



# University of Wyoming WAICO 2008

## Wyoming Airborne Integrated Cloud Observations (Experiment)

February 1 2008 - March 31 2008

[Coincident with WWDC08](#)

*Photo courtesy of Dave Moore; King's College, London*

- [Contacts](#)
- [KingAir \(UWKA\) Data](#)
- [Radar \(WCR\) Data](#)
- [Lidar \(WCL\) Data](#)
- [Radiometer \(GVR\) Data](#)
- [Plot of Flight Hours](#)

### [UWKA Deployment Status Calendar \(KAOS\), psswd'd](#)

### [UWKA Web Page](#)

*Note: torque values are incorrect for the entire project.*

Date	Flight # (* .kml)	Status	Times (UTC)	Hours	Notes
<i>Research Flights</i>					
21 July 2008		Reprocessed and tagged: waico08_qc2 using the boom calculations for the pressure correction.			
<i>Research Flights</i>					
1 Mar	<a href="#">RF11</a>	Tried to sample high altitude (all ice) clouds over Snowies, to 27 kft Radar died, return early, end of project	2050 - 2154	1.1	
28 Feb	<a href="#">RF10</a>	Targeted mid-level stratus with some wave modulation formed over Laramie Valley. Good sampling in some mixed phase wave clouds, multiple wavelets.	2055 - 2036	2.8	
27	<a href="#">RF09</a>	Very good wave and lenticular clouds.	1553 -	5.0	<a href="#">LO</a>

Feb		No known problems.	2048		<a href="#">notes</a>
26 Feb	<a href="#">RF08</a>	VFR flight, no GVR problems.	2027 - 2218	1.5	<a href="#">LO notes</a>
23 Feb	<a href="#">RF07</a>	Only one GVR reset. Base station GPS antenna put horizontal prior to yesterday's test flights.	1657 - 2039	3.8	<a href="#">LO notes</a>
20 Feb	<a href="#">RF06</a>	Worked prefrontal high and mid-level clouds over the Laramie Valley. GVR now ignores format errors, but exhibits backwards time jumps.	2008 - 2255	2.9	<a href="#">LO notes</a>
16 Feb	<a href="#">RF05</a>	Worked wave clouds and wave modulated stratus ahead of system moving in; clouds very dynamic and changing quite rapidly. Radar showed very low transmit power; particularly late in flight. Sam determined that w-band detector is failing; radar is OK.	1700 - 2005	3.2	
14 Feb	<a href="#">RF04</a>	Worked thick stratus deck north of Laramie. Light snow across the valley; little or no liquid water. GVR being repaired at proSensing, radar transmit power show some jitter during flight (Later determined to be prob. with scope), Radar fault 1 at end of flight, 4th seat computer went down at same time; unable to reproduce problem with 4th seat following flight.	1552 - 1822	2.6	
09 Feb	<a href="#">RF03</a>	Worked wave cloud over Laramie Range, east-northeast of Laramie; by end of flight, cloud morphed into some stratus/wave modulated, some problems with GVR, WCR fault1 at end of flight, no other known problems	1655 - 2003	3.3	
08 Feb	<a href="#">RF02</a>	Unable to get GVR working, noticed following takeoff, decided to scrub mission (more info in flight notes)	2015 - 2040	0.5	<a href="#">JF flight notes</a>
06 Feb	<a href="#">RF01</a>	Worked 2 separate wave clouds north (?) of Elk Mountain (generated off of Shirley mtns??). Wave clouds seemed to be changing rather quickly in time. Stepped up from 14 kft to 21 kft (top) through mountain cloud over the Snowy Range, leg length ~12 nmi. GVR not working from ~15 minutes after takeoff for rest of flight. No other known problems.	1706 - 2004	3.1	<a href="#">JF flight notes</a>

