

U.S. DEPT. COMM./NOAA/OAO - DATA SECTION WORK FORM NO.1 OAOWF1 FILE

FLT ID: 960629H	FM: BKF	TO: BKF
FLT NO: 96-032	BLK IN: 0004	ATA: 00.01
ETD: 2000	DLK OUT: 1954	RTD: 20 01
ETE: 0300	BLK TIME: 4.2	FLT TIME: 4400 / 4.0
SPONSOR ORG: NOAA	PROGRAM: STERAO	PURPOSE: 02.2

OAO PERSONNEL

AC KENNEDY, PAUL ✓	SYS ENG ROLES ✓
CP TAGGERT, BRIAN ✓	DATA SYS McMILLAN ✓
NAV KOZAK, S ✓	RADAR
FE WADE, S ✓	BT/ODW
RADIO	CLD PHYS
FD CZYZYK, WHITE ✓	DOPPLER

PARTICIPATING SCIENTIST/VISITORS/OAO

LAST, FIRST NAME	ACTIVITY ON A/C	AFFILIATION
<del>CYZYK, S - WHITE, S</del>	AOC	NOAA/AOC
<del>McMILLAN, S ROLES, J</del>	AOC	↓
HUBLER, GERO BUHR, MARTIN	OZONE	NOAA AL / CIRES
SHERIDAN, PAT HOLLOWAY, JOAN		NOAA / CIRES
DACTELS, D MATEJK, T		NOAA / NSDL
FRIED, ALAN		NCAR - ACP
JOBSON, TOM		NOAA - AL / NRC
KUSTER, WILSON, ROBERTS, JAMES		NOAA - AL

PROPOSED/ACTUAL MISSION/REMARKS (RECCO, FIXES, STORM, PENET, NHOP #)

INE#2 no LA/CO/P.tdy/Attch... to Data system.  
 time had w/ N77ND P3. -1s w/ Citation

Time	TA	TD	WD	WS	Remarks			
2001	23.9	0	105	12	T/O			
2008:50					moving JW-LW to 1.3 g/cm <sup>3</sup>			
2010	8.1	-8.9	253	18	level 12 ft			
2030	3.6	-7.2	271	16.1	begin climb to N77ND			
2137	21.5	3.0	160	4	break w/ N77ND			
2154	22.3	-1.3	211	3.5	1500' AGL pt. B			
2300	-9.2	-49.5	265	20.6	finish pt E climb	⊙	F	
0001			020	8	land			

STERA0 96

-----

FLIGHT #6 H960629

TYPE OF DATA -----	SENSOR OR OPTION -----
INE	1
Accelerometer	1
Temperature probe	1
Altitude change option (for vertical winds)	PA
Static pressure	Rosemount fuselage
Dynamic pressure	Rosemount fuselage
Time source	Micro 99
Constants file	CO2963.CON

Notes:

There were four time/data gaps: 2013:09 2013:10 2221:46  
2221:50

The aircraft INE positions were renavigated with respect to GPS.

SPECIAL NOTE!!! Locations 80, 81 and 82 of record five on the standard tape contain vertical ground, vertical air and vertical speeds, respectively, computed using Dave Jorgensen's vertical wind algorithm. It is recommended that these values be used for vertical wind analysis.

