

Deployable Instruments - Laramie Based - Research
Test flights (DILBERT)
University of Wyoming King Air Research

Summary

DILBERT consists of a set of test flights based in Laramie to test the in-flight functionality of new equipment, and to characterize data received from new instrumentation and compare results of old vs. new systems to identify potential problems.

-  [UWKA flight planning and tracking tools](#)
- [Convert Google Earth points to way points](#)

Date	Flight # (*.kml)	Status	Times (UTC)	Hours	Crew/Notes
21 Oct 2021	RF12	Did wind calibration maneuvers at two altitudes. There may have been too strong of waves for a good result.	1835- 1952	1.4	Ed Sigel Larry Oolman Anna Robertson
20 Oct 2021	RF11	Did wind calibration maneuvers. The Rosemount temperature was not on	1831- 1858	0.6	Tom Drew Anna Robertson Larry Oolman

Order DILBERT Data

- King Air 1 Hz files
- King Air high rate
25 Hz files

User Information

- Planning Chart
- EOL Facilities
- Software
Repository
- Projects & Data
Requests
- Planning and
tracking tools
- Facility User's
Guide

		aircraft.			
6 May 2021	RF10	Check for engine contamination at radar wing and large nadir port. The time server failed to come up. Initially, the CPC was on the wrong channel.	1932-2055	1.5	Brett Wadsworth Anna Robertson Larry Oolman Brent Glover
30 Apr 2021	RF09	Maneuvers in clear air to test pitot & inlet measurements at L1, and measurements at L2 inlet following new valve installation to prevent contamination.	1658-1852-	2.0	Tom Drew Anna Robertson Dave Plummer Zane Little
29 Apr 2021	RF08	Mission was to map out flow above the L1 port and to check for engine contamination at the L2 port. Found that the value on the R1 port was vented to the cabin when closed. Results of RF06 and	1535-1628-	1.0	Ed Sigel Anna Robertson Larry Oolman Zane Little

Facility Instruments

- In Situ
- Wyoming Cloud Radar
- Wyoming Cloud Lidar

Contact

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Facility Manager:

Jeff French



		RF07 are invalid.			
12 Apr 2021	RF07	Maneuvers in clear air to test two inlet locations (L1, nadir port) for exhaust contamination compared to standard inlet (R1). No time server lock.	2025-2117	1.0	Tom Drew Anna Robertson Dave Plummer Brent Glover
31 Mar 2021	RF06	Maneuvers in clear air to test two inlet locations (radar wing, L2) for exhaust contamination compared to standard inlet (R1). Li-7000 lost power, no data recorded.	1618-1751	1.6	Brett Wadsworth Anna Robertson Dave Plummer Brent Glover
23 Mar 2021	RF05	KPR flight. Ran PP and QPR modes upward at minimum IFR altitude and downward above clouds at FL170.	1752-1927	1.7	Tom Drew Yishi Hu Anna Robertson Larry Oolman
13 Mar 2021	RF04	KPR flight. Returned to base when pilot windshield deice	1753-1837	0.8	Ed Sigel Mohammad Astaneh Larry Oolman Anna Robertson

		malfunctioned.			
5 Mar 2021	RF03	Aerosol flight with inlets facing forward. Included wind calibration maneuvers. No AV images.	1738-1849	1.3	Tom Drew Anna Robertson Larry Oolman Harrison Rademacher
24 Feb 2021	RF02	Flight to Greeley to test the UHSAS and SP2 in higher aerosol concentrations. This was followed by high altitude legs at FL200 and FL230 to test the performance of these instruments at high altitude. The airspeed was varied on the FL200 leg to look at the clear air power on the LWC301. The flight concluded with a vertical stack near Scottsbluff to test modes on the KPR.	1848-2118	2.6	Brett Wadsworth Anna Robertson Larry Oolman Harrison Rademacher
		No LWC301, IWG1			

12 Feb 2021	RF01	forwarder software was not installed on the new display. No Licor 7000 data for this project. The outlet was used by the aerosol instruments. There are only upward radiometers, the downward ones were uninstalled for the wing bolt inspection.	1807-2052	2.8	<p>Ed Sigel Anna Robertson Larry Oolman Harrison Rademacher</p>
Flight Hours		As of Oct 27, 2021, 18.3 hours were flown.		Test and Ferry: 0.0	

10/20/2021 Pilot notes (DILBERT21 RF11)

Crew: Drew, Robertson, Oolman

Flight Time: .6

Planned:

Depart NW climb out of bumps and complete one set of Wind Calibration Maneuvers.

Actual:

Departed Laramie to the NW and climbed to 16,500 MSL. Completed wind calibration maneuvers and returned to Laramie.



DILBERT RF10 - 6 May 2021

Crew: Brett Wadsworth, Anna Robertson, Larry Oolman, Brent Glover, Zane Little (LOD)

Look for engine contamination at the radar window and large nadir port. Time server not coming up even though the Meinberg NTP monitor says it has a lock.

