MARLi Test project

Internal Information

Plot of flight hours

Flight Track

Chat

Reasearch Flights					
Date	**Flight# (*.kml)**	**Status**	**Times (UTC)**	**Hours**	**Crew/Notes**
Jun 30 2016	RF12	Flew east-west legs off the coast of California to map the marine boundary layer.	1600-1954	4.0	T Drew L Oolman Z Wang
Jun 27 2016	RF11	Flew boundary between uniform stratus deck and broken cumulus area.	1601-1949	3.9	T Drew L Oolman Z Wang
Jun 26 2016	RF10	Flew over uniform, low stratus deck.	1622-1952	3.6	T Drew L Oolman Z Wang

User Information

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

Facility Instruments

- In Situ
- Wyoming Cloud Radar
- Wyoming Cloud Lidar

Jun 24 2016	RF09	Flew a field of small scattered cumulus. The Licor 7000 reference gas ran out around 2032.	1752-2146	4.0	T Drew L Oolman Z Wang
Jun 23 2016	RF08	First flight in California. Flew clouds off the coast.	1619-1946	3.5	T Drew L Oolman Z Wang
Jun 20 2016	RF07	Headed east of Laramie range. E-W legs western NE to Med Bows. Offset nrth and conued along rectangle. Sounding profiles along track intrmittently. Observed interesting transect vertical structure, strong inversion and moisture profile. Laser overheated after approx 2 hours. Went high resumed operations.	1847-2156	3.0	T Drew Z Wang N Guy
Jun 17 2016	RF06	Flight in eastern Wyoming with legs extending across the Laramie Range. Finished flight with passes along the edge of towering Cumulus.	2011-0015	3.8	T Drew Z Wang L Oolman
Jun 15 2016	RF05	Flight in western Nebraska looking for higher moisture and temperature gradients.	2053-0110	4.1	T Drew Z Wang L Oolman
Jun 14 2016	RF04	Evening flight to reduce the background solar signal.	0111-0420	3.0	E Sigel Z Little L Oolman Z Wang
		Mostly clear air flight at higher levels. E-W and W-E legs across the Laramie Range to sample temperature and moisture			

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Jun 11 2016	RF03	gradients. A line of storms began to develop along the Laramie range that limited our passes over clouds as they blew up pretty quick. A new coolant was tested, though the cooling efficiency seemed worse than the previous flight with just water. Lasers were more stable, but overheated quickly at low levels.	1721-1955	2.5	T Drew Z Wang N Guy
Jun 08 2016	RF02	Sampled clear air at many levels testing the efficiency of the cooler and radiator system to maintain operable temperatures. We had multiple cloud passes, remotely sampling from above a variety of cumulus and stratocumulus. So there is some good data to analyze. The 266 nm beam was not holding power at the beginning and end of flight. The radiator cooling efficiency performed better with the radiator having all water than the previous flight.	1758-2110	3.1	T Drew P Wechsler Z Wang N Guy
Jun 07 2016	RF01	There were laser software issues at the beginning that were due to new software with some differences than previous versions. Once the laser was up and running, we started at -1 C ambient temperature with racetrack legs. The chiller was running at 70% to keep the reservoir at 18 deg C. We then went	1602-1834	2.3	T Drew P Wechsler Z Wang N Guy

		up to -10 C which helped bring the reservoir temperature down to ~ 12 C. The pump quit about 2 hours into the flight. Were just about to go to low levels at this point to test heating			

Flight Hours	As of Oct 05, 2016, 40.8 out of 41 research hours were flown, 0.2 remain.
Ferry	7.1

Restrictions to our Experimental operations domain can be found in this KMZ file

6/30/16 MARLI Pilot notes (Research Flight 12)

Crew: Drew, Wang, Oolman

Flight Time: 4.0

Objective: Test Lidar – Sample on Parish line.

Planned: Fly high to starting point near Shelter Cove. Fly sawtooth out and back; then fly 5000 MSL fixed altitude out and back; and finish with 1500 fixed leg out and back.

Actual: Took off and climbed direct to Shelter Cove. Climbed to 13,300 MSL for Lidar cooling. Then started sawtooth legs. Followed by 5000 MSL legs. Orbited a couple of times while rebooting the data system, then descended to 1500 MSL for outbound leg. Decided to sawtooth on the inbound instead of 1500 MSL fixed altitude. After reaching Shelter Cove returned to Redding direct at 9,500 MSL.

6/27/16 MARLI Pilot notes (Research Flight 11)

Crew: Drew, Wang, Oolman

Flight Time: 3.9

Objective: Test Lidar - Sample across transition of status overcast to broken-scattered clouds visible on satellite image.

Planned: Originally planned to fly to N4000 W12800, but just before takeoff decided N4100 W12600 would be better on the satellite image. Planned to work legs from solid overcast area (majority of the area) to the clear air area (hole). With a spiral at the beginning.