Flight Meteorologist: Sean White: (813) 828-3310 ext. 3072

```

TITLE (MAX 21 CHARACTERS) -- EX HURRICANE PAINE
STERA0 FLIGHT 6
YYMMDDL FLT I.D.
960629H
HHMMSS START TIME -99999 DEFAULT TO START OF DATA FOR PRINTOUT ONLY
200001
HHMMSS END TIME 999999 DEFAULT TO END OF DATA FOR PRINTOUT ONLY
000200
HHMMSS TAKE OFF TIME
200500
* NUMBER OF TAPES (I2) ...FOR STANDARD TAPE OUTPUT ONLY
6
* -----LOGICAL UNIT OF INPUT DATA (I1) 5, 8 OR 9 FOR TAPE DRIVE
9
* -----LOGICAL UNIT OF OUTPUT TAPE DRIVE (I1) [FOR STANDARD TAPE ONLY]
9
* -----LOGICAL UNIT OF PRINTER (I1)
6
* -----DATE OF PROGRAM (MMDDY)
06094
* -----STATIC PRESSURE PROBE (I1)
* 1 = PSW (WINGTIP)
* 2 = PSF (CO-PILOT/FUSELAGE)
* 3 = FUTURE USE
2
* -----DYNAMIC PRESSURE PROBE (I1)
* 0 = PQW(WINGTIP)
* 1 = PQF1 (FUSELAGE 1281)
* 2 = PQF2 (FUSELAGE 1221)
* 3 =FUTURE US
1
* -----INE SELECTION (I1)
* 1 = INE 1
* 2 = INE 2
1
* -----ACCELEROMETER (I1) - USUALLY THE SAME AS YOUR INE SELECTION
1
* ----- TOTAL TEMPERATURE PROBE (I1) [1 OR 2]
1
* ----- DEWPONT TEMPERATURE PROBE (I1) [1 OR 2]
1
* -----ALTIMETER OPTION (I1) - FOR VERTICAL WIND COMPUTATION
* 0 = PRESSURE ALTITUDE (OVER LAND)
* 1 = RADAR ALTITUDE APN-159 (OVER WATER)
* 2 = RADAR ALTITUDE APN-232 (OVER WATER)
0
* -----PRINTOUT RATE SECONDS (I2)
10
* -----WINDSPEED/DIRECTION RUNNING AVERAGE TIME, SECONDS (I2)
10 ! FOR STANDARD TAPE OUTPUT ONLY
* -----TIME OPTION (I1)
* 1 = MICRO 29
* 2 = TIME BASED GENERATOR #1
* 3 = TIME BASED GENEATOR #2
1
* -----NAME OF CONSTANTS FILE EX CO3863.CON
CO2963.CON
*****

```

**Flightplan Thunderstorm Study (Scenario 3)**  
Colorado  
boundary-layer to free troposphere exchange

Doors closed: 13:50

Takeoff: 14:00

Point A, Buckley National Guard Field 39 42 N, 104 45W

Calibration at constant altitude, Observer calls  
Head direction of Pt. B (41 00N, 104 25W) at 15 kft MSL

Pt. A to Pt. B 150 km, ~ 19 min, (Climb < 10 min)

✓ Stay at constant altitude for calibration, observer calls  
14:00-14:25

Intercomparison (1400)

Before the Storm

After Calibration descend to 1500 ft AGL along the way to Pt. ~~E~~ B @ 500'

~~Horizontal Survey within the PBL~~

Pt. B to Pt. C (40 10N, 105 00W), to Pt. D (40 10N, 103 30W), to Pt. E (40 30N, 104 10W)  
14:25-15:10

~~D → C → B~~

~~Racetrack Profile up to 21 kft near Pt. E~~

==> Take first set of HC can samples at 1500 ft AGL, 13 kft, 17 kft, 21 kft MSL  
head east for 1 min 50 sec and climb at 1500 ft/min, reverse direction, head west for 1 min 50 sec, and  
continue climb etc up to 21 kft MSL)  
15:10-15:20

Head direction of Pt. F (40 10N, 104 25W)

Pt. E to Pt. F 60 km, 9 min

15:20-15:30

not 1/10  
3500+

---

**Super Cell Scenario**

IF during any part of the flight Operation Center identifies an isolated storm, fly U-  
Pattern (S, W, N sides) around the storm at max altitude, 21 kft MSL, 17 kft MSL, 13  
kft MSL, and 1500 ft AGL.

The sides of the boxes have to be long enough for the radar characterization of the wind field and the  
distance from the storm is determined by the requirements of the doppler radar. The exact location of  
the boxes at a given altitude will depend on the movement of the storm cell.

Should the time that is required to fly this pattern be too long for the anticipated  
flight duration, limit the number of constant altitude boxes.

This pattern should satisfy both the radar and chemistry objectives of STERAO.

---

Intercomp  
8, 10, 17.5

6 ↑  
F ↓

## Squall Line Scenario

Concentrate on edge of squall line closest to CHILL.

L-pattern on the southern (south-eastern) and the western side of the squall line.

- I) Radar leg : parallel to the line of storm cells at 2000 ft AGL (default) from Bsw to Bse.
- II) Radar leg : return from Bse to Bsw at 500 ft AGL (default).  
Max length of these legs 15 min (~90 km).
- III) Radar leg : perpendicular to the line of storms at the western edge of the squall line, Bsw to Bnw at 500 ft AGL (default). Length of this leg is determined by radar requirement.
- IV) Chemistry : Return to Bse; either directly under the storm in a direct line from Bnw to Bse or parallel to the radar legs, but in closer proximity to the active storm cells at 500 ft AGL.