- 1932. Take off
- 1940 CPC was on wrong channel
- 1945 FL165, on port R1, straight and level. CPC=170, CO₂=413.8, CO=0.079
- 1948 End
- 1949 Radar wing, straight and level. CPC=157, CO₂=414.0, CO=-0.077
- 1951 Porpoise
- 1953 Yaw circles
- 1958 Climb to FL168, CPC=140
- 2020 Descend to FL162, CPC=116
- 2002 CPC back to about 140, reverse course to see if clean aerosol air still there, it is. CPC=104
- 2006 Spike in CPC but we are downwind of where we did circles
- 2008 Back to FL165,
- 2012 90/270, a couple spikes: our own wake?
- 2017 Back to R1, CPC=110, CO₂=415.4, CO=0.078
- 2021 Climb to FL170
- 2022 On R1, straight and level, CPC=135, CO₂=414.3, CO=0.078
- 2026 On nadir port, CPC=120. CO₂=415.6, CO=0.085
- 2028 Porpoise
- 2029 On serial channel monitor, COM5 and higher dropping out frequently
- 2031 Yaw circles
- 2033 Blip on CPC, but we are downwind of own exhaust
- 2036 Turn towards south

- 2037 Straight and level
- 2039 90/270
- 2043 Back on R1
- 2046 Done, go home
- 2049 FL142, in higher CPC counts
- 2054 Land

4/30/2021 Pilot notes (RF9)

Crew: Drew, Robertson, Plummer, Little

Flight Time: 2.0

Planned:

Fly straight and level at 16,500 MSL while they run through various extensions of pitot. Turn around before we get too far away. Then after they switch to another port do some gentle porpoise's (+/- 300 ft. @ 500 fpm). Then make two 90/270 turns @ 45 degrees bank, then two 360's L/R with yaws.

Actual:

Departed Laramie and climbed to 16,500 MSL flying straight and level towards Alcova. About 70 nm northwest of Laramie reversed course. About 20 southwest of LAR reversed course again going about 60 nm northwest of LAR before reversing course again. Made two 300 ft. altitude changes above and below at approximately 500 fpm. Then made two 360's left and right standard rate turns with yaws. Then did a left and right 90/270 @ 45 degrees bank then straight and level before returning to Laramie.



Project: DILBERT-21

30 Apr 2021

Flight: RF09

Notes:

Flight to test L2 inlet + pitot & inlet measurements at L1 in clear air, after new valve installation to prevent sampling cabin air. Sampling included measurements with the L1 pitot at various incremental lengths, and the L2 inlet measuring over various maneuvers, with background measurements made from the R1 inlet numerous times to establish background values. Li-7000 was set up to record cabin air for reference just for this flight, with the Li-7500 added for background atmospheric measurements.

Crew: Drew, Robertson, Plummer, Little; LOD: Mahon.

Flight Summary:

UTC Comment

Wheels up. Climbing to 16.5 kft for measurements.

1705-1711 Sampling from R1 inlet, background CO2 values ~415 ppm (~800 in cabin), CPC 200-250/cc.

171130 Switching to the extendable pitot at L1.

171235-172528 Slowly extending pitot from minimum to maximum length.

171735-171800 Reference measurements with pitot fully extended.

Incremental pitot extensions, from maximum to minimum:

#1 (unlabeled) 171800-172000

#2 (unlabeled) 172012-172212

#3 (unlabeled) 172226-172426, followed by turning to reverse along track.

#4 (unlabeled, estimate 16" extension) 172810-173010

#5 (15 3/4") 173035-173235

#6 (15") 173255-173455

#7 (14") 173510-173710

#8 (13") 173728-173928

#9 (12") 173946-174146

#10 (11 1/4") 174201-174501

#11 (10") 174514-174814

Background measurements from R1, 174910-175110, then turn to reverse course.

#12 (9") 175510-175710

#13 (7.8") 175730-180030

#14 (7.2") 180044-180344

#15 (6") 180400-180600

#16 (5") 180614-180814

#17 (4") 180833-181033

#18 (3") 181047-181247

#19 (2.4") 181254-181454

Background measurements from R1, 181510-181810, then turn to reverse course.

Measurements from L2 port:

182120-182420 Background measurements.

182430-182910 Porpoising maneuvers to +/- 300 ft.

182930 Begin yaw portion of wind calibration maneuvers.

183455 Begin 45-degree 90-270 turn, starting left.

183625 Begin second 90-270, starting right.

1838-1842 Background measurements (note brief inadvertent altitude change early on).

184230-184530 Background measurements from R1, then return home.