Actual: Took off and flew direct to N4100W12600 at 14,000 ft. MSL for laser cooling. Over the shoreline descended to 3000 ft. MSL. Reaching the point, flew spiral profile to 1000 ft. MSL. Then flew ~ 10 nm NW at 1000 ft. MSL. Then spiraled up to 6000 ft. MSL and flew N-NW until about 38 miles north. Then did another spiral sounding to 1000 ft. MSL then climbed back up to 3000 ft. and flew back to the South. Made a racetrack turn back to the North and then flew a Mag E-W racetrack to the overcast edge to the east. On the westward track descended to 2000 ft. MSL. Then flew south track to overcast layer at 1600 ft. MSL. Because the ice ran out, climbed to 14,000 and returned to RDD via the Redbluff VOR.

Marli16 RF11 – 27 June 2016

Tom Drew, Larry Oolman, Zhien Wang, Matt Burkhart (LOD)

Flew boundary between uniform stratus deck and broken cumulus area.

1601 Take off

1616 FL140 T/DP = 0/-31 C winds = 230/23 kt

1617 ACV 23003 10 NMI OVC004 13/12 A3017. The clouds extend inland.

1627 FL140 descending

1634 FL054, small inversion with a few small bumps.

1635 FL037, isothermal at 21 C.

1637 FL030, 21/-6 C 340/11 kt

1700 At KS66A (N41 W126), FL030 16/6 C 010/15 kt. Spiral down

1702 Cloud top at FL020. LWC to 0.5 gm/kg

1703 Cloud base at FL013, 12/12 C 350/24 kt.

1709 Spiral up. Clouds between FL013 and FL020.

1715 FL060, 14/-1 C 280/12 kt. Breaks in the clouds just to our north and west.

1718 Over the edge of the BKN layer (N41 20 W126 12)

1724 FL060 14/1 C 320/9 kt. Start spiral descent over BKN cells.

1730 Cloud top FL019

1731 Cloud base below FL010

1733 Heading south towards the OVC deck.

1738 Over the edge of the homogeneous clouds.

1743 Reverse towards the north and BKN clouds

1747 Over a gap

1758 Turn east

1807 Crossing a linear N/S cloud feature (ship track?)

1813 Turn to the west and descend

1814 FL020 16/5 C 020/27 kt

1820 Over the BKN clouds

1826 14/6 C 010/22 kt. The temperature has been decreasing along this line. Cloud amounts and temperature starting to increase.

1830 Descend to FL017 and turn south into cloud tops.

1831 Descend to FL016

1833 LWC to 0.8 gm/kg

1842 In solid layer. LWC starting at 0.65 and slowly decreasing as we get further from the boundary.

1847 Climb and turn east. May be out of ice.

1850 FL030 16/2 C 010/18 kt

1851 Climbing

1900 FL140 0/-26 K 240/20 kt

1913 Over land.

1933 At the ridge.

1940 Over Red Bluff. Turning north and descending

1949 Land

6/26/16 MARLI Pilot notes (Research Flight 10)

Crew: Drew, Wang, Oolman

Flight Time: 3.6

Objective: Test Lidar and sample stratus deck of clouds.

Planned: Fly to Redbluff VOR then ferry to shoreline and then descend to 5000 MSL and fly out to N40 00 / W 126 00. Once arriving at that point, planned on loitering for about 1:30 minutes, return via Redbluff.

Actual: After takeoff climbed on assigned heading to intercept eastbound track from Redbluff. Climbed to 11,000 MSL and flew direct to N40 00/W126 00. After, crossing the shoreline a radio delay slowed down initial decent. Descended to 4000 MSL. Reaching the point spiraled down to 1000 MSL and then back up to 8000 MSL. Reaching 8000 MSL departed to the west 30 nm and descended to 2500 MSL. Then flew a 30 nm square oriented NW-SE. After completing the square, the ice ran out so we turned eastward toward the point and climbed to 13,000 MSL later asked and received 14,000 MSL for cooling. Flew to Redbluff VOR and then started decent and turned to the airport.

Marli16 RF10 – 26 June 2016

Tom Drew, Larry Oolman, Zhien Wang, Matt Burkhart (LOD)

Flew a field of small scattered cumulus. The Licor 7000 reference gas ran out around 2032.