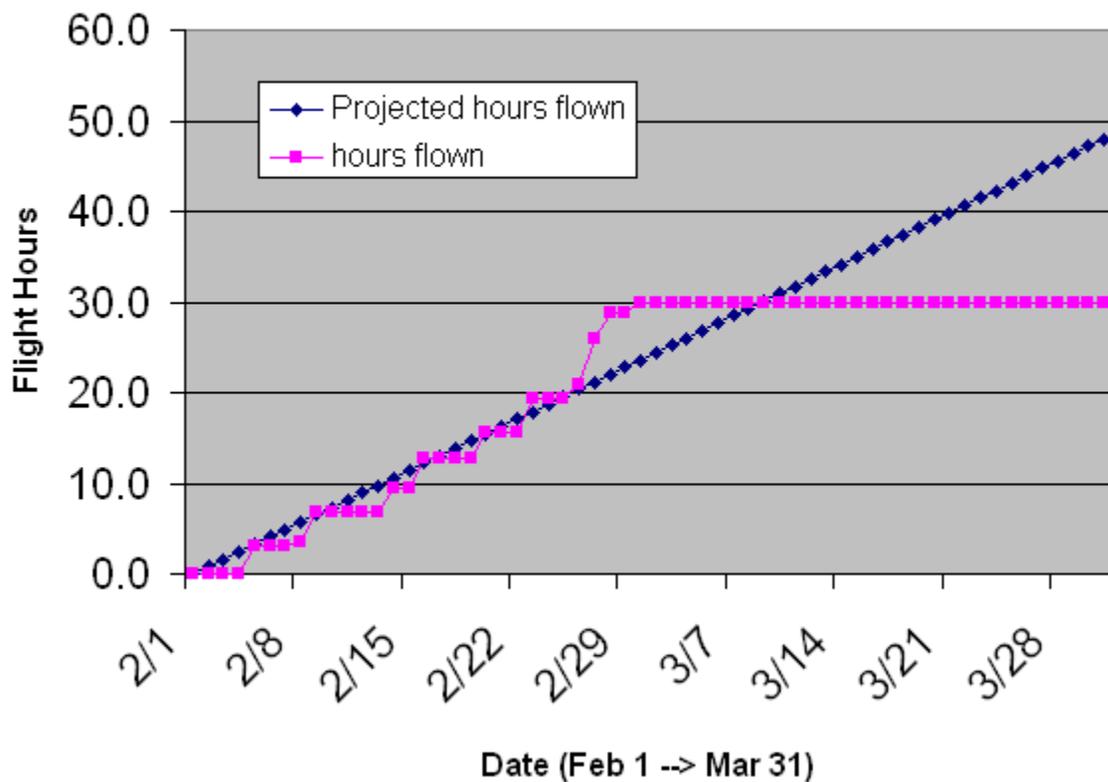
### *Test Flights*

22 Feb	<a href="#">TF04</a>	Test GVR.	1948 - 1954	0.2	
22 Feb	<a href="#">TF03</a>	Test GVR, LWC-100 and wing tip strobes reset small timer words on GVR.	1619 - 2039	0.3	
05 Feb	<a href="#">TF02</a>	Flight for calibration of radar beam and winds. Conducted beam cals at 3 levels, conducted Rodi maneuvers, conducted Lenschow maneuvers. No control of 4th seat computer at third seat, ran WCL, but did not display images in real-time. No other Known Problems	1716 - 1922	2.2	<a href="#">JF flight notes</a>
30 Jan	<a href="#">TF01</a>	Integer time stamp only for WCL, ~1.5 sec offset between WCL and UWKA clock, GVR not working, Incorrect calibration coefficients for AIAS (reprocessed with corrections file to fix), No other Known Problems	1736 - 1844	1.3	<a href="#">JF flight notes</a>

