



University of Wyoming ACME 2007

Airborne Carbon in the Mountains Experiment

March 26 2007 - August 15 2007

Photo courtesy of Vanda Grubisic, DRI

- [Contacts](#)
- [KingAir Data](#)
- Plot of Flight Hours

[Operations Calendar](#)

[Flight Plans](#)

Date	Flight # (* .kml)	Status	Times (UTC)	Hours	Notes
<i>IOP 3</i>					
9 Aug	Flight 18	Morning flight; Part III of III part flight experiment. No known problems.	2007-2312	3.2	JF notes & debrief
9 Aug	Flight 17	Morning flight; Part II of III part flight experiment. No known problems.	1357-1807	4.3	JF notes & debrief
8 Aug	Flight 16	Afternoon flight; Part I of III part flight experiment. No known problems.	1846-2256	4.3	JF notes & debrief
3 Aug	Flight 15	Afternoon flight; Repeated error in RealTime (IP429 ARINC Fault), RealTime data looked OK, Processed data looked OK; Conducted majority of flight IFR.	2010-2215	2.2	JF notes & debrief
3 Aug	Flight 14	Morning Flight; Considerable areas of clouds, needed to conduct portions of the flight IFR, lots of rain/water during second half of flight. No known problems.	1406-1758	4.0	JF notes &

					debrief
1 Aug	Flight 13	Afternoon flight; No known problems	2007-2221	2.4	JF notes & debrief
1 Aug	Flight 12	Morning flight; No known problems	1331-1720	3.9	JF notes & debrief
27 July	Flight 11	Test flight for O2 instrument. CO2 and CO instrument not connected during flight. CPC intermittent, bad channel on data system? Incorrect leap seconds (107?), timing problem fixed in processed files (?).	1644-1821	1.7	JF notes & debrief
18 July	Flight 10	Air conditioner not working; high cabin and DAS temperatures (especially early in flight. No other known problems.	2023-2319	3.0	JF notes & debrief
18 July	Flight 9	Air conditioner not working; CPC not working for first half of flight (reason unknown); Analog1 card problems on DAS startup, needed to manually reset card takeoff delayed by 30 minutes.	1500-1741	2.8	JF notes & debrief
<i>IOP 2</i>					
21 June	Flight 8	No known problems.	2024-2355	3.6	
21 June	Flight 7	No known problems.	1453-1801	3.2	
15 June	Flight 6	No known problems.	2021-2310	2.9	
15 June	Flight 5	MRI Turbulence not turned on until 1505Z.	1420-1748	3.6	
7 June	Flight 4	Primary static pressure, HADS-A, down. Used HADS-B in calculations. EGG chilled mirror hygrometer looks fine.	1536-1729	2.0	
1 June	Flight 3	EGG chilled mirror hygrometer oscillating at higher dewpoints.	1856-2028	1.6	
1 June	Flight 2	EGG chilled mirror hygrometer oscillating at higher dewpoints.	1353-1710	3.4	LDO notes
<i>IOP 1</i>					
3 May	Flight 1	No known problems w/ KA, CO2 instrument froze on climb out of Rifle when running on ambient air, appeared to be OK prior. TAMDAR was not operating	1405-1704	3.1	JF notes & debrief
<i>Test Flights</i>					
		No known problems, Engine runup & pressurization on ground prior to flight to check CO2 instrument sensitivity to cabin pressure, Pitch maneuvers and sideslips, low pass NE near Laramie Peak, upon	2030-		

2 May	Test 6	landing, nearing power down, Tom noticed fault light on INS, subsequent look at the data, everything was OK. TAMDAR was not operating	2118	0.9	
27 April	Test 5	No known problems, Pitch maneuvers and sideslips near the beginning of flight outside of BL. Three missed approaches (2 Walden, 1 Kremmling), spiral descent over Willow Creek. TAMDAR was not operating	1830-1953	1.5	JF debrief
25 April	Test 4	No known problems, Pitch maneuvers and sideslips to test CO2 instrument response to a/c motion, TAMDAR not getting our heading data(??)	2014-2026	0.3	JF notes & debrief
25 April	Test 3	No known problems, Pitch maneuvers and sideslip maneuvers to test CO2 instrument response to a/c motion, Two ascents/descents to check pressure sensitivity, descents conducted at different rates to check sensitivity to descent rates; TAMDAR was not getting our heading data(??)	1626-1729	1.2	JF notes & debrief
16 April	Test 2	No known problems, Pitch maneuvers and Rodi maneuvers to test CO2 instrument response to a/c motion, punched through non-precipitating clouds to/fr, TAMDAR was not operating	1715-1804	0.9	JF debrief
09 April	Test 1	No GPS during flight, no 3rd seat keyboard control of user supplied CO instrument, Rodi Maneuvers	2120-2257	1.7	JF notes & debrief B Stephens notes
Total Flight Hours			61.7 of 62.0, 0.3 remain		

