C, DP=-13, wind=265 @ 14 kt.

1851 Done

1853 Westbound on line 5, FL120. T=1 C, DP=-18 C, wind=300 @ 2 kt

1908 Done

1911 Eastbound, line 4. T=1 C DP=-15 C, wind=270 @ 11 kt

1924 Done.

1926 Westbound, line 3. T=1 C, DP=-27 C, wind=310 @ 9 kt

1941 Done.

1943 Eastbound, line 2, T=1 C, DP=-15, wind=240 @ 2 kt.

1955 Divert for traffic

1958 Done

2000 Westbound, last line. Positive correlation between vertical velocity and temperature. T=1 C, DP=-27, wind=280 @ 10 kt.

2015 Done with grid.

2022 Missed approach RW03R

2026 Land

4/6/2014 START 14 Pilot notes (Flight 8)

Crew: Tom Drew, Tim Sestak, Larry Oolman, Madelyn Powell, Zack Parkell

Flight Time: 2.8

Objective: Wind/turbulence survey around KPRC

Planned: Low approach at KPRC, Sounding to 17,500 MSL at the north end of leg 3. Then a 5 leg pattern centered on the Prescott airport. First leg flown at 1000 ft. AGL, the rest flown at 6500 MSL. Low approach to runway 12 on line 3. Repeat pattern at 7,500 MSL. Low approach and then land.

Actual: Departed KPRC, low approach on runway 3, flew to the north end of line 3 and completed sounding to 17,500. Flew leg 1 at ~ 1000 ft. MSL. Flew the rest of the legs at ~6500 with variations for terrain (traffic). Flew low approach to runway 12 on leg 3. Reversed pattern and flew pattern at ~7500. Made low approach to runway 30 and then landed on runway 3.

START RF08 (2014-04-06)

Tom Drew, Tim Sestak Larry Oolman, Madelyn Powell, Zach Parkell

Mission: Fly a grid pattern over the Prescott area at two levels.

1701 Take off, Applanix ok

1705 Low approach on RW30

1712 Start sounding from FL052

1717 Lowest dry layer at 680 hPa, FL105

1719 Inversion at 660 hPa FL115, DP < -40C

1723 Moist layer 600 to 550 hPa.

1726 FL175, finished with sounding.

1736 First line at FL080. T=8C, DP=-8C, wind=20 deg true and 12 kt.

1741 West of Granite Mountain

1745 Done with line

1747 Second line, descend to FL065 on line. T=7 C, DP=-9 C, wind 340 @ 14 kt

1751 East of Granite Peak

1757 Done with line, north end is about 1 C cooler than the south end

1759 SE bound on line 3.

1803 Left 360 for traffic

1805 Back on course

1807 Low approach on RW12

1808 Above FL065 over hills.

1810 Done with line

1812 NW bound on line 4, FL065.

1822 Done

1824 SE bound on line 5.

1833 Done

1835 NW bound, line 5, FL085.

1838 Climbing for traffic.

1846 Done, offset 4 miles to west.

1848 Line 4. T=5, DP=-12, wind=340 @ 13 kt

1857 Done

1859 NW bound, line 3

1910 Done

1912 line 2

1916 Maneuver for traffic

1920 Done

1922 Line 1

1932 Done with grid.

1941 Low approach over RW30

1943 Land

4/5/2014 START 14 Pilot notes (Flight 7)

Crew: Tom Drew, Andy Taylor, Jeff French, Tony Nguyen, Ken Parsons

Flight Time: 3.1

Objective: Sample clouds at multiple levels across the wind, starting below cloud base to above cloud tops.

Planned: Fly a fixed line 60 nm long about 40 miles west of the Flagstaff Radar oriented ~NW/SE. Sample area 1000 ft. below cloud base to 1000 ft. above cloud tops at 1000 ft. intervals.