Total Flight Hours

remain

# WAICO Flight Hours



# WAICO Flight Notes (RF09)

27 February 2008, 1553-2048 UTC

Larry Oolman

## Crew:

T. Drew  
Z. Wang  
L. Oolman

## Notes:

Great lenticular and wave cloud case  
Everything worked well

## Flight Legs:

Start	Finish	FltLev	Temp	Trk	WndDir	WndSpd	Comments
			C	degT	degT	knot	
15:54:45	16:06:00	132	-8.0	46	321	36.0	
16:06:40	16:08:53	116	-5.7	303	324	31.6	Under lenticular cloud
16:10:26	16:14:33	116	-5.8	144	322	35.2	
16:16:56	16:19:20	118	-6.8	343	325	36.8	Switch WCR to Up mode
16:19:34	16:24:50	118	-6.0	322	317	31.0	
16:27:35	16:31:58	120	-7.2	157	312	31.4	
16:33:54	16:38:31	120	-7.2	339	310	32.4	
16:38:37	16:41:22	120	-6.1	309	323	33.1	
16:43:13	16:45:46	130	-8.1	139	323	33.0	Switch WCR to three beam mode; change all files
16:48:38	16:51:10	146	-11.8	310	328	31.8	
16:52:49	16:56:15	155	-13.7	139	320	37.0	
16:57:39	17:02:54	155	-13.5	312	325	36.3	
17:05:25	17:07:18	155	-13.7	138	320	34.6	
17:09:53	17:13:56	165	-15.4	319	318	36.1	New WCR file
17:15:25	17:17:23	170	-16.2	137	317	37.8	
17:19:12	17:22:50	176	-17.2	314	318	38.7	
17:24:51	17:26:56	180	-18.2	133	316	41.1	
17:29:00	17:32:35	183	-18.8	314	314	42.9	Restart WCR recording; accidentally hit stop button.
17:36:02	17:37:45	173	-17.0	231	319	38.4	New GVR and WCL files

17:38:44	17:40:43	173	-16.7	52	318	37.6	
17:42:05	17:44:12	163	-14.6	234	319	36.7	
17:45:37	17:47:46	163	-14.9	50	323	35.8	
17:48:28	17:50:09	163	-14.6	167	323	36.9	New WCR file
17:57:37	17:59:16	191	-19.7	133	309	47.7	Work higher line of clouds; new files
18:00:55	18:04:56	196	-21.0	308	311	48.7	
18:06:52	18:09:15	201	-22.3	130	307	49.5	
18:11:10	18:16:09	206	-23.1	312	309	49.4	
18:18:17	18:20:48	210	-24.4	133	307	49.7	
18:22:54	18:28:26	216	-24.8	316	313	50.8	New WCR file
18:30:29	18:33:46	226	-27.1	132	313	53.5	
18:35:46	18:42:20	231	-28.3	309	314	53.7	
18:44:53	18:46:30	236	-29.5	130	311	56.2	
18:48:25	18:52:42	234	-29.1	313	313	55.4	
18:54:41	18:56:45	233	-28.6	127	312	54.6	
18:58:48	19:03:21	233	-28.6	305	315	54.3	New WCR file
19:05:43	19:08:11	231	-27.8	130	314	55.6	
19:10:15	19:14:07	250	-32.3	313	318	56.0	
19:18:56	19:20:32	250	-32.7	133	314	59.5	Different cloud line
19:22:19	19:26:12	246	-31.9	311	316	58.1	Start on lenticular
19:28:08	19:30:11	241	-30.5	129	316	56.8	
19:32:02	19:37:22	236	-29.2	307	318	55.5	
19:39:10	19:41:29	231	-28.2	132	315	52.5	
19:43:36	19:48:34	226	-27.1	313	315	50.5	New WCR file
19:50:29	19:53:07	220	-25.8	129	314	49.0	
19:55:19	20:00:03	216	-25.5	308	313	47.9	
20:02:01	20:05:20	211	-24.4	129	311	48.0	
20:07:12	20:13:12	206	-23.5	313	313	45.1	
20:15:03	20:18:25	201	-22.8	133	312	43.1	New files
20:19:42	20:25:29	196	-21.4	311	315	40.9	
20:27:32	20:29:28	191	-20.3	129	319	39.0	
20:31:20	20:35:24	181	-17.9	309	320	37.6	
20:36:04	20:42:52	139	-8.4	223	314	34.9	Start home

# WAICO Flight Notes (RF08)

20 February 2008, 2027 - 2218 UTC

Larry Oolman

## Crew:

T. Drew  
Z. Wang  
L. Oolman

## Notes:

No GVR problems.  
Entire flight was VFR  
May be some interesting rotor data down wind of Elk Mountain near the end of the flight.