March

Sun	Mon	Tue	Wed	Thu	Fri	Sat
				1	2	3
4	5	6	7	8	9	10
11	12 Spring Break Perry, Brett gone	13 Spring Break Perry, Brett gone	14 Spring Break Perry, Brett gone	15 Spring Break Jeff Perry, Brett gone	16 Spring Break Jeff Perry, Brett gone	17
18	19 Jeff gone	20 Jeff gone	21 Test Flight/ mini-IOP?	22 Test Flight/ mini-IOP?	23 Test Flight/ mini-IOP?	24
25	26 Test Flight/ mini-IOP?	27 Test Flight/ mini-IOP?	28 Test Flight/ mini-IOP?	29 Test Flight/ mini-IOP?	30 Test Flight/ mini-IOP?	31

2007

April

Sun	Mon	Tue	Wed	Thu	Fri	Sat
1	2 IOP 1	3 IOP 1	4 IOP 1	5 IOP 1	6 IOP 1	7 IOP 1
8 IOP 1	9 IOP 1	10 IOP 1	11 IOP 1	12 IOP 1	13 IOP 1	14 IOP 1
15 IOP 1	16 IOP 1	17 IOP 1	18 IOP 1	19 IOP 1	20 IOP 1	21 IOP 1
22 IOP 1	23 IOP 1	24 IOP 1	25 IOP 1	26 IOP 1	27 IOP 1	28
29	30 IOP 1 extend down for maint.					

2007

May

Sun	Mon	Tue	Wed	Thu	Fri	Sat
		1 IOP 1 extend down in PM	2 IOP 1 extend	3 IOP 1 extend	4 IOP 1 extend	5
6	7	8	9	10	11	12
13	14 Flight Safety (Kevin??)	15 Flight Safety (Kevin??)	16 Flight Safety (Kevin??)	17 Flight Safety (Kevin??)	18 Flight Safety (Kevin??)	19
20	21 Flight Safety (Tom??)	22 Flight Safety (Tom??)	23 Flight Safety (Tom??)	24 Flight Safety (Tom??)	25 Flight Safety (Tom??)	26
27	28	29 IOP 2	30 IOP 2	31 IOP 2		

2007

June

Sun	Mon	Tue	Wed	Thu	Fri	Sat
					1 IOP 2	2 IOP 2
3 IOP 2	4 IOP 2	5 IOP 2	6 IOP 2	7 IOP 2	8 IOP 2	9 IOP 2
10 IOP 2	11 IOP 2	12 IOP 2	13 IOP 2	14 IOP 2	15 IOP 2	16 IOP 2
17 IOP 2	18 IOP 2	19 IOP 2	20 IOP 2	21 IOP 2	22 IOP 2	23
24	25 HSI Flights	26 HSI Flights	27	28 HSI Flights	29 HSI	30

2007

July

<i>Sun</i>	<i>Mon</i>	<i>Tue</i>	<i>Wed</i>	<i>Thu</i>	<i>Fri</i>	<i>Sat</i>
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16 IOP3	17 IOP3	18 IOP3	19 IOP3	20 IOP3	21 IOP3
22 IOP3	23 IOP3	24 IOP3	25 IOP3	26 IOP3	27 IOP3	28 IOP3
29 IOP3	30 IOP3	31 IOP3				

2007**August**

<i>Sun</i>	<i>Mon</i>	<i>Tue</i>	<i>Wed</i>	<i>Thu</i>	<i>Fri</i>	<i>Sat</i>
			1 IOP3	2 IOP3	3 IOP3	4 IOP3
5 IOP3	6 IOP3	7 IOP3	8 IOP3	9 IOP3	10 IOP3	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

2007



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Flight Plans

Flight Plan Number	Flight Plan Description	Text sheet (.html)	Flite Star Plot (.pdf)	Google Earth Plot (.kml)**	Notes
<i>Dummy Flight Plans</i>					
Dum01	Morning upwind flight on high wind day, north to south, 2 storm peak overpasses	text file	Flite Star file	Google Earth file	
Dum02	Afternoon downwind flight north to south	text file	Flite Star file	Google Earth file	
Dum03	Morning upwind flight on low wind day, north to south, 2 storm peak overpasses	text file	Flite Star file	Google Earth file	
Dum04	Morning upwind flight on high wind day, south to north	text file	Flite Star file	Google Earth file	
Dum05	Morning upwind flight on high wind day, Frasier Exp. Forest, south to north	text file	Flite Star file	Google Earth file	
Dum06	Morning upwind flight on low wind day, Frasier Exp. Forest, north to south, 2 storm peak overpasses	text file	none	Google Earth file	
Dum07	Afternoon, 24 hour upwind flight, south to north	text file	Flite Star file	Google Earth file	
Dum08	Niwot Ridge Overpass	text file	Flite Star file	none	