1622 Take off

1622 Labview based King Air display quit updating. It was working earlier.

- Restarted the display
- Stop and restart DDS
- Exit DDS and restart
- Stop and restart King Air Display

1631 Heading south toward Red Bluff. FL110 8/-12 C 260/7 kt

1632 Turn west

1635 Restart XFer

1636 Marli started. Required reboot.

1644 Arcata report: BKN004 OVC006

1658 Over the shoreline. FL110 6/-7 C 280/18 kt. Cloudy west of Shelter Cove, clear to the south

1700 Descending

1703 Bottom of a moist layer, drier below.

1704 FL050 20/-36 C 320/13 kt

1705 Descend

1706 Clouds a considerable distance below. Tops look uniform. FL040 21/-22 C 330/13 kt.

1728 Point KO60A. 19/-8 C 320/16 kt

1730 Descending in spiral

1732 Bottom of dry layer at FL025

1732 Cloud top at FL018. LWC to 0.5 gm/kg

1733 Cloud base at FL012, start climb.

1744 FL080 13/-1 C 200/19 kt. Heading west

1748 Descending on line heading west

1751 Complex structure in the humidity

1753 FL025 18/-13 C 360/13 kt. Temperature nearly isothermal between FL050 and FL025.

1755 FL020. Turn to the southeast, just above the moist layer. Climb to FL030

1807 Turn to the northeast. 19/-14 C 350/17 kt

1809 Descend to FL026

1819 Done with line, turn to northwest.

1831 Done with line, turn to the southwest

1842 Completed box on west end of diamond. FL026 18/-11 C 000/11 kt. In drier air. Turn east

1847 Out of ice

1849 Climb

1853 FL080 13/-7 C 290/17 kt.

1856 Up some more

1859 FL120 3/-10

1900 FL130 2/-28 260/13 kt

1914 Climb to FL140 1/-28 C 280 13 kt

1920 Over land

1938 A few bumps over the ridge. W ±2 m/s

1944 FL140

1945 Over Red Bluff.

1952 Land

6/24/16 MARLI Pilot notes (Research Flight 9)

Crew: Drew, Wang, Oolman

Flight Time: 4.0

Objective: Test Lidar and sample clear skies and possibly a few clouds.

Planned: Fly to direct to N41 00 / W 126 00. Once arriving at that point, planned on loitering for about 1:45 minutes. Planned on flying a rectangle pattern.

Actual: After takeoff, climbed on course to N41 W126. Oakland handed me off to Seattle Center and we stayed with them until returning to shore. Dropped to 5600 MSL once we crossed the shoreline outbound. After arriving at filed point, did a spiral to 1500 MSL and then climbed to 6000 MSL and headed to NW corner to start rectangle. Heading south on the first leg, decided instead to continue to the south because there were some small clouds present further southwest. I asked to move our area south and that was approved. A group of clouds were on the western edge of our area, but we overflew some of them heading west then southeast. Then did three legs roughly NE-SW with clouds on the southwest half of the legs. Dropped to 4000 MSL on one leg. On the last leg dropped to 1500 MSL for a short leg, but climbed to 3000 MSL as we headed towards shoreline. ATC assigned 10,000 MSL for traffic, but I was able to stay down at 3000 MSL for a about ten more minutes. Because the traffic was departing Arcata we had to climb well before the shoreline. Returned to KRDD direct.

Marli16 RF09 – 24 June 2016

Tom Drew, Larry Oolman, Zhien Wang, Matt Burkhart (LOD)

Flew a field of small scattered cumulus. The Licor 7000 reference gas ran out around 2032.

1752 Take off

1812 At FL110, T/DP=5/-40 C winds 310 degrees at 27 kt

1823 Over the shoreline

1829 FL060, 11/-21 C 000/18 knots. Descend to FL055

1830 More whitecaps today. Good return on Marli

1839 FL055, 11/-14 C, 010/20 kt

1843 Adjust 355 nm laser

1853 At point KS66A (N41 W126). Spiral down

1858 FL015 11/8 C 000/26 kt. Climbing

1900 Inversion around 3500 ft

1902 Top of inversion around 5000 ft

1907 FL080, 9/-23 C 320/20 kt. Descending

1910 FL060, 11/-18 C 000/18 kt.

1918 NW of KS66A by 40 nmi

1821 Heading south

1930 South end of leg. Near the edge of a widely scattered cloud field. Move the center point to KO63A (N40.3 W126). Seeing waves in the dew point, on the Licor (-19 to -10 C).

1935 Turn west in intercept a more substantial cloud. FL060 11/-7 C 010/8 kt

1941 Over cloud

1943 Turn to north then come around to SE to intercept the cloud again.

1953 Turn to west

1957 Near the international border, turning to the northeast

2010 Descending and turning to the west. Currently to the north of the cloud field.

2015 Turn to the SSW, towards the cloud

2023 Climbing in a spiral

2027 FL080 10/-28 C 000/6 kt. Descending

2013 Cloud base at FL019

2035 FL015 11/9 C, 350/24 kt

2039 Licor reference gas gone?

2044 FL030 10/1 C 350/23 kt. Heading back to Redding.

2058 Shut down Licor computer

2102 Climbing

2104 FL060 13/-25 C 010/21 kt

2108 FL100 7/-37 320/21 kt

2138 ±2 m/s bump. Large gradient in water vapor

2146 Land

6/23/16 MARLI Pilot notes (Research Flight 8)

Crew: Drew, Wang, Oolman

Flight Time: 3.5

Objective: Test Lidar and sample clear air and clouds.