1852 On the ground.

4/29/2021 Pilot notes (RF8)

Crew: Drew, Oolman, Robertson, West

Flight Time: 1.0

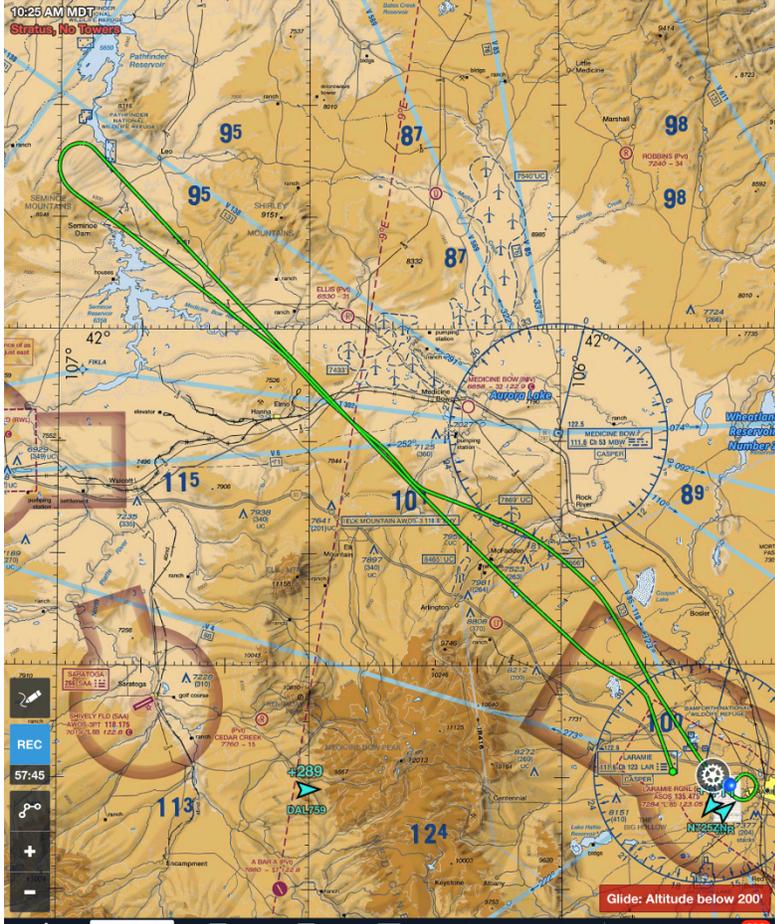
Planned:

- Climb to 170
- Straight/Level R1-3 min
- Straight/level Pitot test 30 min
- S/L R1-3 min Switch to L@ inlet
- S/L -2min
- Porpoises-2 sets +/- 250 feet
- Rodi maneuvers
- 2 90/270 at 45 degrees left and right
- S/L R1-3min
- Return to LAR
-

Actual:

Flew to north towards MBW and picked a heading that we could fly for about 30 minutes without having to turn. Climbed up to 170 VFR. Flew for approximately 28 minutes Strait and level and then Cory discovered a leak in the system and we returned to LAR. Aircraft worked well and the flight went well.

Thanks Edward Sigel



DILBERT RF08 - 29 April 2021

Crew: Ed Sigel, Anna Robertson, Larry Oolman, Cory West, Brent Glover (LOD)

Map out flow at the L1 port

1536 Take off

154400 FL170, measuring R1, CPC 220,

154530 CPC peak to 620

174900 Done with R1

155000 Slowly raise inlet

154140 Slowly lower inlet, weird: CPC constant near 1850, no change in pitot

155420 Run to top again, no change. Ending L1 test

155630 Back on R1, CPC back down to 440

155950 On L2, CPC back to 1880, Picarro 795

160240 Done with that test.

160355 R1 and L2 both open, numbers low

160500 Partially close R1, can feel leak through hole in side of valve

160500 closing leak with finger, number bouncing. After the flight, found that the valve used is vented to the cabin.

1606 Head home

1629 Land

Project: DILBERT-21

12 Apr 2021

Flight: RF07

Notes:

Second flight to test response of nadir port and L1 inlet locations compared to standard inlet (R1). Maneuvers cut short because of obvious contamination in both locations. Performed speed changes in straight and level flight, and 90-270 turns.

The time server developed an error and would not get a lock. The flight proceeded without this, the Picarro, data system, and Applanix times were all synced to within 1 second, however the display time was off (Display time reference point at 030100 UTC 6 Jan 2021, compared to 210012 UTC 12 April 2021 on the Applanix, if needed.). Note for Applanix post-processing: first file produced by the Applanix was corrupt and was removed from the post-processing step, as the second file began shortly before takeoff.

Crew: Drew, Robertson, Plummer, Glover; LOD: West.

Flight Summary:

UTC Comment

2025 Off the ground.

2028 Through cloud layer enroute to 16 kft.

202930 Pumps on.

Standard inlet reference values: CPC just under 300/cc, CO₂ ~415 (Li-7000 similar on this flight).