**Google Earth plots require running [GoogleEarth](#) on your local machine
save file on local machine and open within Google Earth

Flight and Debrief Notes

JF

Project: ACME07

Flight: IOP 3, Flt 8; Research Flight 16

File: 20070808a

Crew:

D. Cooksey

T. Campos

J. French

B. Stephens

Preflight:

Part one of a three part flight experiment. Sample upwind air over western CO, southeastern Utah, and northeastern AZ.

1045 preflight for 1245 takeoff, expect ~4 hour flight.

Wx: 1837Z, winds: 280/13G19 kts, T25/Td-01 C, SCT110 (fair wx cu)

On data system startup Analog1 failed, Don Lukens pulled panel and hit reset switch on card.

Flight:

(times GMT)

1846 wheels up

1850 climb to 175 for complete BL sample

1855 at 175 very near top of BL (BL characterized by dry adiabatic fr/ sfc to 170-175, moisture well mixed fr/ sfc to 170, sct fair wx cu from ~164 to 180)

1856 back at 165 for enroute to Blanding, just under cld base

1903 pick up IFR to Blanding to get on top of clds, slowly climbing to 200

1914 level at 200

2005 begin descent towards Blanding

201815 low pass Blanding, climb enroute to Kayenta

2028 at 175 descend to 165 to complete enroute

203130 begin descent into Kayenta

204145 low pass Kayenta, climb to 175 enroute to Halls Crossing

2051 at 175, descend towards Halls Crossing

2059 low pass at Halls Crossing, climb enroute to Canyonlands

2109 at 175, descend to 165 for cruise

2117 begin descent to Canyonlands

212630 low pass at Canyonlands, climb enroute to Grand Junction

2135 at 175 begin descent to Grand Junction

2147 low pass Grand Junction, climb towards Montrose

2157 at 175, descend to Montrose

2204 low pass at Montrose climb back towards LAR

2210 pick up IFR, continue climb to 230

2219 level at 230

2245 begin descent towards LAR

2256 wheels dn

Postflight:

UNEVENTFUL

Debrief:

No issues with flight

Problem with Analog1 on startup, on first failure, Lukens removed panel and reset card

Flight and Debrief Notes

JF

Project: ACME07

Flight: IOP 3, Flt 7; Research Flight 15

File: 20070803b

Crew:

D. Cooksey

T. Campos

J. French

B. Stephens

Preflight:

To be part of two flight experiment. We are sampling receptor points this PM.

Set up for 2:00 PM takeoff with 12:30 PM preflight, expecting relatively quick turnaround between flights. Lots of clouds in area this AM, expect more clouds this afternoon, with convective activity/

Flight:

(times GMT)

Wx: winds ???/? kts, T24/Td12 C, Scattered at 095; Thunderstorm in area

2010 wheels up

Noticed on roll down runway that every 3-10 s get IP429 ARINC fault; in text window behind RealTime display, message says "change in IP429 status (a000) *or* (0), all of INS data looked OK in RealTime, decided to continue with flight.

Picked up IFR clearance out of LAR

2024 FL200, enroute to Hayden

2029 begin descent towards Hayden

2044 low pass at Hayden, no CO2 pooling, climb

2050 enroute to setup approach for Eagle, fly enroute at 140

2114 begin descent on approach for Eagle

2122 low pass at Eagle

2130 cancel IFR over Kremmling area, climb to 175 enroute to Granby for low approach

2138 begin descent from 175 towards Granby

214430 low pass at Granby, climb enroute to Walden

2153 at 165, begin descent towards Walden

215930 low pass at Walden, climb enroute to LAR

2207 at 175, begin descent to LAR

2215 wheels down at LAR

Postflight:

Uneventful

Debrief:

No issues re: ops or instruments.

Post-flight processed data for INS looks OK, need to talk with Larry re: what readraw does with the data, as several INS-related message produced in 'readraw'.

Flight and Debrief Notes

JF

Project: ACME07

Flight: IOP 3, Flt 6; Research Flight 14

File: 20070803a

Crew:

D. Cooksey

T. Campos

J. French

B. Stephens

Preflight:

To be part of two flight experiment. We are sampling receptor points and forecast initial points this AM.

Set up for 8:00 AM takeoff with 6:15 AM preflight, lots of clouds in area, particularly in western CO, need to get 'creative with flight plan, expect some early VFR work on eastern side, followed by mostly IFR approaches on Western side.