## Flight Legs:

Start	Finish	FltLev	Temp	Trk	WndDir	WndSpd	Comments
			C	degT	degT	knot	
21:04:39	21:07:20	89	-8.2	99	283	36.4	Pass under cloud street
21:11:32	21:16:22	89	-7.4	275	282	35.4	Switch radar to Up mode
21:17:48	21:20:25	89	-7.4	97	281	35.8	
21:22:41	21:25:11	89	-7.7	10	281	45.4	
21:26:41	21:29:53	89	-7.7	199	278	39.9	
21:30:17	21:33:04	89	-7.2	283	285	36.0	
21:33:23	21:35:29	89	-7.5	2	280	35.3	
21:40:47	21:42:27	119	-11.6	6	301	38.1	Radar back to 3 beam mode
21:42:45	21:45:07	119	-10.8	328	309	37.9	
21:47:24	21:50:40	123	-11.3	210	308	37.1	
21:51:30	22:02:37	124	-10.9	236	294	35.3	Two passes over cloud downwind of Elk Mountain
22:06:33	22:16:39	108	-7.6	116	285	26.6	Start home

# WAICO Flight Notes (RF07)

23 February 2008, 1657-2039 UTC

Larry Oolman

## Crew:

T. Drew  
Z. Wang  
L. Oolman

## Notes:

GVR only reset once during the flight,  
GPS base station antenna was on its side prior to the test flights before this flight.

## Flight Legs:

Start	Finish	FltLev	Temp	Trk	WndDir	WndSpd	Comments
			C	degT	degT	knot	
16:58:48	17:01:17	108	-8.7	157	247	4.7	
17:02:17	17:06:31	115	-10.7	285	290	8.0	West towards Sheep Mountain
17:07:34	17:11:42	115	-10.8	103	278	8.9	
17:13:16	17:17:11	115	-10.7	282	282	7.8	
17:18:56	17:24:02	115	-10.7	103	273	9.1	No WCR file
17:26:35	17:32:03	130	-14.5	284	261	10.7	
17:34:25	17:40:42	130-150	-16.3	103	250	9.0	Porpose between FL130 and FL150
17:42:07	17:47:46	130-150	-17.4	286	263	8.0	Porpose between FL150 and FL130
17:49:32	17:54:00	140	-16.7	104	246	9.9	New files
17:55:50	18:05:08	145	-17.5	283	254	10.3	
18:17:53	18:23:59	220	-34.7	285	265	16.8	New files
18:25:55	18:31:28	230	-37.4	103	255	21.3	
18:40:04	18:43:13	230	-37.3	16	252	21.7	
18:49:38	18:52:41	245	-41.6	344	247	22.3	New files
18:54:50	18:58:36	255	-44.1	164	238	22.9	
18:59:30	19:02:28	255	-44.2	351	232	21.8	
19:03:13	19:06:04	255	-44.1	108	238	22.2	
19:07:34	19:10:01	255	-44.1	310	234	19.0	New files
19:17:45	19:19:15	150	-18.1	99	298	12.4	Lenticulars east of Snowies

19:20:30	19:22:34	155	-19.1	281	296	14.4	
19:20:30	19:22:34	160	-20.4	94	292	15.4	
19:36:43	19:38:55	165	-21.4	298	291	14.3	
19:42:37	19:40:47	170	-22.9	101	292	14.0	
19:44:52	19:47:29	180	-24.8	291	280	14.4	New files
19:49:19	19:53:18	190	-27.6	115	268	16.0	
19:53:24	19:55:57	190	-27.6	102	257	15.9	Under mid-level wave cloud
19:59:01	20:01:03	190	-27.9	76	259	16.0	
20:02:24	20:05:21	190	-27.9	256	263	15.5	
20:07:10	20:09:55	200	-30.1	78	258	17.9	
20:12:02	20:15:52	210	-32.5	260	259	20.3	
20:17:55	20:21:31	200	-30.1	79	259	17.2	New WCR file
20:22:42	20:26:14	200	-30.1	259	265	17.5	GVR reset
20:27:47	20:31:18	197	-29.5	79	266	19.1	

# WAICO Flight Notes (RF06)

20 February 2008, 2008-2255 UTC

Larry Oolman

## Crew:

T. Drew  
Z. Wang  
L. Oolman

## Squawks:

ANALOG1 would not respond to pings. Recycled power twice.  
GVR code hung the first time we tried it.  
GVR had negative time jumps during the flight.