Nadir port:

2035 Straight and level flight, starting with decelerating to minimum speed.

2037 Accelerating along same track. CPC & CO₂ drop somewhat with acceleration, but still very contaminated.

2039 Starting left-turn 90-270. Some drift in measurements but still high.

L1 inlet:

2050 CPC counts still near 2000, CO₂ high. Baseline CO₂ on Li-7000.

203430 Switched to R1 again for reference, CPC/Picarro went back down.

204530 Switched back to L1.

2050 Speed test along straight track - again, CPC/CO2 drop with acceleration/throttle up but still very contaminated.

205545 Starting left-hand 90-270.

205830 Switch back to R1 to confirm background measurements and head home.

2117 On the ground.

Project: DILBERT-21

31 Mar 2021

Flight: RF06

Notes:

Flight to test response of radar wing and L2 inlet locations compared to standard inlet. Consisted of measurements in clear air, with a sequence of straight-and-level flight, 90-270 turns in both directions, porpoising pitch maneuvers, yaw maneuvers in left and right turns, and spiraling ascents and descents in alternating directions. These were repeated in their entirety for each inlet.

The Li-7000 lost power between the initial startup and takeoff, no data were recorded. Applanix software was not set to record properly, values recorded to the data system were used..

Crew: Wadsworth, Robertson, Plummer, Glover; LOD: West.

Flight Summary:

UTC Comment

1618 Off the ground.

Standard inlet:

1624 Straight-and-level, centering on 16kft for these maneuvers.

1628 90-270 turn, initially turning right.

1629 Second right 90-270.

1630 90-270 turn, initially turning left.

1632 Second left 90-270.

1634 Beginning pitch maneuvering on descent, aiming for 1500 fpm.

1638 Beginning yaw maneuver following wind calibration procedure, left-hand turn.

1641 Continuing yaw maneuvers, right-hand turn.

1644 Beginning spiral descent to 14 kft, right-hand turn.

1647 Spiral ascent back to 16 kft, left-hand turn.

1649 Standard inlet maneuvers complete.

Radar wing inlet:

1651 Straight-and-level at 16 kft. CPC near 2000/cc and CO2 near 800 ppm upon switch.

1653 90-270 turn, initially turning right.

1654 Second right 90-270.

1655 90-270 turn, initially turning left.

1657 Second left 90-270.

1658 Setting up for pitch maneuvers.

1659 Beginning pitch maneuvering on descent.

Head further east for yaw maneuvers.

1703 Beginning yaw maneuvers, left-hand turn.

1705 Continuing yaw maneuvers, right-hand turn.

170930 Beginning spiral descent to 14 kft, left-hand turn.

1712 Spiral ascent back to 16 kft, right-hand turn.

Radar wing inlet maneuvers complete.

L2 inlet:

1717 Straight-and-level at 16 kft. CPC near 2200/cc and CO2 near 900 ppm upon switch.

Added a few minutes of level flight to see if lines cleared up, no change.

172230 90-270 turn, initially turning left.

1724 Second left 90-270.

172530 90-270 turn, initially turning right.

1727 Second right 90-270.

1728 Beginning pitch maneuvering on descent.

1732 Beginning yaw maneuvers, left-hand turn.

173430 Continuing yaw maneuvers, right-hand turn.

1737 Beginning spiral descent to 14 kft, left-hand turn.

173930 Spiral ascent back to 16 kft, right-hand turn.

L2 inlet maneuvers complete.

1742 Switched back to standard inlet, measurements rapidly dropped back down: CO₂ just above 400 ppm, CPC near 300/cc. Returning home.

1751 On the ground.

3/23/2021 Pilot notes (RF5)