Repeat this pattern II)-IV), if radar observations call for it. Adjust altitude if radio communication with CHILL require it.

V) Racetrack profile ahead of the squall line (in clear air) up to max altitude.

VI) If there is an anvil within the altitude range of the P3, descend to that altitude and attempt to approach the anvil by flying short legs (< 5 min) parallel to the line in progressively closer proximity to the storm (pilots disgression).

VII) Fly to the back side of the squall line around the storm at max altitude.

Attempt again to approach the anvil region.

VIII) Racetrack profile behind the squall line.

IX) Radar and chemistry leg behind the squall line from Bne to Bnw.

---

---

If the radar indicates an anvil that is within the altitude range of the P3, attempt to transect part of the anvil if it is feasible and safe. Start these transect away from the cloud and attempt to move closer on subsequent transects.

---

---

## Hydrocarbon Profile between Pt. F and Pt. G

At 15:35 head direction of Pt. G (41 00N, 104 25W)

Hydrocarbon profile between Pt. F and Pt. G at 21 kft, 17 kft, 13 kft MSL, and 1500 ft AGL

Start HC-leg at : 05, :20, :35, :50 so that the HC sample will be centered along this leg. Change altitude approximately 3 min after HC sample ends (**Observer calls**)

15:35-16:35

If at any point during this leg the **Observation Center** at the CHILL Radar site should indentify a target storm, switch to the **Active Storm Phase**.

### During the Active Storm Phase

#### **Characterize Airflow with Radar and Characterize In-Flow Region of Cloud**

Cloud identification and flight coordinates will be given by CHILL Radar.

#### **Radar Legs:**

Straight lines parallel to and S to SW of the storm approximately 12 km away from the perimeter of the storm, orientation parallel to storm track at 7kft MSL (within the PBL, this should also be the inflow region of the storm)

until dissipation of storm.

Alternatives:

I) Straight leg parallel to the storm track.

====>

II) Fly L-pattern (south and west side of the storm). **See Squall Line**

#### **Scenario**

====>

II) Repeat radar flight pattern at different altitude.

(7kft, 16 kft, and > 22 kft MSL).

16:35-18:35

### After Dissipation of the Storm:

Characterization of PBL after Storm Dissipation:

Cross below location of the latest radar echo for 15 min (~100 km)

18:35-18:50

Characterization of Vertical Profile after Storm Dissipation

**Race track Profile** at location of the latest radar echo of the storm, descend to 500 ft AGL and then climb to max altitude at 1500 ft/min

==> Take second set of HC can samples at 1500 ft AGL, 13 kft, 17 kft, 21 kft MSL

18:50-19:20

### HC profile after the storm

North-South leg across the center of the last radar echo, the length of the HC-leg is approximately 100 km (not quite 1 deg latitude)

Hydrocarbon profile at 25 kft (or max altitude), 21 kft, 17 kft, 13 kft MSL, and 1500 ft AGL

Start HC-leg at :05, :20, :35, :50 so that the HC sample will be centered along this leg. Change altitude approximately 3 min after HC sample ends (**Observer calls**)

19:20-20:35

Climb to 12 kft MSL for calibration

2328 -

(Start NOy calibration, and stay at altitude for calibration 20:35-20:50, Observer calls)

Head direction of Buckley (39 42N, 104 45W) Pt. A

~ 20 min

Return to Buckley at ~21:00

Pt. A (39 42N, 104 45W)

Pt. B (41 00N, 104 25W)

Pt. C (40 10N, 105 00W)

Pt. D (40 10N, 103 30W)

Pt. E (40 30N, 104 10W)

Pt. F (40 10N, 104 25W)

Pt. G (41 00N, 104 25W)

other points will be determined during the flight.....

Alternatives:

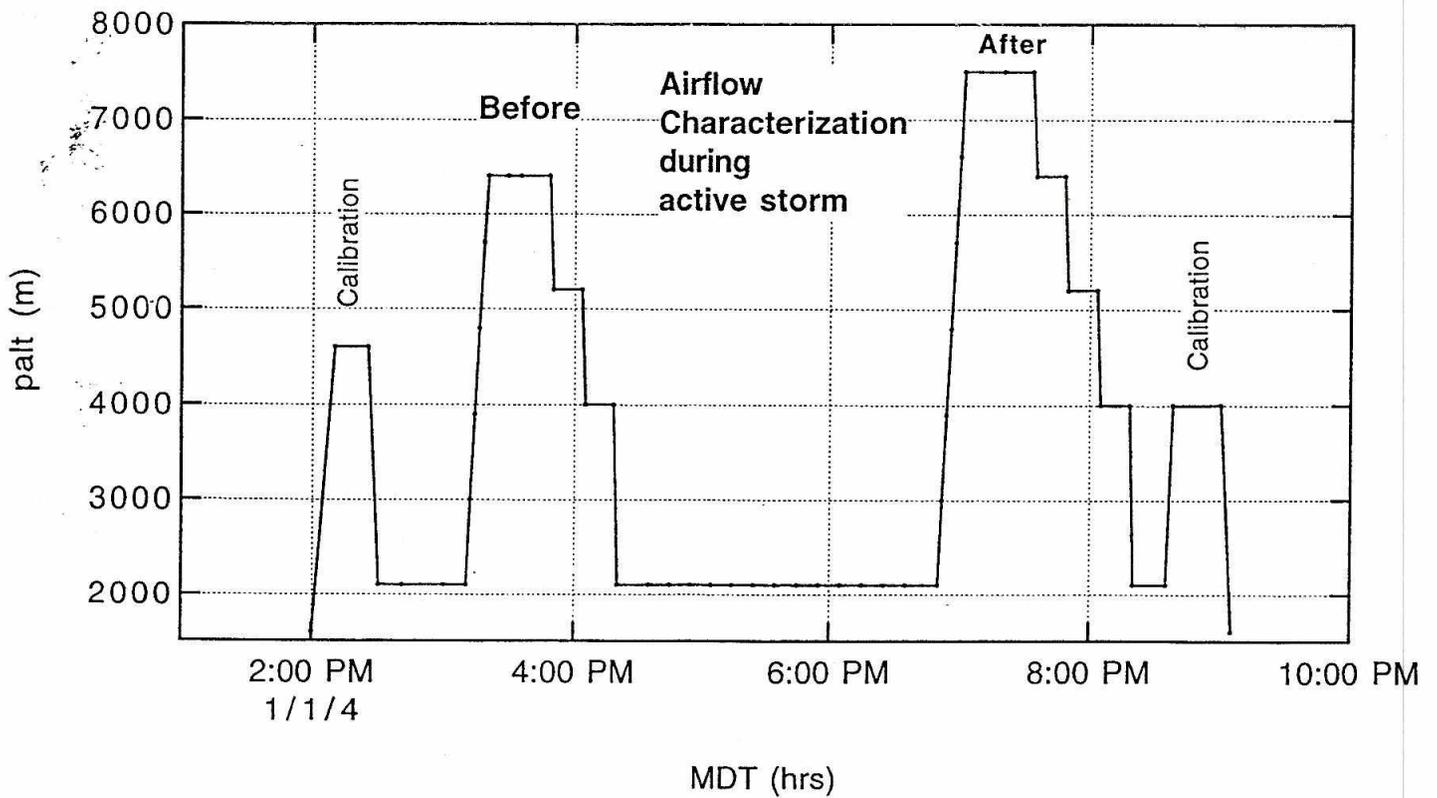
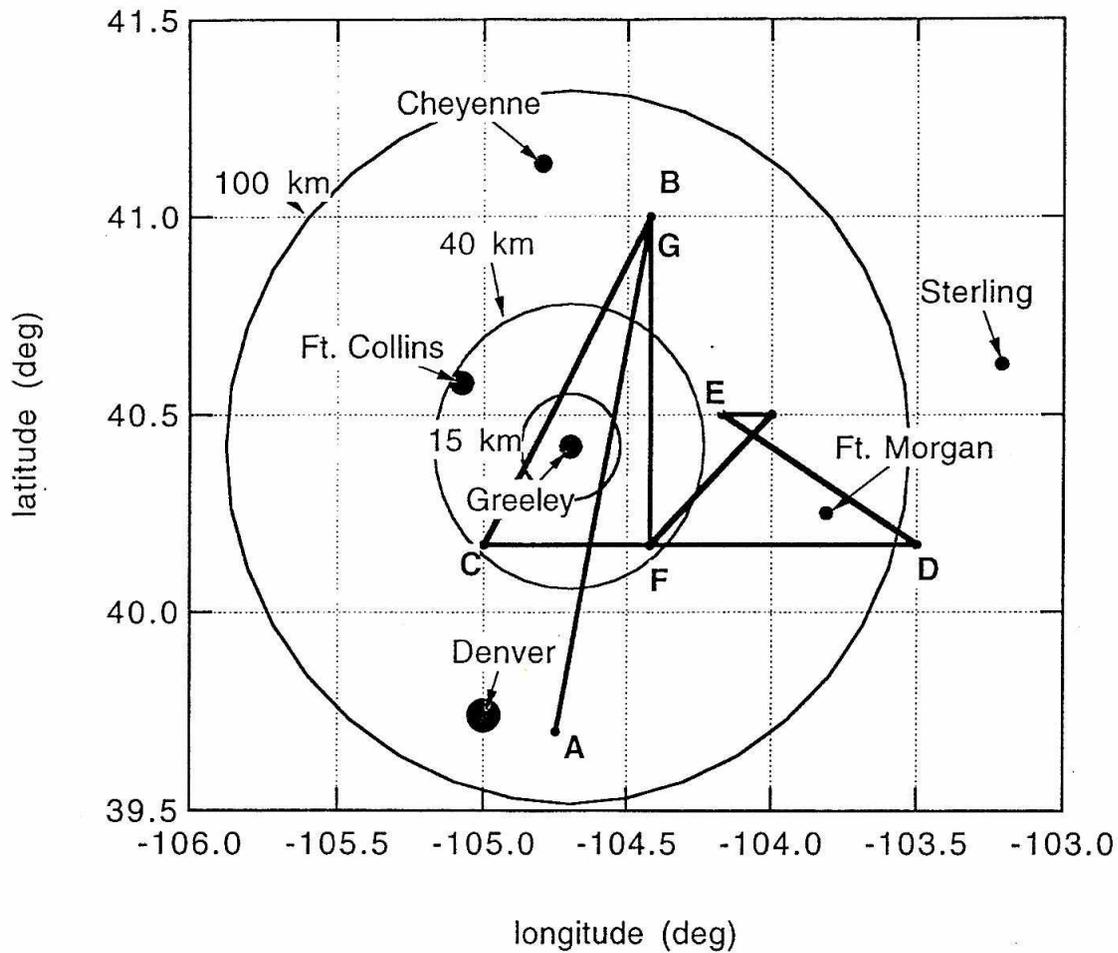
D) 16:35-17:50: If there is no appropriate storm identified in the study area, start HC profile between Pt. F (40 10N, 104 25W), and Pt. AH (40 10N, 103 25 W) at 1500 ft AGL, 13 kft MSL, 17 kft MSL, 21 kft MSL, 25 kft MSL.