Actual: Departed KPRC VFR and ferried to area near the south end of the line at 9,500 MSL under cloud bases. Turned northwest on the line and then picked up IFR flight plan and climbed to 11,000 ft. MSL. Flew each leg stepping up 1000 ft. until at FL 180. Shortened line by about 10 nm on the south end due to lack of clouds on that end. Offset line to the west 10 nm and repeated a few legs on the new line. Targeted a developing buildup to the west and after coordination with ABQ Center made several ~E/W penetrations from FL 190 to 15,000 MSL. Returned to KPRC.

START-14

RF07

Flight Notes—J French

Crew:

T Drew, A Taylor, J French, T Nguyen, K Parsens

LOD:

B Heesen

Preflight:

Plan—

1. Focus on convective clouds west of Flagstaff radar.

Wx: Partly clouds—convective clouds in entire area—but most intense clouds and virga located in N-S line east of Prescott

Flight:

2110 Wheels up

2115 everything up and running

2126 on south end of line—not much for clouds down here, at 9000 ft; visually looks like many more clouds to the north. This line will be through virga—cloud base appears to be around 12000 ft

2132 upto 11000 ft, working north along line

2144 end leg 1

2147 leg 2 at 12000 ft, still below cloud base; passing through lots of virga

2202 end leg 2

2205 leg 3 at 13000 ft, just below cloud base

2221 end leg

2224 leg 4 at 14000, now above cloud base—still mostly in virga—but passing through a few clouds

2239 end leg

2242 leg 5 at 15000 ft

2255 end leg

225830 leg 6 (offset 5 miles to west from previous—clouds appear to be further west than lower level virga), at 16000 ft; max CLWC on line ~ 0.75 g/m³

2309 end leg, cut short on south end

231230 leg 7 at 17000 ft, CLWC up to 1 g/m³

222350 end leg (cut short on north end)

2327 leg 8 at 18000 ft --- kindof a bust, above all clouds on this line—seeing some clusters that go a bit higher, but not on line

2336 end leg

---decide to try to target an individual cluster and make repeated pens and different altitudes----

2343 Pass 1 at 18000

2347 Pass 2 at 18000

2349 Pass 3 at 19000

2351 Pass 4 at 18500

2354 Pass 5 at 18000

2356 Pass 6 at 17500

2358 Pass 7 at 17000

0000 Pass 8 at 16500

0003 Pass 9 at 16000

000530 Pass 10 at 15500

----END for day----

0016 wheels down

Post Flight:

No known instrument problems.

4/3/2014 START 14 Pilot notes (Flight 6)

Crew: Tom Drew, Jeff French, Ken Parsens, Travis Swaggerty, Travis Gaines

Flight Time: 3.6

Objective: Fly short low-level legs over varying terrain and water. Do wind calibration maneuvers.

Planned: Selected higher elevation area northwest of Flagstaff; lake area near Lake Havisu; desert area 25 miles east of Lake Havisu; and forest area south of Prescott to make short sample runs (with a repeat at right angle). Low approach planned at the Bagdad airport. Wind calibration maneuvers at the end of the flight.

Actual: Departed KPRC, ferried northwest of Flagstaff made ~north/south and ~east pass at 500 AGL and 1500 ft. AGL over target area. Ferried to Lake Havisu at 10,500 MSL. Flew ~southeast/northwest and ~southwest/northeast legs over lake at 500 AGL. Ferried to selected desert area and made ~northeast/southwest and ~southeast/northwest legs at 500 AGL.

Ferried to Bagdad airport and made low approach over the runway. Climbing out to the northeast, picked up strong aerosol signal so decided to turn ~southwest until clear. Then made additional north/south leg across aerosol plume.

Ferried to mountain forest area. Made ~east/northwest legs at about 1500 AGL over mountain.

Climbed to 15,000 MSL and did maneuvers. Descended and returned to KPRC.

START-14

RF06

Flight Notes—J French

Crew:

T Drew, K Parsens, J French, T Swaggerty, T Gaines

LOD:

B Heesen

Preflight:

Plan—

1. Focus on multiple low-level legs over a variety of surface conditions to gather data for Heiman/Heitronics comparison.
2. Missed approach at Bagdad airport to attempt to detect aerosol plume from Copper mine/smelter just upwind of airfield
3. Rodi wind calibration maneuvers

Wx: clear, moderate winds—received light dusting of snow night before.