Planned: Ferry to shoreline and then descend to 5000 MSL and fly out to N40 30 / W 128 00. Once arriving at that point, planned on loitering for about 30 minutes.

Actual: After takeoff climbed to 14,000 MSL and flew direct to N40 30/W128 0. Crossing the shoreline descended to 5000 MSL. Later climbed up to 6500 MSL. About 100 nm out, Seattle had me check in with SFO HF. Reaching the filed point, we did a north 20 nm leg and returned to the point (racetrack). Then made a spiral profile to 1000 MSL. Flew a short track north and then back to the point. Climbed to 6000 MSL then later to 6500 for the return flight. After reporting the FIR inbound was switched back to Oakland Center and then later Seattle Center. About 20 nm from the shore line Seattle assigned 11,000 MSL and then returned to Redding.

Marli16 RF08 – 23 June 2016

Tom Drew, Larry Oolman, Zhien Wang, Matt Burkhart (LOD)

First flight in California. Flew a few clouds off the coast out in the international waters. The clouds were messy going from solid to BKN with multiple layers and cloud types.

1619 Take off

1629 FL140, T/DP=0/-11 C, winds=250/31 kt

1648 Descend

1655 At shoreline. FL060 10/4 C 290 16 kt

1657 FL050 10/5 C 310/13 kt

1702 Band of fog below us.

1714 Below cloud layer

1725 Only thin clouds above

1727 In cloud. LWC 0.5 gm/kg

1732 Out of cloud band

1734 No cloud above

1737 Climb above cloud layer. FL058 8/11 C 265/22 kt

1739 Climb to FL063, above moisture inversion. 10/-24 C 270/21 kt

1744 Clouds below. BKN, multiple layers.

1756 At point N40 30 W128 00 FL063. Turn to north and descend to FL055. Over solid layer

1800	Open gap
1802	Back over cloud, clear above
1803	Turning back to south
1810	Only operating 355 nm laser
1812	Back to waypoint, spiral down
1813	FL050, bottom of dry layer
1814	FL042 cloud top
1817	FL018 in SCT Cu up to 0.5 gm/kg
1818	Level at FL015
1819	Clear below
1820	Cloud base around 800 ft.
1822	In clear air
1827	Profile to FL080
1828	Tops of low Cu at FL030

1829 FL042 stratus deck. Bottom of inversion

1831 FL055 10/-17 C, 310/17 kt

1834 FL080, 8/-31, 280/22. Descend

1837 FL060 10/-22 C 200/14 kt

1840 Adjust laser

1853 Over uniform stratus FL065

1907 Over edge of cloud. Marli caught nice wave feature

1908 FL067 12/-18 C 280/16 kt

1914 Climbing

1915 FL070 11/-13 C 200/19 kt

1918 FL110 6/-47 C 270/29 lt

1919 Over land

1934 FL110, nice ±1 m/s waves. Still have ice

1938 FL116

6/20/16 MARLI Pilot notes (Research Flight 7)

Crew: Drew, Wang, Guy

Flight Time: 3.0

Objective: Test Lidar cooling and sample Laramie Range eastward to the state line.

Planned: Across the Laramie Range out to the east out to near Scottsbluff. Establish 20 nm E-W legs. Possibly change orientation to N-S.

Actual: After takeoff climbed to 10,500 MSL. Did a profile down to 1500 ft. and reversed course and profiled back up. Upon reaching Laramie valley, turned north and flew a parallel line 20 nm north of the original. Turning south did another profile down and up. Climbed to 16,500 and returned to the Laramie valley on the original line. Did one more profile and returned to Laramie.

Project: MARLI16

Date: 20 Jun 2016

Flight: RF07

System Scientist: Nick Guy

UTC Comment

1856 Wheels up

1906 East ver Lar range at 10kft

1920 Clouds 2000 ft below FL. Strng inversin below.

1921 355 alignment

1931 Descend to 6000 MSL for profile. Inversion couple hundred meters below. significant, 6-8000 MSL.

1937 West on track, ascend to 10000 fr profile.

1942 Continue up to 10500 MSL.

2010 Crossing Lar range dewpoint icreased nearly 40C!

2014 North 20 mile before turning back east.

2043 Jumps in dewpoint along track.

2051 Descend to 5500 MSL and ascend back up on N-S track

2057 Tlaser = 28C, looks like we are running out of ice.

2107 West on track to Lar. 0C at 16500 MSL.

2122 Licor VNC socket failure to connect. Computer turned off.

2124 Powered on AV computer. When start s/w it appears old version may start even though new version is selected. About however shows correct version.

2152 Wheels down.

Notes:

Restarted licor 7000 software after losing connection during taxi. Started up as older version, need to adjust which is auto start.

Flight Summary:

Headed east of Laramie range. E-W legs western NE to Med Bows. Offset nrth and conued along rectangle. Sounding profiles along track intrmittently. Observed interesting transect vertical structure, strong inversion and moisture profile. Laser overheated after approx 2 hours. Went high resumed operations.