## Flight Legs:

Start	Finish	FltLev	Temp	Trk	WndDir	WndSpd	Comments
			C	degT	degT	knot	
20:28:23	20:34:35	175	-19.4	11	192	12.1	Near Sheep Mountain
20:37:05	20:46:51	195	-22.3	190	238	16.8	
20:49:55	20:57:50	215	-26.9	10	228	22.8	New WCR & WCL files
20:59:43	21:06:15	225	-28.8	190	233	24.1	
21:08:48	21:13:39	235	-31.1	10	227	27.8	New files
21:15:07	21:21:52	245	-32.9	191	229	32.8	
21:32:24	21:34:57	265	-37.8	122	230	30.0	New files
21:49:19	21:54:51	180	-20.4	59	202	10.4	New flight line to northeast
21:56:33	21:59:55	185	-21.4	240	207	6.5	New files
22:02:02	22:08:05	190	-22.7	57	217	6.5	
22:10:16	22:13:13	190	-23.2	236	215	5.3	
22:14:55	22:18:47	195	-24.0	57	208	7.5	
22:20:49	22:24:10	200	-24.8	239	227	8.4	
22:26:22	22:29:27	210	-26.0	57	243	18.5	New files
22:31:32	22:36:40	220	-28.3	238	244	21.7	
22:42:58	22:45:48	170	-18.8	59	178	4.4	Spiraled down to this level
22:46:37	22:52:48	125	-8.2	205	242	8.7	Head home

## **Flight and Debrief Notes**

*JF*

**Project: WAICO08**

**Flight: Research Flight 2 (RF02)**

**File: 20080208a**

### **Crew:**

T. Drew

Z. Wang

J. French

### *Preflight:*

Targeting clouds to NW of Laramie. Want to test GVR after it failed on last flight.

2009Z wx: Clear, winds 260/26 gusting to 42, T=-6C, Tdp=-12C

deep clouds over Snowy Range, satellite indicates clouds to west of Snowy Range and over Shirley Basin

### *Flight:*

2015 wheels up

up climb out of LAR, open Nadir port and start new file for GVR.

Notice that all 3 brightness temperatures on top of each other for GVR...does not look right.

Cycle power on GVR during file, no change.

Exit all GVR control, turn off all power to probe and restart control program, new file. Still all brightness temperatures on top of each other.

Decide to return to Base to fix GVR.

### *Postflight:*

Short flight, collected one short radar file, short lidar file, 3 GVR files

Problem with GVR turns out to be hot load not flipping into position for cal check. (RTV used in screw holes 'glued' hot load in place following window re-install the following day. Cleaned out all holes and re-installed window, careful not apply too much RTV.

## Flight and Debrief Notes

JF

**Project: WAICO08**

**Flight: RF01**

**File: 20080206a**

### Crew:

T. Drew

Z. Wang (PI)

J. French

### *Preflight:*

Plan is to target clouds to the NW of Laramie. Plenty of wave clouds in valley, as well as what appears to be elevated stratus decks. Winds are forecast to be primarily westerly at flight level.

1700Z: winds 220 at 23 kts, T -6C, Td -12 C, sky clear, light blowing snow

Plan to depart VFR, fly under "roll" clouds in lee of Sheep Mtn to collect liquid water data for GVR and WCL. Then proceed to NW, pick up IFR and look for target clouds.

### *Flight:*

Wheels up 1706

1712 flying under roll cloud to collect water data from WCL and GVR

1713 started Licor (oops, a little late)

1720 in clear, north of roll cloud, pick up IFR to NW, ascend to FL120.

1730 above some low-level stratus, will target some clouds directly in front of us, looks like a stack of lenticulars.

17-33-49 up/dualdown radar file (udd)

### **Cloud 1**

1734 leg 1 into wind at FL120, fssp 100-120  $\text{cm}^{-3}$ ,

173920 leg 2, tail wind, roughly same droplet conc., LWC (Gerber)  $\sim .15 \text{ g m}^{-3}$

1742 climb to FL130, try to realign on center of wave cloud

174445 leg 3 at FL130, fewer droplets ( $80 \text{ cm}^{-3}$ ), larger mode, higher clwc ( $0.35 \text{ g m}^{-3}$ )

*Note lead cone on GVR is iced...*

1748 looks like the wave is merging with some stratus (??)