II) 17:50-19:05: start HC profile between Pt. AH (40 10N, 103 25W) and AI (41 00N, 103 25W) at 25 kft MSL, 21 kft MSL, 17 kft MSL, 13 kft MSL, 1500 ft AGL

Climb to 12 kft MSL for calibration, 30 min

Return to Buckley

The detailed characterization of the 1 deg lat by 1 deg long box will hopefully help to pick the most appropriate orientation for the HC profiles for subsequent flights. It also allows to fall back into the thunderstorm mode at any time if appropriate storms should develop later on.



**Flightplan Thunderstorm Study (Scenario 3)**  
 Colorado  
 boundary-layer to free troposphere exchange

Doors closed: 13:50

Takeoff: 14:00

**Point A**, Buckley National Guard Field 39 42 N, 104 45W

**Calibration at constant altitude**, Observer calls  
 Head direction of **Pt. B (41 00N, 104 25W) at 12 kft MSL**

Pt. A to Pt. B 150 km, ~ 19 min, (Climb < 10 min)

Stay at constant altitude for calibration, observer calls  
 14:00-14:25  
 12k 2010-2030

After Calibration descend to 1500 ft AGL at Pt. B

**Intercomparison with Citation between Pt. B and Pt. F**

**Rendezvous with Citation at 14:35 at Pt. B at 15k 2040-2100 8000 MSL**

At 14:35 head direction of Pt. C (41 00N, 104 25W) 17.5k 13.5k 8.5k 2123  
 8.5 13.5 17.5

Hydrocarbon profile between Pt. B and Pt. C at 8 kft MSL, 13 kft MSL, 17 kft MSL, 21 kft MSL, and at 25 kft,

Start HC-leg at :05, :20, :35, :50 so that the HC sample will be centered along this leg. Change altitude approximately 3 min after HC sample ends (**Observer calls**)  
 14:35-15:50

Return to Buckley Pt. A

Pt. A (39 42N, 104 45W)

Pt. B (41 00N, 104 25W)

Pt. C (41 00N, 104 25W)