6/17/16 MARLI Pilot notes (Research Flight 6)

Crew: Drew, Wang, Oolman

Flight Time: 3.8

Objective: Test Lidar cooling and sample Laramie Range eastward to the state line.

Planned: Across the Laramie Range out to the east to near the state border. Establish 20 nm E-W legs. Start at 2 Kilometer AGL and step down.

Actual: After takeoff climbed to 13,500 MSL. Upon reaching state line established E-W leg. Did multiple passes at 11, 500. After several passes extended the line to the west over Laramie Range into the Laramie Valley at 11,000 MSL. Did a reversal and Stepped up to 11,500 and proceeded to the east end. Although planned to go down to 1 K decided to go high to 16,500 to cool off Lidar and returned on the line. At the west point, turned NW climbed to FL 205 and overflew shelf on building cumulus. Did a course reversal overflew it again at FL210 and then returned to Laramie.

Marli16 RF06 – 17 June 2016

Tom Drew, Larry Oolman, Zhien Wang

Flight in eastern Wyoming with legs extending across the Laramie Range. Finished flight with passes along the edge of towering Cumulus.

2011 Take off

2028 Licor 7000: Invalid floating point operation. Restarted software and started recording

2042 Marli software not working, try the previous version. This didn't fix the problem.

2052 Start marli after reboot of computer.

2100 Heading east at FL135. Temperature/dewpoint = 8/-13 C. Winds 170 degrees at 16 kt.

2103 Descend to FL115

2108 Reverse course back to west near the Wyoming/Nebraska border. T/DP=11/-11 C. Winds 190/18 kt.

2116 Turn on the 266 nm laser.

2119 Back to east. 10/-6 C 180/13 kt.

2125 Done with leg.

2128 Remove ferrite bead

2129 Head west

2139 Head east

2145 End of line

2149 Head east 11/-10 C, 190/20 kt

2156 End of line, add bead

2159 Head east.

2206 End of line

2210 Head west

2216 End of line

2220 Head east

2226 End of line, descend to FL100

2228 Small cloud, climb to FL105

2223 FL105, 13/-3 C 2015/12 kt

2237 Extending line west, seem to be at the top of the boundary layer

2240 Climb to FL110

2046 At the east edge of the Laramie Range.

2254 West side of the Laramie Valley. 12/3 C 150/28 kt

2256 Climb to FL115

2307 Licor quit updating: disconnect – invalid pointer, connect – started again.

2316 At the west end of the original track 11/-9 C 180/18 kt

2319 Bath at 20 C, out of ice.

2322 East end of original line, climb.

2325 FL160 above the haze. May be from fires in Arizona.

2326 FL165 -3/-18 C 230/22 kt

2339 Over eastern edge of the Laramie range

2351 Work the west side of building Cumulus

2353 FL200, just outside the Cu

2357 Reverse and climb to FL210

2400 Head home

2415 Land

6/15/16 MARLI Pilot notes (Research Flight 5)

Crew: Drew, Wang, Oolman

Flight Time: 4.1

Objective: Test Lidar cooling and sample Laramie Range eastward to the state line.

Planned: Fly out to the east to near the eastern edge of our work area. Establish 20 nm E-W legs. Start at 2 Kilometer AGL and step down each leg 3.0, 2.0, 1.5, 1.0 km.

Actual: After takeoff climbed to 17,500 MSL but dropped to 15,500 to get under the boundary layer. Then went up to 16,000. After reaching East end, set up one racetrack about 40 nm long. After the first loop, decided to set up a 20 nm line oriented N-S for the wind. Stepped down from 16,000 to 8,000 MSL. Did a climbing sounding near the middle of the leg and then resumed the line. After reaching the original point, conducted another sounding down and up. Then did a ~ 20 nm somewhat square cloud survey at about 15,500. Then returned to Laramie.

Marli16 RF05 – 15 June 2016

Tom Drew, Larry Oolman, Zhien Wang, Ben Heesen (LOD)

Look for higher moisture contents and gradients in western Nebraska.

2107 Take off

2114 PMB is broke, reading -93

2116 Marli data system won't trigger

2118 Marli data system works after restarting the software

2128 FL155, temperature = 0 C, dew point temperatures varies between -30 and -5 C.

2133 At the top of the boundary layer, ±2 m/s waves

2134 Climbing

2135 FL160, T/DP = -1/-36 C

2155 FL161 T/DP = -1/-25 C, W = ±1 m/s. Just above the boundary layer. Small cumulus forming to the north of Oshkosh, NE on the top of the boundary layer.