Flight:

(times GMT)

Wx: winds 170/05 kts, T17/Td13 C, clear

1406 wheels up, climb to 175 enroute to Walden

1415 at FL175, begin descent to Walden

1422 low pass at Walden, strong CO2 spike, starts at ~800 ft AGL; climb to 155 enroute to SNP

1429 at 155 over SNP, begin spiral descent

143445 1000 ft AGL over SNP (no CO2 spike evident), climb to 175 enroute to Granby

144230 at 175, begin descent to Granby

1448 low pass at Granby, CO2 spike begins at ~1100 ft AGL; climb enroute to Kremmling

1455 break off enroute to Kremmling, check valley loop for clouds, decide to continue with valley loop as relatively cloud free

1458 over Williams Fork

150030 begin descent down St. Louis Valley

1503 over FEF

1504 end loop, shoot for Kremmling

151030 at 165 over Kremmling, spiral descent into kremmling

1516 low pass at Kremmling, CO2 spike begins ~1700 ft AGL, climb enroute to Rifle

1524 level at 175

1528 pick up IFR to Rifle approach, enroute at 180 (lots of clouds/some rain)

1556 low pass at Rifle, climb towards Meeker

161630 low pass at Meeker, climb enroute to Eagle

1621 busy at Eagle, decide to go to Hayden first

1637 low pass at Hayden, still seeing CO2 spike

1643 climb enroute to Kremmling, once over Kremmling will decide re: Eagle approach.

171930 low pass at Eagle, still see CO2 spike, climb enroute back to LAR

1735 FL230 enroute to LAR

1746 begin descent towards LAR

1758 wheels down

Postflight:

Uneventful

Debrief:

No issues re: instruments.

Ops took longer than planned for because IFR operations and setting up IFR approaches took significantly longer than VFR would have.

Flight and Debrief Notes

JF

Project: ACME07

Flight: IOP 3, Flt 5; Research Flight 13

File: 20070801b

Crew:

D. Cooksey

T. Campos

J. French

B. Stephens

Preflight:

To be part of two flight experiment. We are sampling same points as flight from this AM, Also plan to 'go over hill' and sample pollution cloud in Denver (Centennial Airport)

Set up for 2:00 PM takeoff

Flight:

(times GMT)

Wx: winds 07/09 kts, T26/Td08 C, few 110

2007 wheels up

2010 begin climb to 155 enroute to Walden

2017 begin descent to Walden

2023 low pass at Walden, climb to 155

2029 at 155, begin descent to Granby

204030 low pass at Granby

2041 climb to 145 towards Williams Fork

2050 LOOP1 begin descent down St. Louis Valley

205230 low pass at FEF

2053 climb to 145 towards point AFT1

210030 LEG1 AFT1 to AFT2 at 145, won't be able to go any higher due to clouds

2103 at AFT2 end leg, begin setup for loop2

210730 LOOP2 begin descent down valley

210943 low pass over FEF

211045 end loop, climb enroute to Centennial airport

2124 begin descent VFR into Centennial

213430 low pass at Centennial, climb enroute back to LAR

2158 level at 240

2203 begin descent to LAR

2221 wheels down at LAR

Postflight:

Uneventful

Debrief:

No issues re: instruments or ops

Flight and Debrief Notes

JF

Project: ACME07

Flight: IOP 3, Flt 4; Research Flight 12

File: 20070801a

Crew:

D. Cooksey

D. Montzka

J. French

B. Stephens

Preflight:

To be part of two flight experiment. No real advection (if anything from the east) so will spend AM flight sampling point in 'receptor' valley, expect several loops and FEF transects at several levels.

Set up for 7:00 AM takeoff

Slight delay for instruments, get off ~7:30 local

Flight:

(times GMT)

Wx: winds 140/04 kts, T14/Td11 C, clear

1331 wheels up

1340 at 175 enroute to Walden

1343 call time hack for CO2 system

1345 spiral descent into Walden

1352 low pass over Walden

1359 at 135, begin descent to Kremmling

1408 low pass at kremmling

1415 at Williams Fork, 145, (LOOP1) begin descent to head of St. Louis Valley

1420 low pass at FEF, 500 ft AGL

1421 begin climb back to 145

1429 at Williams Fork 145

1432 LOOP2 begin descent down valley

1435 CO2 and aerosol spike, low pass FEF

1436 begin climb back to 145

1444 at Williams Fork 145

144630 LOOP3 begin descent down valley

1449 low pass over FEF

1454 low pass at Granby (large CO2 spike)