Flight:

1658 Wheels up

1700 everything up and running

1715 in area of snow on ground, nw of flagstaff

---SNOW-----

~1719 Leg 1 (north-south) ~700 ft AGL over snow-covered field

172145 Leg 2 S→N, ~700 ft AGL

172630 Leg 3 W→E, ~700 ft AGL

Setup for legs slightly higher

1730 Leg E→W, ~2000 ft AGL

1734 Leg N→S, ~2000 ft AGL

173745 Leg S→N, ~2000 ft AGL

----END SNOW----

----LAVA FIELD----

1742 Leg 1, ~500 ft AGL

1745 Leg 2, ~500 ft AGL

---END LAVA-----

---LAKE and LAKE/SHORELINE----

1833 Leg 1, 500 ft AGL (clip shoreline a couple of times on leg—obvious in data)

1838 Leg 2, 500 ft AGL (ditto on the shoreline clip)

184125 Single shore crossing

184450 – 184510 Crossing at ~650 ft AGL

184800 – 184812 Crossing at ~650 ft AGL

---END LAKE----

----DESERT-----

1856 Leg 1, 500 AGL

185745 Leg 2, 500 AGL

190015 Leg 3, 500 AGL

190230 Leg 4, 500 AGL

----END DESERT----

---MISSED APPROACH/AEROSOL SAMPLING---

191645 Low approach, W→E, winds roughly 260 degrees

1918 – 1923 in aerosol plume on CPC (background was ~1500 /cc, in plume 8000 – 10000 /cc)

1926/27 – 193030 second pass through plume

1932 – 193930 third pass through plume

----END AEROSOL-----

----PONDEROSA----

195830 – 200100 Leg over Ponderosa forest

-----END PONDEROSA-----

----RODI WIND CALIBRATION MANEUVERS----

2008 begin Rodi circle right w/ yaw

2010 begin Rodi circle left w/ yaw

2014 begin Rodi circle right w/ speed

201645 begin Rodi circle left w/ speed

---END RODI-----

2029 wheels down

Post Flight:

No known instrument problems.

4/2/2014 START 14 Pilot notes (Flight 5)

Crew: Tom Drew, Brian Davis, Larry Oolman, Adam Kriete, Gretchen Wachenheim

Flight Time: 4.2

Objective: Sample clouds at multiple levels across the wind, starting below cloud base to above cloud tops.

Planned: Decided to target area west of Flagstaff and then move to area downwind of San Francisco Mountains and sample area 1000 ft. below cloud base to 1000 ft. above cloud tops. Prior to takeoff decided to work area closer to the Flagstaff weather radar.

Actual: Departed KPRC VFR and ferried to area near Flagstaff radar at 9,500 MSL under cloud bases. Picked up IFR flight plan and aligned on a radial of the Flagstaff radar perpendicular to the wind (310/130 mag.) about 30 nm line. Stepped up 1000 ft. from 12,000 MSL to 18,000 ft. MSL. (Above cloud tops). Decided to offset southwest 20 nm and repeat stack from 18,000 to 10,000 (almost below cloud base). Repeated last leg at 15,000 MSL. Returned to KPRC.

START RF05 (2014-04-02)

Tom Drew, Brian Davis, Larry Oolman, Adam Kriete, Gretchen Wachenheim

Mission: Fly a stack through convection near the Flagstaff radar.