2157 Descend to FL135 and turn west. Turn on the 266 nm laser.

2200 Descend to FL125 to below the clouds.

2204 6/-4 C

2211 METAR KAIA 152153Z AUTO 15015G27KT 10SM CLR 33/09

2211 FL123 South of Scotts Bluff, 7/-8 C reverse to the east

2225 East end of line

2227 Heading south FL123, 6/-6 C Wind 180 degrees true / 22 knot

2234 South of line 6/0 C

2237 Heading N, FL113 9/3 C 160/16 kt. Near Lewellen, NE

2243 North end of line 9/4 C 175/26 kt

2245 Heading south, FL100, 13/5 C 170/21 kt

2254 South end of line, 13/4 C 170/20 kt

2256 Heading north FL085 18/5 C 160/18 kt

2301 North end of line 17/6 C 160/21 kt

2304 Heading south, FL070 22/7 C 140/22 kt

2313 South end of line, 23/6 C 140/19 kt

2315 Heading north, FL070

2318 Start spiral climb, NW of Lake McConaughty

2324 At FL120

2325 Heading south, FL120, 7/2 C 180/21 kt

2328 South end of line, 8/-3 C 180/16 kt

2331 Heading north, FL120, 8/-16 C 190/14 kt

2337 North end of line, 8/-3 C 195/20 kt, start spiral down

2342 FL070, start climb

2349 FL134, top of boundary layer

2352 FL155, 1/-27 C 235/24 kt

2354 Heading west on box pattern

0000 Turn to north, descend to FL150

0001 Downdraft to -3 m/s over decaying cloud

0003 2/-26 240/22 kt

0004 Over decaying cloud that appeared to be growing a few minutes previously

0006 Turn east

0011 Turn south

0016 Bath temperature rising, may be out of ice.

0017 Turned off pump to ice cooler

0017 2/-24 C 235/22 kt. Done with box pattern. Since we are out of ice, climb to cooler temperatures and head home

0020 FL165 -1/-33 C 240/26 kt

0051 FL165 -2/-16 C 235/36 kt

0106 Land

6/13/16 MARLI Pilot notes (Research Flight 4)

Crew: Sigel, Wang, Oolman, Little

Flight Time: 3.0

Objective: Test Lidar cooling and sample Laramie Range eastward to the state line.

Planned: Fly across the Laramie Range out to the east and back. Start at altitude of around zero degrees, then step down to check cooling.

Actual: Took off, climbed to 15,000 MSL staying in clear air. East to west flight track.

Climbed to FL 180 ft looking to get on top of clouds. Asked for a block of 140 to 180 North to South. We navigated off OPPEE inter. We were under most of the clouds at 150 and made passes under them south to north over the Med Bows. We climbed to 180 got on top and mad descents to 140 through them and climbed back up to 180 on top again. After two passes we headed north for some clear air for 50 miles and proceeded back to Laramie.

Marli16 RF04 – 14 June 2016

Ed Sigel, Zane Little, Larry Oolman, Zhien Wang, Brent Glover (LOD)

Marli test. Evening flight to reduce solar noise.

0123 Take off

0130 PMB shows -93

0134 FL180, T=-9 C, DP=-33

0138 Descending

0142 FL155, T=-5, DP=-20

0144 Heading east at FL155 from near Hannah.

0209 East end near Ft. Laramie, T=-3, DP=-12

0210 Turn west and descend to FL120

0215 At FL120, T=+4 C, DP=-5 C

0231 Near Wheatland #3, T=+4 C, DP=-12 C

0233 Climbing to FL150.

0237 Over a small Cu

0240 Passing through tops in climb to FL180

0242 Turning to south to fly over cloud layer.

0243 FL180, T=-8, DP=-31

0251 Near southern edge of cloud layer, T=-10, DP=-23

0252 Past cloud edge just north of Colorado border. Turning back to north.

0303 Past north edge of cloud, T=-9, DP-30 C

0304 Start sawtooth pattern between FL180 and FL150, heading to the south

0305 Cloud top near FL174

0306 Cloud base FL165, T=-7 C

0312 Back to FL180

0313 Past cloud edge, turn back to north

0315 Start down to FL150

0328 Finished with westward leg. Climb to FL170 and head back east.

0337 In cloud up to 1 gm/kg

0338 Descend to FL150 setting up for clear air leg.

0345 Descent to FL125, out to the north of the clouds

0354 Head home.

0414 Land

6/11/16 MARLI Pilot notes (Research Flight 3)

Crew: Drew, Wang, Guy

Flight Time: 2.5

Objective: Test Lidar cooling and sample Laramie Range eastward to the state line.

Planned: Fly across the Laramie Range out to the east and back. Start at altitude of around zero degrees, then step down to check cooling.

Actual: Took off, climbed to 17,500 MSL using the aircraft thermometer for zero because the real time was hung. After real time was restarted Zhien decided to just stay there which was about -5 C.

Later we climbed to FL 190 – FL 200 to try to cool off the system. On return to the Laramie Valley decided to overly some clouds. We needed to climb up to FL 235 to get on top of the lowest clouds in the area. We then descended to 13,900 MSL to check the cooling of the Lidar and returned to Laramie.