Crew: Drew, Oolman, Robertson, Hu

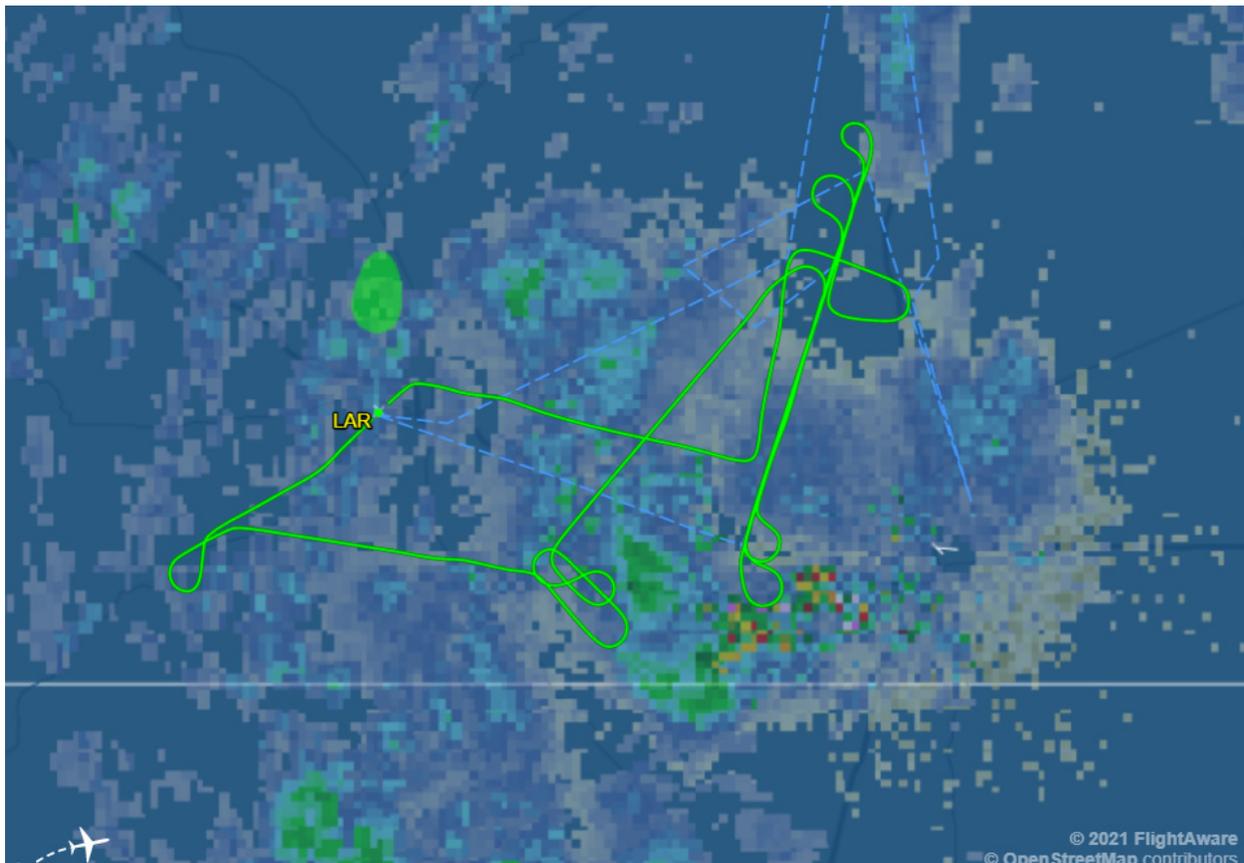
Flight Time: 1.7

Planned:

Fly N-S oriented leg through radar echoes by Chugwater. Six at minimum IFR altitude and six at FL 240.

Actual:

Flew towards CYS at 13000, then started working a N-S line just west of Cheyenne at 11,000 MSL. Echoes were a little weak so moved about 10 nm east and reestablished line. Did Two N-S legs at 10,000 MSL, climbed to 17,000 MSL and did two more along same line. Started the RNAV 30 approach into Laramie, but Laramie went below minimums for that approach, so instead flew the RNAV 3 approach.



21/03/13 Pilot notes (Dilbert Test FLT. 4)

Crew. Sigel, Oolman, Robertson and Astaneh.

Flight Time: .8

Planned: Takeoff at 10:30. Depart to the East fly strait and level at 130, towards TOR. Start collecting data in clouds. Two straight and level legs 5 or 6 miles a climb up 18000 feet and repeat. 90/270s at the end and go home.

Actual: Departed LAR at 10:40. Departed late due to the fact I switched the power off. Picked up the clearance on the ground. We then Flew East towards TOR climbing to 130. We took off on Rwy 3 in VFR weather. After departing we hit some small banks of clouds all was working well but never really went Hard IMC. At 110 we were VFR on top we could see way into Nebraska and down into Colorado and Kansas. There were higher clouds to the south so I requested from Denver to fly towards them. We went IMC and I saw a bit of Ice on the left windshield. It seem to dissipate quickly. The next band of clouds was thicker and had more moisture in it the Ice on the windshield didn't disappear and looking though the copilots side I could see it was working fine. I then turned the pilot's side too High to see if it would clear. No such luck. Knowing that the weather was moving in and I most likely to be shooting an approach back in Laramie I elected to return immediately. I did consider the landing weight at Laramie and chose to land no matter what the weight was due to the detreating conditions. After departing in VFR weather I would have thought we could have landed in them as well. The weather had changed and was getting worse so I elected to use the RNAV 3 approach. All went well and we broke out at 1500 AGL the layer of ice melted quickly from the windshield and we landed with no further problems.

Thank you very much! Ed Sigel



VFR & TFRs



42.257/-106.017 PUCIP...