2048 Take off, Applanix ok

2108 First leg, FL110, heading 300, below cloud base and just to southeast of nexrad echos. Heading into them and showers. T=-9C, DP=-11, wind 215 true at 26 knots

2111 Climb to FL120, T=-12, DP=-13, wind=230@25.

2113 Water on 2D-P window?

2118 Done, 2D-P still bad

2120 SE bound at FL130, T=14, DP=-16, wind 215@21

2122 LWC up to 1 gm/m3

2127 2D-P back

2132 NW bound at FL140, T=-17, DP=-18, wind 230@34 kt

2142 Done

2145 FL150, T=-18, DP=-23, wind=230@27 kt, in and out of cloud tops.

2154 Done

2156 FL160, T=-19, DP=-29, wind 240@47 kt, mostly above cloud and through some fragments. More turbulence at this level.

2202 Clouds higher to NW, clipping a few cloud tops

2206 Done

2208 SE bound at FL170. Still in a few cloud tops. T=-24, DP=-27, wind=230@40 kt

2216 Wind=230@73 kt

2218 Done

2221 NW bound at FL180, T=-19, DP=-45, wind=235@74 kt

2238 SE bound at F180. Starting stack approximately 20 miles SW of previous. Clouds appear less developed. T=-16, DP=-50, winds=230@77 kt.

2246 Done. There were no clouds on this leg.

2249 NW bound at FL170. T=-15, DP=-50, wind=235@75 kt

2257 Starting to hit a few cloud tops on the NW end of the line. Particles on CIP to 500 micron. LWC to 0.2 gm/m3. T=-21, DP=-25, wind=240@35.

2300 Done

2303 FL160, T=-21, DP=-25, wind=240@27 kt. CIP particles to 800 micron.

2311 Done. In cloud most of the leg.

2314 FL150, T-19, DP=-21, wind=240@40 kt. CIP particles to 1200 micron.

2322 Clear below.

2323 Done.

2325 SE bound, FL140. T=-16, DP=-23. Wind=240@26 kt.

2336 FL130, T=-14, DP=-16, wind=220@22 kt.

2346 Done. LWC up to 0.8 in turn.

2348 FL120. T=-12, DP=-18, wind=230@25 kt. Midlevel cloud deck above us with small Cu coming up to our level.

2359 Done

0001 NE bound FL110, T=-10, DP=-11, wind=215 @ 23 kt

0011 Done

0014 FL100, T=-8, DP=-11, winds=240@25 kt

0024 Done

0027 NW bound, FL150. T=-18, DP=-21, wind=220@36 kt.

0035 Done, head back to Prescott

0048 Land

START-14

RF04

Flight Notes—J French

Crew:

T Drew, C James, J French, C Moreno, Herzog

LOD:

B Heesen

Preflight:

Plan—

1. Missed approach after takeoff
2. Fly legs along wind from Bradshaw Mountains towards Sedona and beyond—focusing on wave dynamics

Wx: clear, moderate winds.

Flight:

1826 Wheels up

1829 everything up and running

1831 low approach

Climb to FL140 west of SW Granite to set up for first long wind leg

1842 begin leg 1 → tracking ENE with tail wind, FL140

1857 end leg 1

Descend to 10 kft for return leg

1901 begin leg 2

1932 end leg 2

Decide to offset leg by ~10 miles to the north

1936 begin leg 3, 11 kft

1949 end leg 3

1951 begin leg 4, 12 kft

2012 end leg 4

2014 begin leg 5, 13 kft

2027 end leg 5

2030 begin leg 6, 15 kft

2053 end leg 6

Decide to offset back to south, along original leg line---not as much wave activity on this northern line

2057 begin leg 7, 14 kft

2107 end leg 7

2110 begin leg 8, 15 kft

2131 end leg 8

2133 begin leg 9, 13.5 kft

2144 end leg 9

2148 begin leg 10, 14.5 kft

2209 end leg 10

Conduct mini-sounding between 17.5 kft and 10 kft, on upwind side of Bradshaw mountains

2211 at 17.5 kft, begin descent at ~1kft/min

2218 at 10 kft, end sounding

2221 begin leg 11, 13 kft

2233 end leg 11

2235 begin leg 12, 12 kft

2256 end leg 12

2303 wheels down

Post Flight:

No known instrument problems.

4/1/2014 START 14 Pilot notes (Flight 3)

Crew: Tom Drew, Jeff French, Dorothea Ivanova, Darin Baker, Logan Puckett

Flight Time: 1.3

Objective: Possible high alt cloud sampling north of Page, AZ. Sounding SW of Granite Mountain and then mountain/mechanical turbulence off Granite Mountain.