Project: MARLI16

Date: 11 Jun 2016

Flight: RF03

System Scientist: Nick Guy

UTC Comment

1728 Wheels up

1737 No temperature info. Display not updating.

1742 Went back to transfer program and toggled IWG and UDP and now KA Display is working.

1749 Restarting DDS computer. Pushed in breaker on outside of cabinet for applanix.

1755 Not receiving Applanix data. Powered off, so turned instrument back on. Had to restart POSAV software.

1759 Wind information back

1801 T = -5C, Tres = 15C, flying at 17,500 MSL. We are performing laser alignment, E-W tracks across Laramie range, approximately 80 mi track.

1802 POSAV Faults: GPS Data Gap, Invalid Installation Parameter.

1805 Java Display now working with radar display, however not finding Applanix. I don't know what the issue is but we are recording GPS data, Applanix is online. Where does the Java display get it's positional data?

1815 T= -5C, Tres = 15C, Temperature channel on lidar is okay, water vapor is difficult. Approx 3km above ground.

1821 266 laser not stable at the moment.

1826 Regulating at 100% to maintain Tlaser = 25C, Tres = 15.2

1828 Ascending to get to -10 ambient temp, 20 kft MSL, T = -12C

1837 Licor software shut down. Will not restart. Likely have to hard power down software afterward.

1842 T = -10.8C, Tres = 13.3C. 266 being realigned.

1856 Turn back west, ascend to 21 kft MSL t maintain -11C temperature. Eastern side of legs are warmer than west.

1903 Tres = 13.0C, T = -12.3C. Regulating at 100%.

1909 T = -13C, Tres =12.4, regulating at 90%.

1912 Ascending to see if we can get over some clouds for 266 reflection measurements.

1914 At 22500 MSL, just under anvil from west cloud system. T = 16.5C, Tres = 11.8, regulating at 70%.

1916 Pointer not working on KA Display.

1918 Jumping to 23500 MSL

1919 Over cloud. T = -18.7C, Tres = 11C. Right wing went through cloud.

1925 T = -19C, Tres = 9.9C, regulating 50% at Tlaser = 25C

1930 Descending to warmer levels.

1935 FL 139, T = 5C, Tres = 10.8C, Tlaser =25.2C, regulating at 58%.

1937 Tres = 13.4C, reg at 75%, Tlaser = 26C, T = 5.4C

1941 Tres = 16.7C, reg at 100%, Tlaser = 27.8C, T=5.5C

1943 Tres = 17..7, Tlaser = 28.7C up to 29, shutting down laser.

1955 Wheels down.

Notes:

POSAV Logging Device Error. Not sure what is going on there. Failure to write to card.

Applanix was turned off during flight. I think I caught the breaker when walking by and had to reinitialize.

Coolant was changed to antifreeze and regulation seemed less efficient.

Flight Summary:

Mostly clear air flight at higher levels. E-W and W-E legs across the Laramie Range to sample temperature and moisture gradients. A line of storms began to develop along the Laramie range that limited our passes over clouds as they blew up pretty quick. A new coolant was tested, though the cooling efficiency seemed worse than the previous flight with just w ater. Lasers were more stable, but overheated quickly at low levels.

6/8/16 MARLI Pilot notes (Research Flight 2)

Crew: Drew, Guy, Wechsler, Wang

Flight Time: 3.1

Objective: Test heating and cooling efficiency of LIDAR, also look at some clouds.

Planned: Start at about 15,000 MSL and fly around to see how the MARLI cooling system worked. Then check LIDAR cooling at lower levels.

Actual: Took off, climbed to FL 190 to cool off the system due to the warmer temperatures caused by the two-hour delay. After cooling off, flew a spiral down to 3000 ft. AGL and then back up to various mid altitudes to try to find a balance in cooling.

We then tried to overfly some clouds going as high as FL 200 to get on top of some of them. Returned to lower altitudes, flew over a lake and then returned to Laramie.