1500 at 150, enroute to Kremmling

1505 low pass at kremmling, large CO2 spike

151430 at AFT1, 155, descending 90/270 to 145 to setup for transect legs

151730 LEG1 AFT1 to AFT2 FL145

152050 at AFT2 climb to 155

1526 LEG2 AFT2 to AFT1 FL155

152840 at AFT1 climb to 165

1532 LEG3 AFT1 to AFT2 FL165

153430 at AFT2 climb to 175

153830 LEG4 AFT2 to AFT1 FL175

154110 at AFT1 begin descent to 130

154630 LOOP4 begin descent down St. Louis Valley

154945 climb to 145, setup for loop

1558 Williams Fork 145

160030 LOO5 begin descent down valley

160330 low pass FEF, slight CO2 spike

160420 climb to 145

1612 Williams Fork 145

1615 LOOP6 begin descent down valley

1617 low pass at FEF, slight CO2 spike

1618 climb to 145 enroute to AFT1

1623 LEG5 AFT1 to AFT2 FL145

162530 at AFT2, climb to 155

162915 LEG6 AFT2 to AFT1 FL155

163230 at AFT1, climb to 165

163530 LEG7 AFT1 to AFT2 FL165

163830 at AFT2, climb to 175

???? LEG8 AFT2 to AFT1 FL175

1645 end leg, descend to setup for last descent down valley (loop)

164930 LOOP7 begin descent down valley

165230 low pass FEF, CO2 spike is not there

1653 climb out of valley to pick up IFR enroute to LAR

170530 level at 230

1708 begin descent towards LAR

1720 wheels down

Postflight:
Uneventful

Debrief:

No issues re: instruments or ops

First flight with Cooksey as pilot; ops went smooth, expect Cooksey will pilot remainder of missions.

Flight and Debrief Notes

JF

Project: ACME07

Flight: IOP 3, Flt 2; Research Flight 10

File: 20070718b

Crew:

T. Drew

A. Desai

J. French

D. Montzka

Preflight:

To be part of two flight experiment. We are sampling receptor points this PM.

Set up for 2:30 AM takeoff with 12:30 AM preflight.

Air conditioner not working last flight, Brett and T. Pierce work on it between flights, but unable to fix.

Hot out this PM, pull out ~50 minutes before scheduled takeoff. Did not put ground A/C on aircraft outside, cabin heats up too much....

Flight:

(times GMT)

Wx: winds 320/15G20 kts, T29/Td05 C, Partly cloudy

2022 wheels up

2029 very hot in cabin, DAS 111, decide to hold altitude at FL155 (just below clouds) to attempt to cool cabin down

2039 still hot, DAS 113.2, cabin 101

2044 cabin at 99, DAS 113.2 (cabin trending in right direction....) decide to continue with flight plan, begin descent for missed approach into Walden

2050 missed approach at Walden

2056 spiral descent into SNP, DAS 112, cabin 99

2100 700 ft AGL over SNP

2107 at FL175 over Willow Creek, begin spiral descent

2111 hit point over Willow Crk, climb to FL175 enroute to Granby; Cabin 97, DAS 111

2117 level at FL165, hold for CO2 cal

2121 begin descent into Granby

2126 missed approach at Granby, climb enroute to Williams Fork

2133 descend to head of St. Louis Creek Valley

2137 over FEF, 200 ft AGL, then climb to FL145 at Williams Fork to repeat

2145 descend to head of St. Louis Valley

2149 over FEF, 200 ft AGL

2150 spiral climb to FL145

2153 at FL145 hold for CO2 cal

2158 begin FEF transverse at several levels, need to shorten some, maybe knock out highest altitude because of clouds

2217 end FEF transverse, FL165 enroute to Walden

2227 begin descent into Walden

2233 missed approach Walden, climb to 155 enroute to SNP

2238 begin descent over SNP

2242 low over SNP, climb to FL175 enroute to Willow Creek

2248 at FL 175 begin descent to Willow Creek

2253 over pt at 500 ft AGL climb to FL230 enroute to LAR

2319 wheels down

Postflight:

Uneventful

Debrief:

Cabin clearly too hot, started off way behind curve before takeoff. Even if aircraft air conditioner was working, likely would have had heat issues. Suggest from now on will use ground a/c unit for afternoon flights. Also should minimize length of time aircraft is outside prior to flight.

Flight and Debrief Notes

JF

Project: ACME07

Flight: IOP3, Flt 1; Research Flight 9

File: 20070718a

Crew:

T. Drew
A. Desai
J. French
T. Campos

Preflight:

To be part of two flight experiment. We are sampling receptor points and some back trajectories this AM (modeling shows very little advection through the day).

Set up for 8:30 AM takeoff with 6:30 AM preflight.

On startup, Analog1 fails (does not respond to ping). After 2 power dns/ups still no response. All other cards respond to manual ping, D. Lukens resets card (via reset button on front of card). Following reset the Analog1 comes up.

Takeoff delayed ~1/2 hr. due to Analog1 problems.