Planned: Decided to stay local for first flight, (possible second flight to Page). First, low-approach at KPRC, then fly to southwest and do sounding up to FL 260. Then drop down to 10,000 MSL and fly pattern over Granite Mountain and repeat at 12,000 MSL.

Actual: Departed KPRC, made low approach on runway 21L, flew to DRK 225@25 started racetrack sounding (~10 nm), picked up IFR changed to DRK 225@20 made sounding to FL 260 with level-off at 13,000 for ATC coordination. Descended to 10,000 MSL canceled IFR, and started Granite Mtn. line. Completed first leg and part of second. Returned to KPRC.

START-14

RF03

Flight Notes—J French

Crew:

T Drew, D Ivanova, J French, D Baker, L Pucket

LOD:

B Heesen

Preflight:

Plan—

1. Missed approach after takeoff
2. Conduct sounding upwind of Granite Mountain
3. Time permitting, conduct Granite mtn/Prescott airport wind pattern

Wx: clear, light winds.

Flight:

1725 Wheels up

1728 everything up and running, setting up for missed approach

1732 missed approach

1739 descend to lower level and setup for sounding

1741 begin sounding (up) from ~500 ft AGL

1807 sounding complete

Descend to 10 kft to setup for legs over Granite Mountain

181745 begin leg 1 over Granite mountain, along 200 deg Magnetic, 10000 ft

182900 end leg 1

183045 begin leg 2

Decide to cut flight short, RTB

1840 wheels down

Post Flight:

No known instrument problems. Sounding should provide good comparison with radio sonde launched about 1 hour later from ERAU.

3/30/2014 START 14 Pilot notes (Flight 2)

Crew: Tom Drew, Jeff French, Erica Diels, Matt Kibby, Sidney Scott

Flight Time: 4.3

Objective: Smoke sample pattern from wildfire near Sedona. Cloud work near Flagstaff, Sounding SW of Granite Mountain.

Planned: Low approach at PRC, then fly up to wildfire area avoiding TFR and fly perpendicular legs downwind of smoke at 9,500 MSL. Then proceed to cloud area around Flagstaff and do cloud samples at multiple altitudes along a line. Then do sounding SW of Prescott upwind of Granite Mountain.

Actual: Departed KPRC, made low approach on runway 21L, climbed to 9,500 MSL enroute to wildfire, went around TFR and then set 3 perpendicular legs at 9,500 roughly 3 miles apart.

Climbed towards FLG picked up IFR and tried to work cloud field along wind but had to keep shifting to stay in cloud. Flew 12,000- 15,000 MSL.

Then proceeded to San Francisco peak area and set a line roughly 220 magnetic and flew multiple passes stepping up 500 ft. starting at 15,000 ft. MSL and stepping up to FL 180. After FL 180 stepped up 2000 ft. intervals until FL 260.

Then Flew to the DRK 225@25 at FL 260 and did a racetrack descent for a sounding. Then returned to KPRC.

START-14

RF02

Flight Notes—J French

Crew:

T Drew, E Diels, J French, M Kibby, S Scott

LOD:

B Heesen

Preflight:

Plan—

1. Missed approach after takeoff
2. Fly ladder pattern downwind of fire that is between Sedona and Flagstaff
3. Sample clouds
4. Conduct sounding upwind of Granite Mountain
5. Time permitting, conduct Granite mtn/Prescott airport wind pattern

Wx: medium to high clouds, some orographic wave clouds to North and east. moderate winds forecasting to increase in strength through the day.

Shoot for 1700 takeoff – ready earlier than expected so decided to launch early

Flight:

1623 Wheels up

1625 everything up and running, setting up for missed approach

1628 missed approach

1630 proceed to fire location

1638 fire abeam—left side of aircraft (flying with tailwind)

164030 Leg 1 @ 9500 ft, roughly 3 mi downwind of fire

164330 end leg 1

1644(??) begin leg 2 @9500 ft, 6 mi downwind of fire

1648(??) end leg 2

165000 begin leg 3 @9500 ft, 9 mi downwind

165445 end leg 3

Could not really tell in realtime data whether we were seeing any smoke in aerosol probes—note that we were above BL top, so smoke may have all been below our position (but we tried!)