Project: MARLI16

Date: 08 Jun 2016

Flight: RF02

System Scientist: Nick Guy

UTC Comment

1807 Wheels up

1809 Tres = 24C.

1812 Tres < 20C.

1813 Start laser operations.

1817 T = -9C, Tlaser = 25C, 19 kft MSL.

1820 Starting 266 nm laser channel.

1829 Tres = 13C, regulating at 40%.

1837 Tlaser = 25C, regulating at 49%.

1839 Spiral descent to about 3km AGL at 1000 ft/min.

1842 Tres = 12.3C, T = -3.5C, 26 laser not holding power, adjusting.

1845 Tres = 13.2C, T = 1C.

1846 T = 6C, Tres = 13C, regulating at 47%.

1848 T = 12C, 10 kft MSL.

1850 Regulating at 70%.

1851 Regulating at 90%.

1852 Regulating at 99%.

1853 Tlaser = 27C.

1854 Tlaser = 28C, Tres = 25C, rising.

1858 Level at 15 kft MSL, T = -1C, Tres,Tlaser dropping.

1859 Tlaser = 28C, Tres = 21C.

1909 Going to sample clouds from above with MARLi, try for 1000 ft above cloud top at 17,500 MSL>

1911 Over cloud, fair weather Cu and stratocumulus.

1916 T = -6C, Tres = 15C, regulating at 50%.

1926 Dropped lower to about 10500 MSL, T = 1C, Tres = 14.5C.

1928 Tres = 15.2C.

1933 Tres = 17.8C, regulating at 60%.

1943 Tres = 19.3C, regulating at 100%, T = 5C.

1947 Tlaser = 26.2C

1950 Tres = 20C, Tlaser = 26.5C.

1956 Tlaser = 26.6C, T = 2.2C.

2003 Ascend up. T = -11C @ 19500 MSL.

2008 Over Sc, into cloud momentarily.

2010 Out of cloud.

2012 Tres = 12.4C, T = -11.5C.

2024 Tres = 10C, T = -10.5C.

2036 Descend to 12000 MSL, T = 7C. Possibility of frozen radiatior as Tres stuck at 10 for a while.

2041 Tres = 18C, T = 7C, Tlaser = 25.5C, regulating at 65%.

2044 Tlaser = 26.3C, regulating at 90%.

2046 Tlaser = 27C, passing over lake.

2050 Turned around, northward pass over lake.

2052 Tres = 22C.

2053 Lost 266 nm.

2105 Wheels down.

Notes:

Configuration not typical. Nick sat in front seat, Perry sat in System Scientist seat to help with MARLi operation/troubleshooting.

POSAV recording may not have been started.

Flight Summary:

Sampled clear air at many levels testing the efficiency of the cooler and radiator system to maintain operable temperatures. We had multiple cloud passes, remotely sampling from above a variety of cumulus and stratocumulus. So there is some good data to analyze. The 266 nm beam was not holding power at the beginning and end of flight. The radiator cooling efficiency performed better with the radiator having all water than the previous flight.

6/7/16 MARLI Pilot notes (Test Flight 1)

Crew: Drew, Guy, Wechsler, Wang

Flight Time: 2.3

Objective: Test and align LIDAR

Planned: Start at about 15,000 MSL and fly around to see how the MARLI cooling system worked. Possibly do an alignment.
Then check LIDAR cooling at lower levels.

Actual: Took off, climbed to 15,500 MSL picked up VFR flight following from Denver. Flew approximately 32 nm leg to the North and reversed course. After second reversal went to a racetrack pattern. Picked up IFR and climbed to FL 190. After several patterns the Lidar quit and we returned to Laramie.

Project: MARLI16

Date: 07 Jun 2016

Flight: RF01

System Scientist: Nick Guy

UTC Comment

1616 Wheels up

1618 GLAT not working, problem with Ashtech? MARLi powered up.

1620 Climbing to 15 kft MSL. T = 0 deg C. Tres = 20C, holding. No laser power.

1621 Level out at 15,500 ft MSL, T = -1.3C.

1624 Pockels cell not firing

1629 Laser and power supply restarted, Maintaining T = -1C.

1637 Laser problem attributed to software, first time using this version.

1638 First MARLi flight data acquired!!

1643 Aircraft at 0.7 electrical.

1644 Strong reflection from port window into telescope.

1646 Tres = 18C, Tlaser = 25C, chiller regulating at 70%. Flying 32 mi legs on racetrack.

1654 Chiller regulating at 99%. Laser and Tres stable, 25C and 18.5C, respectively.

1705 266 nm power increased.

1715 266 Looks okay, but temp is going up.

1719 Begin ascent to 19 kft MSL. Tres, Tlaser dropping.

1720 T = -11C, Tlaser = 25.5C, Tres = 18.2C (and dropping).

1723 Tres = 16.8C

1737 Tres = 13C, Tlaser = 25C, chiller regulating at 50%.

1745 266 nm beam aligned, now aligning 355 nm, Tre = 12C.

1747 T = -11C, Td = -24C

1751 Tlaser = 25C, Tres = 12.5C

1802 Aircraft electrical at 0.58, Tres = 12C, regulating at 47%.

1815 Laser operation ceased. Pump quit with blown fuse.

1820 Heading back to KLAR.

1831 Wheels down

Notes:

Configuration not typical. Nick sat in front seat, Perry sat in System Scientist seat to help with MARLi operation/troubleshooting.

Ashtech data not available. Found following the flight that signal wires were properly connected. Fixed.

POSAV recording not started

Licor software appears to have shutdown during flight (or inadvertently turned off). Instrument operation not affected, data collected.

Flight Summary:

There were laser software issues at the beginning that were due to new software with some differences than previous versions. Once the laser was up and running, we started at -1 C ambient temperature with racetrack legs. The chiller was running at 70% to keep the reservoir at 18 deg C. We then went up to -10 C which helped bring the reservoir temperature down to ~ 12 C. The pump quit about 2 hours into the flight. Were just about to go to low levels at this point to test heating.