Flight:

(times GMT)

Wx: winds 230/12 kts, T23/Td07 C, clear

1501 wheels up

1506 CO is too low 100 ppb (??), T. Campos thinks lamp came on late, run another cal to characterize...

1511 begin descent for missed approach into Walden

1516 missed approach at Walden

1531 begin descent to head of St. Louis Valley

1533 begin run down valley

153530 bottom of valley, large CO2 spike

1536 climb to FL145 over valley

1540 @ FL145, to Williams Fork

1545 begin 2nd descent to head of St. Louis Valley

154730 bottom of valley, CO2 spike

1548 climb to FL145 over valley

1600 on line for FEF transverse at several levels

1617 cabin T 89F, DAS 104F

1620 FL175, enroute to Kremmling

1622 begin descent into Kremmling

1627 missed approach at Kremmling

1633 enroute to Hayden

1637 begin descent into Hayden

1643 missed approach at Hayden, big spike in CO2 and CPC (railed CPC??), prior to spike output of CPC into DAS did not appear to be working (CPC front panel #s looked OK, but realtime was reading near zero)

1648 cold spikes in TRF and TDP, 1-2 C, lasted 1-2 seconds...doesn't show up in processed data, I think this is realtime display issue.

1651 at FL175 enroute to Walden

1655 begin descent into Walden

1700 missed approach at Walden, then climb to FL145

1710 low pass at A09A, stay low (1000 ft AGL) to A09B (these points in Saratoga Valley)

1719 begin climb to FL230, enroute to LAR

1732 descend to LAR

1742 wheels down

Postflight:
Uneventful

Debrief:

CPC not working for first 2/3 of flight, display on front panel of instrument looks right but data system # near zero. Following flight appears to work on ground...maybe a cable issue?? Maybe at D/A issue?? Will keep eye on instrument next couple of flights....

On ground cold startup of DAS unable to reproduce problem with Analog1 card, will keep eye on over next flights

Air conditioner did not work during flight, rather warm in cabin. Brett and Tom P. trouble shoot between missions, unable to find/fix problem before second flight, will look at following days.

ACME – Flight #2

1 June 2007

Larry Oolman

Flight Crew:

Tom Drew, Ankur Desai, Larry Oolman, Teresa Campos

Summary:

This flight was near the Frasier Valley and upwind in the Yampa Valley and southern Wyoming. The EGG chilled mirror hygrometer exhibited dropouts at higher dewpoints.

Notes:

1353 Take off
1358 Cloud base at FL150
1401 FL180
1411 Start descent
1413 Cloud top FL158
1414 Cloud base FL148
1424 Low approach over 20V (Kremmling)
1428 FL125
1431 Low approach over GNB (Granby)
1433 FL100
1439 FL150
1443 Descend to FL130
1445 Start down (SLV) St. Louis Creek Valley
1448 (FEF) Frasier Experimental Forest
1452 FL150
1457 Start down SLV
1459 FEF
1503 FL148
1508 Start down SLV
1510 FEF
1515 FL150
1520 Low approach over 20V
1524 FL150
1530 Over SPL (Storm Peak Laboratory) FL110

1532 FL135
1537 Low approach over HDN (Hayden)
1543 FL170
1549 A02A (40 30'N 108 00'W)
1555 FL135
1601 A02B (41 00'N 107 45'W)
1606 FL155
1611 A02C (41 00'N 107 00'W)
1614 FL140
1624 A02D (41 30'N 107 00'W)
1629 FL165
1636 A02E (41 30'N 107 45'W)
1637 FL090
1646 Low approach RWL (Rawlins)
1658 FL230
1710 Land

Flight and Debrief Notes

JF

Project: ACME07

Flight: Research Flight 1

File: 20070503a

Crew:

T. Drew

B. Stephens

J. French

I. Pollack

Preflight:

To be part of two flight experiment. We are sampling back trajectories points around Montrose, Eagle and Grand Junction this AM. Plan to sample around Walden and Kremmling this afternoon.

Set up for 8 AM takeoff with 6 AM preflight.

No issues during preflight (except project manager JF missed preflight brief...)

Flight:

(times GMT)

Wx: winds 150/10 kts, T12/Td4 C, partly cloudy

Following engine start, 3rd seat headset mic did not work, opened doors w/ engine running to replace headset.

1405 Wheels up

1414 @ FL175 heading south, begin descent towards Walden

1421 missed approach at Walden, climb back to FL145 enroute to Granby

1426 upto FL150, decide to continue climb to FL175

1429 @ FL175, begin descent to Granby

1437 missed approach at Granby, climb back to FL175

1444 @ FL175, begin descent at St. Louis Valley

1449 @ valley head, descend down into valley

1451 over tower (??) at 200 ft AGL (big spike in CO2 and CPC at end of valley)

1452 climb to FL175 enroute to Grand Junction

1458 topped at FL175, drop back to FL165 for ferry to GJ, puts us just over top of most clouds

1526 begin descent into Grand Junction

1536 missed approach at Grand Junction, climb back to FL175

1545 at FL175, begin descent toward Montrose

...maneuver to avoid traffic....