Move on to cloud work

1655 climb up to the clouds to decide an appropriate clearance and pick up IFR

1705 climbing through 13900 – into the base of clouds

1706 near the tops at 15500

171130 leg 1 → more or less clipping through tops of a Strato-cu –type cloud—maybe setoff by orography or gravity wave??? 15500 ft

171700 end leg 1

171815 begin leg 2 at 15000 ft

172215 end leg 2

172300 begin leg 3 at 14500 ft, clouds become more 'spotty' at this level

173000 end leg 3

1732 conduct another leg (4) at 15000 as we fly north towards San Francisco Peak to look for potential wave

173530 end leg 4

1742 over top of peak→turn into wind to get on upwind side

1746 begin leg 1 @ 15500; nice strong single wave feature with 8 m/s down draft on lee side (flight downwind)

???? end leg 1

175600 begin leg 2 @ 16000, upwind

180830 end leg 2

181100 begin leg 3 @ 16500, downwind

181445 end leg 3

181715 begin leg 4 @ 17000, upwind

182900 end leg 4

183200 begin leg 5 @ 17500, downwind

183600 end leg 5

183830 begin leg 6 @ 18000, upwind

185145 end leg 6

185500 begin leg 7 @ 20000, downwind

185840 end leg 7

190150 begin leg 8 @ 22000, upwind

191330 end leg 8

191700 begin leg 9 @ 24000, downwind

192030 end leg 9

192430 begin leg 10 @ 26000, upwind

193730 end leg 10—end study of wave

Ferry to location upwind of Granite Mtn for sounding

200100 begin sounding at 26000

202300 end sounding at ~500/1000 AGL

2034 wheels down

Post Flight:

No known instrument problems. Good flight for wave over San Francisco Peak, OK for clouds, should have nice sounding comparison with radio-sonde launched at ERAU.

3/26/2014 START 14 Pilot notes (Flight 1)

Crew: Tom Drew, Jeff French, Melanie Wetzell, Davey Meress, Dante Tabaracci

Flight Time: 4.4

Objective: Mechanical turbulence/Wave off Granite Mtn., Cloud work/wave near Flagstaff, possible dust storm to the northeast (Chinle Area).

Planned: Low approach at PRC, 5 leg pattern centered on Granite Mountain at 10,000 MSL (except 5th leg lower) then ferry to Flagstaff and do cloud work (possible wave?).

Actual: Departed KPRC, made low approach profile on runway 21, climbed to 10,000 MSL flew 4 leg pattern (on 200-020 mag.), flew 5th leg at 6000 ft. MSL (~1000 ft. AGL).

Picked cloud field to the NW (vs. FLG area). Worked cloud field 12,000 – 15,000.

Ferried to FLG at 15,000. No wave at FLG, but noticed big dust storm NE. Ferried to dust storm and flew 5- SE-NW (140-320 mag) legs across storm with approximately 10 nm legs separation, in and above dust. Completing the last leg we returned to KPRC.

START-14

RF01

Flight Notes—J French

Crew:

T Drew, M Wetzel, J French, D Meress, D Tabarracci

LOD:

B Heesen

Preflight:

Plan to fly pattern over Granite Mountain and east over the valley and near the airport to look at effects of flow over and around mountain, potentially mechanically-generated turbulence in the Prescott valley and near the airport.

Following that study, will proceed to the north to capture either clouds or an expected dust storm.

Wx: strong winds, gusty, some shallow convective clouds, mainly well north of the airfield—do not appear to be producing precip.

Flight:

1727 Wheels up

Applanix stayed up during takeoff. Note that LICOR data is all bad—flows are zero.