12:10 PM MST



REC
00:00

+

-

MAR 13
12:10 PM MST

-53m -48m -43m -38m -33m -28m -23m -18m -13m -8m

Glide: 135KIAS, 13:1

Airports Maps Plates Documents Imagery Flights ScratchPads Checklist More

3/5/2021 Pilot notes (RF3)

Crew: Drew, Oolman, Robertson, Rademacher

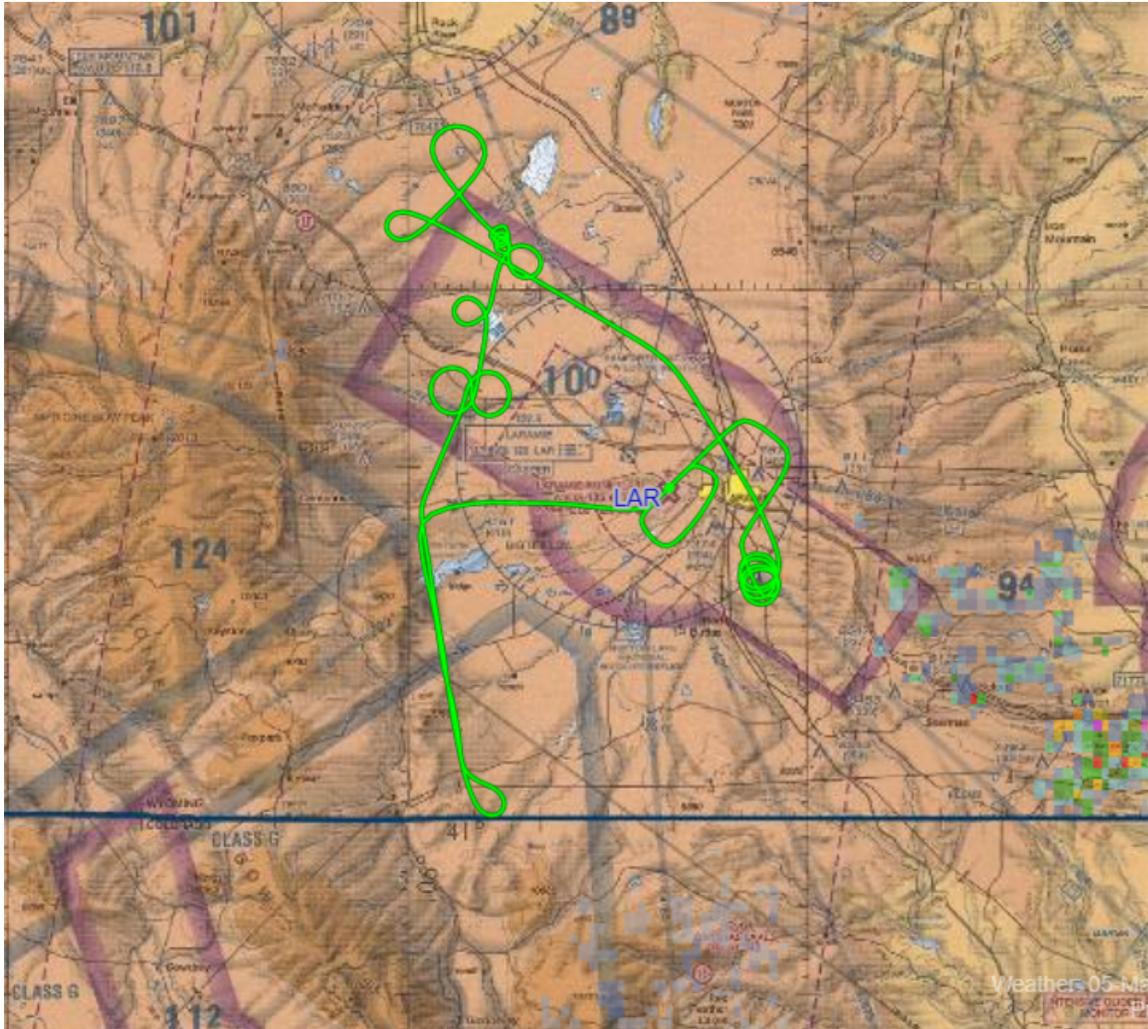
Flight Time: 1.3

Planned:

Fly downwind of Sheep Mountain at low level to look for turbulence. Reverse course and climb to about 12,000 ft. in smooth air. Then climb to smooth air for Wind Calibration Maneuvers. Conduct a few steep turns to try to hit the aircraft wake. Spiral down at 1000 fpm. Do a low approach over the runway and then land.

Actual:

Flew to north side of Sheep Mountain and flew along the base at 500 ft. AGL. Continued south past Jelm Mountain, reversed course climbed to 12,000 ft. MSL, but continued climb to 14,500 MSL due to turbulence. Reaching the north end, turned towards the center of the Laramie Valley and climbed to 16,500 for Wind Calibration Maneuvers. Did three 360 steep turns. Tracked into the wind and then did a right 270 trying to cross our wake. Flew southeast of Laramie (downwind) and spiraled from 16,500 MSL to 500 ft. AGL. Made a low approach on runway 21 and then landed.