1556 missed approach at Montrose, climb back to FL175 enroute to Rifle

1607 @ FL175, descend toward Rifle

1618 missed approach at Rifle, climb to FL175 enroute to Eagle

1625 @ FL175, descend toward Eagle

1633 missed approach at Eagle, climb to FL230, pick up IFR, enroute to LAR

1645 @ FL230

1650 begin descent towards LAR

1704 wheels down

Postflight:

Uneventful

Debrief:

At end of St. Louis Valley, passed over house fairly low, Britt/Tom will move way point further to left to avoid making such low pass

CO2 instrument: when on ambient air, flows were to low, this began sometime through the flight, Britt noticed when climbing out of Rifle...turns out that valve (??) was frozen, Teresa and Ilana changed some SS tubing in prep. For afternoon flight...

Mechanic issues:

On prep for second (afternoon) flight Tom unable to start right engine (blades did not spin). Turns out that starter/generator burned out. Flight was scrubbed.

End of IOP1

Flight & Debrief Notes

JF

ACME07
20070425b
Test Flight 4

Crew:

T Drew
B Kuestner
J French
T Campos

Flight Notes:

Second test flight for the day. Set up to be very short, only a few pitch and yaw maneuvers and then RTB

2015: Wheels up

2017: climb to FL095, conduct 3-4 PTC (up/dns), conduct 3-4 YAWS (up/dns)

2023: RTB

2026: wheels down

Debrief Notes:

Appeared to have significantly less sensitivity to pitch. However, need to take closer look at data to confirm this.

Very short preflight.

No other issues.

Flight & Debrief Notes

JF

ACME07

20070425a

Test Flight 3

Crew:

T Drew
I Pollack
J French
T Campos

Flight Notes:

Test motion sensitivity and descent rate for CO2 measurements. Pattern will be conducted in clear air to NW of Laramie.

1626: Wheels up, following takeoff, climb to FL175

1633: at FL175, descend ~ 1 kft/min to just above surface

1644: at 500 AGL, begin climb back up to FL175

1651: FL175, begin descent ~ 2 kft/min to just above surface

1656: 650 ft AGL, climb back to above clouds (top of BL) to set up for motion maneuvers

1702: level at FL150

170220: begin PTC up/dn

1706: end PTC (3 up/dns)

1707: FL165, setup for yaws during S/L

170730: begin YAWS

1710: end YAWS

1710: coordinated circle LEFT

171330: end circle left, begin coordinated circle RIGHT

1716: end circle right

1730: wheels down

Debrief Notes:

Still see significant variation (8 ppm) during pitch, much less in yaw.

Short preflight; way-points did not need to be entered by pilot. Pre-flight was picked up at time of pull-out from checklist. This appeared to work well.

GPS flag that was noted on first test flight...T Drew set up for a GPS approach at end of flight, no flag was noted. Drew will run a few more GPS approaches when possible to further test system.

Probe/boom heats not turned on for flight. Did not penetrate cloud during flight.

Final decision is to make small modifications to CO2 instrument and conduct very short test flight later in afternoon.

Debrief Notes

JF

ACME07

20070416a

Test Flight 2

Crew:

T Drew

T Campos

L Oolman

I Pollack

Debrief Notes:

Purpose of this test flight was to test the response of user-supplied CO2 instrument to aircraft motion. During test flight 1, instrument showed significant noise response to pitch maneuvers. Instrument PI changed orientation of valves between flights.

Secondary objective was to conduct set of Rodi maneuvers. Although maneuvers were conducted during initial test flight, GPS was not operational during first test flight. GPS was operational this flight, thus Rodi maneuvers should be of greater utility here.

Pre-flight was reduced by ~60 minutes as instruments were tested on ground, in hangar. Way-points did not need to be entered by pilot. Pre-flight was picked up at time of pull-out from checklist. This appeared to work well.

There still appeared some effect on instrument measurements during pitching maneuvers. It appeared significantly less than during test flight 1. More analysis needs to be conducted for quantitative statements.

Needed to break through clouds going to site where maneuvers were conducted...it appeared inadequate drying after cloud penetration. Will need to look at CLWC to make statements re: what is acceptable for cloud pens.

T Drew noticed a 'weird gps flag' on approach. Will conduct a few more GPS approaches when appropriate to determine if there is a problem that needs to be attended to.