1734 after takeoff remain in pattern and conduct missed approach, wheels & flaps up

1738 at 10 kft, wind at 200 magnetic, setup for first of 5 'along-wind' legs, beginning on SE side and working NW'ly with each leg, roughly 2 miles between legs

1745 LICOR is fixed—flow switch was in off position

1744(?) begin leg 1, tailwind

1755 end leg 1

1757 begin leg 2, against wind

1811 end leg 2

(from leg 1 and 2 – just downwind of airport and through the rest of the downwind leg, very turbulent with lower horizontal wind. Upwind of this—air was fairly smooth, with a single wave)

1812 begin leg 3, 1822 end leg 3

1824 begin leg 4, 1839 end leg 4

Setup for last leg at ~1000 ft AGL (average) – try to fly this at 6000 ft MSL, constant

1841 begin leg 5, 1852 end leg 5

End patter → head NW to chase clouds

1903 → 1940 make some cloud penetrations at altitudes from 13000 to 16000 ft MSL → clouds very messy and difficult to work—decide to give up—and head NE towards Flagstaff.

1955 note dust storm source region east-northeast of Flagstaff—decide to setup for cross wind legs at different altitudes above and in storm

2000(?) Leg 1 across wind at 13500 – above dust layer—near upwind (source) edge

2009 end leg1

Proceed downwind ~10 nmi., descend to ~1000 ft AGL for second leg

2012(?) begin leg 2 (6100 MSL)

2020 end leg 2 – lots of counts on PCASP—dust actually showing up on CIP!!!

2024 begin leg 3 at 10 kft MSL

2031 end leg 3

2035 begin leg 4 (13500 ft, more or less on top)

2042 end leg 4

2045 begin leg 5 at 12000 ft, 2054 end leg 5

Return to Prescott

2144 wheels down

Post Flight:

LICOR inop first ~15 minutes. No other know instrument problems/issues

3/26/2014 START 14 Pilot notes (Test Flight 2)

Crew: Tom Drew, Jared Testa, Jeff French, Larry Oolman, Curtis James

Flight Time: 1.0

Objective: Fly sample run to east side of Flagstaff to possible prescribed burn area (later in the week) to get a baseline. Do wind calibration maneuvers. Check out ERAU practice areas and local features and procedures with ERAU Chief.

Planned: Fly sample run to east side of Flagstaff to possible prescribed burn area later in the week at 11,000 MSL and 9,000 return. Find area of smooth air, do wind maneuvers. Possible cloud penetrations near FLG.

Actual: Took off 21, right turnout, joined sample line to FLG at 11,000 MSL. Reaching end of line at FLG, picked up IFR and climbed to FL 190 east of FLG. Descended and resumed VFR and returned on line at 9000 ft. MSL. Landed Runway 3.

START-14

TF02

Flight Notes—J French

Crew:

T Drew, J Testa, J French, C James, L Oolman

LOD:

B Heesen

Preflight:

Plan on 2 S/L legs SW to east of Flagstaff, Rodi maneuvers for winds, radio check with ground, 'checkout' airspace and exercise ATC communication, etc

Plan to be airborne around 1145, expect ~1 hour flight.

Wx: moderate winds, gusty, convection in area w/ relatively high cloud base and virga (no precip reaching ground)

Flight:

End up delaying takeoff—just because we weren't ready with pre-flight brief, etc.

1931 Wheels up

1939 on S/L leg at 11 kft (tracking NW)

1949 end S/L leg –located East of Flagstaff

Decide to climb into clouds east of San Francisco peak to get some cloud data. Will climb to 19 kft, get cloud data, then descend back down to do second S/L leg tracking back towards Prescott.

1950 – 1958 flight through some virga and clouds—mixed phase clouds, and some fairly high CLWCs

2006 begin line at 9 kft, tracking to SW, towards Prescott. NOTE-smoke from controlled burn visible well off of right wing, located NW of downtown Flagstaff

???? end line

2025 wheels down

Post Flight:

Did not conduct Rodi maneuvers because winds strongly influenced by local thunderstorm effects.

CIP data not recorded due to operator error.