DILBERT RF03 - 5 March 2021

Crew: Tom Drew, Anna Robertson, Larry Oolman, Harrison Rademacher, Cory West (LOD)

Aerosol flight. Inlets now forward facing. No AV images.

1738 Take Off

1740 LWC301SL = 0.01

1743 Start 500 agl leg east of Sheep Mountain, light turbulence

1748 Done

1752 Return at FL145

1752 Torque still broke

1756 Done

1758 Start wind calibration maneuvers

1810 Done

1810 45 degree bank to left to see if we can intercept our own wake

181350 May have succeeded

1815 Try upwind leg then 270 turn perpendicular

1828 Start spiral down from FL165 south of Laramie

1837 Down to 500 ft agl

1841 Left display screens went to sleep

1844 Low approach on LAR runway 21

1849 Land

DILBERT RF02 - 24 February 2021

Crew: Brett Wadsworth, Anna Robertson, Larry Oolman, Harrison Rademacher, Cory West (LOD)

- 1849 Take off
- 1853 KPR - load qc512_down_30m_15m_2.5km_200ms.pax, this mode does not display but it does record a file. File status is correct in display
- 1914 Torque is random, oil may need to be drained from the sensor.
- 1918 Low approach at Greeley
- 1927 Above clouds
- 1932 FL200
- 1936 Vary airspeed for LWC301
- 1938 Climb to FL230
- 1940 KPR qpc128_down_30m_15m_6.5km_200ms
- 1946 FL230, T=-28, DP=-54, winds 90 kt from 340
- 1947 Clouds beneath us, heading to west of Scottsbluff, climbing to FL245
- 1957 FL245, T=-39, dp=-54, winds 94 kt from 250
- 2001 Gentle +/- 300 ft porpoising around FL235
- 2003 Done, descend and return to same east point
- 2009 FL175 +/- 300 ft east to west, same KPR mode. T -31 dp=-39, winds 50 kt from 275
- 2012 Done
- 2013 KPR load qpc_down_30m_15m_2.5km_200ms
- 2017 FL120 +/- 300 ft east to west, T=-20, dp=-38, winds 20 kt from 300
- 2021 Done
- 2023 Repeat west to east
- 2026 Done
- 2027 KPR pp_up_down_75m_15m_6.0km_200ms, down beam only
- 2028 FL130
- 2030 Done

2031 KPR pp_up_down_60m_15m_6.0km_200ms, down beam only
2032 FL120, T=-20, dp=-36, winds 16 kt from 320
2035 Done
2036 KPR pp_up_down_30m_15m_6.0km_200ms, down beam only
2038 FL090, T=-12, dp=-25, winds 17 kt from 280
2040 Done, head back to Laramie
2041 Climb to FL120
2042 KPR Up & Down
2053 KT1585 RS-232 data appears on the Monitor program but not the King Air display
2100 In more convective clouds, visible on KPR up beam
2119 Land

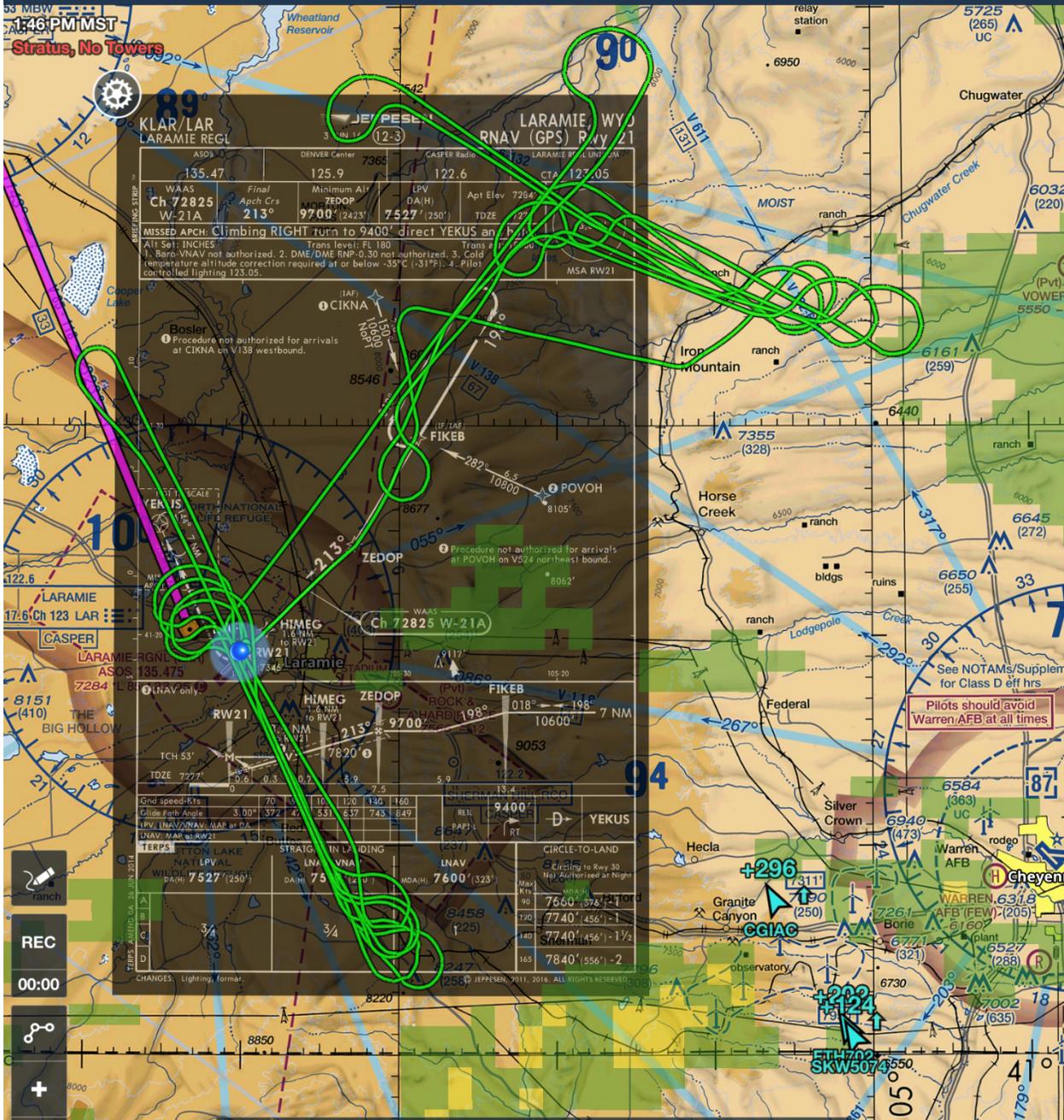
21/02/12 Pilot notes (Dilbert Test FLT. 3)