1751 climb to FL135, cloud character definitely changing

1753 attempt to make pass, but wave structure not apparent any more

1756 break off ops, target another cloud to West/Southwest

*1800 Start new GVR file, note that GVR data on previous file looks like it was too short; should have ~50 minutes of data, also data on new file looks screwed (brightness temperatures too high)*

### **Cloud 2**

1802 leg 1 tail wind FL135,  $0.2 \text{ g m}^{-3}$ , fssp  $\sim 80 \text{ cm}^{-3}$   
1805 leg 2 into wind, FL120, T -18 C,  $0.3 \text{ g m}^{-3}$ ,  $110 \text{ cm}^{-3}$   
1808 90/270 setup for leg at same altitude  
1810 leg 3 at FL120  
1816 leg 4, FL130, missed center of cloud, looks like cloud has moved to south somewhat (perpendicular to wind)  
1819 turn 180 to realign with cloud further to the south, climb to FL135  
1821 leg 5, tail wind, much better centered, nice ice tail evident on radar and lidar  
1825 leg 6, into wind, FL140, above liquid layer  
1828 90/270 setup stacks stepping down in 500 ft increments  
183030 leg 7 tail wind, FL135, clip top  
1835 leg 8 into wind, FL130, LWC  $0.25 \text{ g m}^{-3}$ ,  $90 \text{ cm}^{-3}$   
1840 leg 9, tail wind, FL125, less water, fewer drops  
1845 leg 10, right at bottom of middle layer cloud, last penetration  
1847 end ops in these wave clouds

*1902 decide to try to work clouds over Snowy Range, look pretty deep, fairly homogeneous, will make several passes, ~along wind, stepping up in 1000 ft increments*

### **Cloud 3**

1907-1910 leg 1 at FL150  
1912-1918 leg 2 at FL160  
1921-1923 leg 3 at FL170  
1926-1931 leg 4 at FL183 (note jump is due to resetting the altimeter after going through FL180, should be an actual 1000 ft altitude gain)  
193330-193630 leg 5 at FL193  
1942-1948 leg 6 at FL203  
1950-1953 leg 7 at FL213  
1954 end ops in this cloud

1955 RTB

2004 wheels down

### *Post Flight:*

GVR data looks bad after first ~20 minutes or so.

Wave clouds changed rapidly.

No other known problems.

## Flight and Debrief Notes

JF

**Project: WAICO08**

**Flight: TF02**

**File: 20080205a**

### Crew:

T. Drew

P. Wechsler

J. French

### *Preflight:*

GVR fixed following TF01.

Completed ELT install prior to flight

Flight is more of “calibration” than instrument test. Expect all ops will be in VMC conditions.

Four (4) items on wish list for today’s flight:

1. Northern most flight legs (under VFR conditions) for WWDC flights over Snowies, under 14 kft.
2. WCR beam calibrations at 3 levels
3. Rodi maneuvers
4. Lenschow maneuvers

Preflight weather does not look conducive for item (1) *{clouds over snowies}*.

Expect should be able to complete (2), (3), and (4). Maneuvers will likely be conducted north of Laramie.

### *Flight:*

Wheels up @ 1716

Proceed to area North/Northwest of KLAR. Just south of where Rock River (creek?) comes out of Snowy Range. This area appears free of ground fog that covers much of prairie (but does not show up on radar). Set up for radar cals. Plan is to begin at 3 kft AGL and work our way up.

### **Radar file 17-26-08 for 3 kft AGL calibration (3 kft AGL)**

172650, begin right 45 deg. circles

172850, end right circles

~173130(?), begin left 45 deg. circles

173343, end left circles

173422, begin S/L with tail wind

173522, end S/L

173700, begin S/L into wind

173800, end S/L

**Radar file 17-44-52 for 10 kft AGL calibration (FL172)**

174522, begin right 45 deg. circles  
174740, end right circles  
174744, begin left 45 deg. circles  
175021, end left circles  
175240, begin S/L with tail wind  
175340, end S/L  
175532, begin S/L into wind  
175635, end S/L

**Radar file 18-05-17 for 17 kft AGL calibration (FL245)**

180737, begin S/L into wind  
180837, end S/L  
181030, begin S/L with tail wind  
181130, end S/L  
181630, begin right 45 deg. circles  
181853, end right circles  
182024, begin left 45 deg circles  
182257, end left circles

**End radar beam calibrations**

Descend to FL140 for Rodi maneuvers, noted on earlier ascent that this level had relatively light winds, relatively devoid of strong shear. The vertical wind variation on the order of  $0.5 \text{ m s}^{-1}$ .