Flight and Debrief Notes

JF

Project: ACME07

Flight: Test Flight 1

File: 20070409a

Crew:

T. Drew

B. Stephens

J. French

I. Pollack

Preflight:

Implementation of new checklist procedures went very smooth. Takeoff time was delayed by 15 minutes (original 1500 MDT, delayed to 1515 MDT) due to problems with user supplied instrument on startup.

Upon first start of data system (outside hangar) DIGIO1 failed and would not initialize. Decision made not to cycle power on UPS due to Ethernet hub connection through 4th seat to user supplied instruments. Cycled power on front of data system. Upon restart, DIGIO1 initialized fine.

At engine start, right side (??) generator would not start. Drew shutdown engines. Spiker & Pierce started right side and generator started. Once again shutdown engines and proceeded with normal startup. This resulted in ~5 minute delay of takeoff.

Noticed on ground (after doors shut) that had no keyboard control of CO from 3rd seat.

Flight:

(times GMT)

Wheels up 2120.

Head south out of LAR, climb to FL175; this puts us on top of most clouds. As we head south, cloud cover increases from ~5/10 to about 8or9/10.

2139: begin missed approach into Granby, clip few clouds on way down.

214330: pass over runway at Granby

Ascent out of Granby, difficult to find hole in clouds

2151: back to FL175; looking at clouds, decide not to proceed west for another low level pass. Decision made to pick up IFR, climb to FL235, proceed north of LAR and conduct flight maneuvers.

2203: FL235

2210: descend to FL120, drop IFR. Will now ascend to above clouds (somewhere between FL140 and 170 to conduct maneuvers)

2223: FL175, just above cloud tops; setup to begin Rodi maneuvers; More variance in vertical wind than would like....

~2227: begin wind circles w/ airspeed variation

~2236: begin wind circles w/ sideslip variation

~2243: Straight/Level with slow sideslip variation

~2245: Straight/Level with slow Pitch/alpha variation

Noted some variation in user supplied CO2 output during the maneuvers

Wheels down 2256

Postflight:

Uneventful

Debrief:

Lack of control of CO instrument from 3rd seat keyboard was noted. Engineering will take care of this before next flight.

No flight tracks displayed on realtime...GPS from ashtech was not working (had worked at some time before data recording began...but no data came through after recording turned on) Test GPS outside before next flight. Conjecture: could be bug in serial Ethernet driver, could be result of power down of data system on front panel (not using UPS)...Power downs/ups of data system will now go through UPS (as normal), user supplied will need to re-establish connection via remote desktop following a power down.

Some discussion on impact of aircraft motion on user supplied CO2 measurements.

*(After data processed) T Campos needs to change orientation of valves in instrument to reduce impact of a/c motion. This will require ~1 day of work and necessitate a second test flight before beginning research ops.

Some discussion re: weather...today demonstrated how difficult it can be to fly VFR over entire domain. Expect it to be easier in summer IOPs, however expect to be difficult

through end of April (perhaps). Do want to avoid liquid water...small amounts of cloud water probably (??) OK, but avoid rain and moderate CLW (~.25 grams???)

Mechanic issues:

Generator not start...likely due to 'sticky relay', K/A hasn't flown since mid-Feb (~2 mos.)

Right bleed air valve also 'sticking' (again due to non-use??) Spiker/Pierce will look at.

Non-use problems may be solved by maintenance test flight proceeding instrument test flight...this should be discussed in post-project critique.

Flight Notes:
B. Stephens
20070409a

Here are my notes from the flight, all times UTC from my watch (sync'd to time.gov preflight):

21:14 CO forced 2 cals, no control from front seats

21:17 Runup

21:18:30 Taxi to rwy

21:19:35 Roll

21:20:05 Wheels up

21:25:00 @ base of well defined cloud layer, 14 kft, 50% coverage

21:28:15 CO2 cal started

21:31:25 Brief cloud pen.

21:34:50 CO2 cal done

21:41-21:42 Light rain

21:43:30 Low point (100-200') over GNB

~21:50 CO cal 28000/5000 counts

21:53 Picked up IFR, started CO2 cal

21:58 21.5 kft, CO2 back to air

22:01:00 CO2 to REF @ 23.0 kft

22:03:00 CO2 back to air @ 23.1 kft

~22:05 starting descent

22:08:00 and 22:08:30 Brief cloud pen.

22:08:30 @ base of cloud layer, 14.3 kft

22:24:30 CO2 cal done, left on HS, maneuvers start

22:39 Middle of side-slip Rodi maneuvers, CO2 oscillation apparent sampling air

22:42 CO2 on HS, oscillations ~ 3 ppm?

~22:43 Straight-line side-slips

22:45 Porpoises

~22:57:00 Touchdown