Crew. Sigel, Oolman, Robertson and Rademacher.

Flight Time: 2.8

Planned: Takeoff at 11:30. Depart to the north fly strait and level at 120, towards MBW VOR. Start collecting data in clear air. Two straight and level legs and then 5 or 6 with a climb up 300 feet and down 300 feet. 90/270s at the end of each leg. Then fly to where we can intercept clouds and make several passes though and go home.

Actual: Departed LAR at 11:30. We then Flew North towards MBW climbing to 120. We asked 90/270 degree turns at the end of each leg. We crossed the MBW FL120. Visibility was less than a mile at times and it was not VFR. We proceeded back to LAR and were able to find VFR weather south of LAR. After completing the straight legs we asked for a block of 110 to 130 feet and to provide our own terrain separation. DEN was very cooperative and gave us anything we wanted. We climbed and descend two to three times on each leg after that for approximately 8 legs. Then we went looking for clouds. We basically went out in the Shirley Basin and had no problem finding clouds. We made 6 legs in clouds and came home. LAR was calling for 300 overcast and 2 miles visibility. It was not even close. To my untrained eye it was 20 miles visibility and bottoms were at 15000 AGL. I shot the 21 approach and all was well. The Aircraft worked well and there were no wright ups.
Thank you very much! Ed



DILBERT RF01 – 12 February 2021

Ed Sigel, Anna Robertson, Larry Oolman, Harrison Rademacher, Cory West (LOD)

This is an instrument test project. The updated KPR, the new SP2, and the UHSAS are being tested. The left science display is also new.

LWC301 IWG1 forwarder is not installed so no LWC301 data. The Licor 7000 outlet is used by the aerosol instruments so no data will be collected.

1807 Takeoff
1813 Snow to the north of Laramie, heading back south
1825 Leg 1: 75 m, burst/chirp, with snow above, leaving up/down
1831 Leg 2: 60 m, burst/chirp
1837 Leg 3: 30 m, burst/chirp
1847 Leg 4: 30 m B/C & QPC, FFT=16, forgot record repeat
1852 Leg 4: 30 m B/C & QPC, FFT = 16
1901 Leg 5: 30 m B/C & QPC, FFT = 32
1908 Leg 6: 30 m B/C & QPC, FFT = 64
1916 Leg 7: 30 m B/C & QPC, FFT = 128
1923 Leg 8: 30 m B/C
1928 Leg 9: 30 m B/C & QPC 6.5 km mode FFT = 128
1940 Leg 10: reverse course, same mode, missed record again
1947 Leg 9 again, Head NE until center of band then turn east.
1957 Leg 10: head back to the west
2003 Leg 11: FFT = 16
2009 Leg 12: same mode
2015 Leg 13: Continue on 290 heading with FFT = 32
2019 Leg 14: Back to SE, same mode
2026 Leg 15: FFT = 64
2033 Leg 16: same mode
2036 Head home
2037 30 m B/C & QPC 6.5 km mode, FFT = 128, down antenna only
2048 Shut down KPR
2052 Land