**Begin Rodi Maneuvers**

~183300, begin right turn with yaws  
~183550, begin left turn with yaws  
~183830, end turns with yaws  
  
~183930, begin left turn with airspeed variation  
~184155, end left turn with airspeed  
~184205, begin right turn with airspeed variation  
~184440, end right turn with airspeed

**End Rodi Maneuvers**

Remain at FL140 for Lenschow maneuvers, try to conduct in roughly same area as Rodi Maneuvers.

**Begin Lenschow Maneuvers**

*Pitch up/dns*  
184635, begin set 1  
184740, 15 sec S/L between sets  
184845, complete set 2

*Yaws rgt/lft*

185045, begin set 1

185145, 15 sec S/L between sets

185245, complete set 2

*S/L into/out of wind*

183505, begin 60 sec into wind

185410, end S/L

90/270

185550, begin 60 sec out of wind

185650, end S/L

*Wind Circles*

15 sec S/L

185745, begin wind circle right

190008, end wind circle right

15 sec S/L

190105, begin wind circle left

190337, end wind circle left

15 sec S/L

*S/L speed run*

15 sec S/L

190445, begin speed run (Res AS → min AS → max AS → min AS → Res AS)

190930, end speed run

15 sec S/L

**End Lenschow Maneuvers**

1914, at FL100 set Licor flow

1922, wheels down

*Post Flight:*

AIAS/BIAS disagree, this is calibration issue, fixed in post processing using the corrections file

No control of 4<sup>th</sup> seat from 3<sup>rd</sup> seat; thus did not run WCL idl display program, because of how data system display is piped, could not easily (quickly) reboot 4<sup>th</sup> seat, from now on should run realtime with -d option (so no data system display piped to 4<sup>th</sup> seat)

No video tape for flight (operator error, I failed to start recording...)

## Flight and Debrief Notes

JF

**Project: WAICO08**

**Flight: TF01**

**File: 20080130a**

### Crew:

T. Drew  
B. Glover  
J. French

### *Preflight:*

No ELT for flight

First test flight for WAICO/WWDC project. No instruments have been giving any problems prior to flight.

First installation for Pazmany's GVR. Unable to look at GVR during flight, cable issue between GVR laptop and front display. Should be fixed for next flight.

Six (6) items on wish list for today's flight:

1. Northern most flight legs (under VFR conditions) for WWDC flights over Snowies, under 14 kft.
2. Legs beginning ~500 ft below cloud stepping up through base, then a bit above base to confirm operation of radar, lidar, and radiometer; as well as verifying operation of in situ cloud probes.
3. Two tight circles (720) in "relatively homogeneous" cloud followed by ~2-minute wings level for power calibration of up/down/down-fore beams of WCR
4. WCR beam calibrations at 3 levels
5. Rodi maneuvers
6. lenschow maneuvers

Preflight weather does not look conducive for item (1) *{clouds over snowies}*, (4), (5), and (6) *{too strong of winds and likely waves}*; however, consensus is that still good day for testing (2) and (3) and thus test flight is very worthwhile.

### *Flight:*

Wheels up @ 1736

Proceed to area West/SouthWest of KLAR, east of Sheep Mtn. There appears a cloud perpendicular to wind (wind is west to east) with sharp base, no precip falling out, good candidate for item 2.

~1741, begin legs, passes beneath cloud, South/North, roughly 3 passes, ending at ~1800

~1804, climb into cloud, towards the north, looking for “homogeneous clouds”

~1813, begin right circles for WCR power calibration

~1816, begin ~2 minutes S/L for WCR power calibration

~1818, climb to higher altitude to sample higher in cloud.

~1828, decide to RTB

*Post Flight:*

No real issues.

GVR turns out did not work during flight, fixed on following day when Pazmany came to town.

Weather did not allow calibration maneuvers (waves and strong winds at surface).