

UND Citation Flight Notes

Name SH46 Job _____ Date 23 June/96

Time used, (CST, GMT, etc.): MDT Program STRAO Test
not CST

Time	Comments
19300 1907	TAKE off
193300 (1)	START Box MANEUVER (man logs at 19K'
193502 (2)	} Box MANEUVER
193705 (3)	
3900 (4)	
194112 } #1	
194212 } #2	2 nd log 160 KTS
194516 } 2	} 190 KTS
194616 } 3	
194930 } 3	} 4
195030 } 4	
195347 } 4	START pitch attack/pitch maneuver
195447 } 4	Fast slow FAST slow
195530	stall Buffet
195730	end pitch/attack maneuver
200233	check pitch seems seems to be wrong sign?

UND Citation Flight Notes

Name Stith Job _____ Date 23 Jul 96

Time used, (CST, GMT, etc.): _____ Program Skaro / Page 2

Time	Comments
2009	2009
200930	Start sideslip maneuvers
201154	end Series of slow then fast maneuvers. with rudders side to side

UND Citation Flight Notes

Name SMIV Job _____ Date 23 June 96

Time used, (CST, GMT, etc.): MDT Program STERAO

Time	Comments
2238	LICR CO2 18000' goes off scale high. H2O drops sharply
2325	NO BMC cable on Ozone - Fix (Fixed LATER)
	No laser reference voltage on Probes
	Palt 11894 at 394' PENSP
	GPS 12157 IOP
	↑ IDC
	↑ No laser
	at cal of
	tevy

UND Citation Flight Notes

Name St. H Job Steve O Date 26 June 96 / Page 1

Time used, (CST, GMT, etc.): MDT (pm) Program S

Time	Comments
0517	(Note times are PM not military today)
0523	No GPS(?)
0528	LICOR CO ₂ reads 1000 ppm - 170p
<hr/>	
054037 } 1 140	START 140 kts Reverse track
054243 }	020/15 020/25 GCL VERPAC way points ^{20 to} 137 _{system}
054350	Reset GPS no JOY
054533 } 2 140	start return 140 kts
054719 }	
055014 } 1 160	start leg at 160 kts
055212 }	
055507 } 2 160	second leg at 160 kts
055704 }	
060032 } 1 190	NO ₂ is on NO ₂ mode.
060230 } 060015	NO ₂ switch to auto mode
060550 } 2 190	
060750 }	
061733	tooling with NO ₂ flow - in-situ flow meter

275/36

284/36

272/36

327

UND Citation Flight Notes

Name Still Job _____ Date 26 June 96 / Page 2

Time used, (CST, GMT, etc.): MDT Program STERAO

Time	Comments	
062105 } 140 kts	29k' next leg of Reverse tracks	137.6
062305 }		
062600 } 140 kts	light chop at 062	136
062830 }		
063344 } 160	missed 2 nd 160 will redo	157.6
063542 }		
063935 } 190		188.3
064035 }		
064444 } 190	light chop observed	191.8
064546 }		
064835 } 160	light chop ± 3 kts	159.8
064935 }		
071100	start right turn across auxil 20mi turn	
072010	just finished 2 nd pass 38 slight increase in	No
073500	start low; descending leg 33k'	
075000	Second low 1st leg 35k'	
0815	Just went through a bit of overshooting tops	
0820	at 38k'	
	Rezero	

275/36
284/36

↑
188.3
191.8

2120
2140

STORM FLIGHT NOTES

STITH

27 June 96

151430

Holding for clearance

Too 500' 410 17700

305 125

ANNA 42 245/24 SIDING

315 NW for 30mi 5 mi + Rev. track

- could do interception

020/120

1610

trying to find a storm - heading north to look
at 35k (for fuel), then turned south for possible small
candidate observed on radar.

140/120kts

1611

IAS (Pilot) = 174
IAS Data Syst 169

1612

Some spikes on O₃ (?)

1614

19 + out of cloud

94.5/59kts

1622

Heading toward candidate storm

1630

Pass 1 33k' through Anvil

1645

Pass 2 " " (saw range)

165140

Start new cell anvil at 10 mi range - buffer of
anvil - cell just forming anvil

27 Jun '96 - Reverse Tracks

2

~~17:45:01 0.066~~

Time	roll	ZAS	Co-Plot ZAS
17:45:01	0.066	156.5	160.
17:46:00	0.002	153.2	160.
17:49:36	-1.78	156.8	160
17:50:35	-1.17	155.2	160
17:53:53	-0.264	126.4	130
17:54:55	-0.593	126.9	130
17:58:06	-1.494	127.4	130
17:58:49	-0.094	126.1	130

Ph

1720 Pass at 41k' going to 42k' higher
No alt upn levels

1725 in tops of annul at 41.5k'

1730 Making run along annul axis 41k' to 39k'
(closely due to ATC)

1746 Finish 2 passes along annul axis last one was
~~180°~~ 180° from first one at 39k'

1745.00 } Reverse track 39k' 160 kts
1746.00 }

174935 } Reverse track 39k' 160 kts
175035 }

175338 } Reverse track 39k' 130 kts
175455 } ~~130 kts~~ (IAS DATA = 126.8 kts)

175744 } Reverse track 39k' 130 kts
175843 }

1804 noise in IDP?

1820 CN flow stopped for A BT(?)

1833 Land

2100
2100

10350
4020

095/36

030/100

28 June Stereo

ST74

1612

TAXI for TAKEOFF

1621

Holding for ATC Release.

162635

climbout

1633

Going through cloud band

1638

In and out of cloud - rather high @3

1640

through a small cell

1647

Near tops

~~54/35~~ 54/35

1717

Having no luck finding cloud will head East and sample a developing small cell that is far away.

1719

HIT TOP (low cloud) some change in NO + Ozone

1724

2nd pass through n/a cell

1777

Another pass same general area. 020/30

1735

Small NO spike in last cloud, but will give up

1801

T and T_p are 10° off in cloud check temp. Had needles and T_{prox} = 7

T_{reel} = 5

T_{de} = -5

Why is temperature off?

T seems warm in sounding, too

1818

Note P. hit Note = 31 mb

P. hit wing = 64. mb

$\left. \begin{matrix} T \\ 20.5 \\ T_w \\ 15.8 \end{matrix} \right\} \text{ASSEMBLY on land 77}$

2348 69.58°

Z T T_p

ATIS °F

on ground (21.07 °C
22.14 ReT

29 June 96 Strano

1407 Taxi for take off

1431 Getting ready for intercomparison - zeros on O₂

1434 Getting 0's on CO some oscillations noted on O₂ (?)

1443 Start intercomparison 17.5k'

265/15 ways from P.3 229/30 ours

1448 Repair CO

1456 end 1st intercomparison

1502 2nd leg intercomparison (missed start time) 13.5

1504 Drop intercomparison to avoid cloud

15056 Back with them

150755 CO about 100 ppb, O₃ ~ 60 ppb, NO₂ ~ 0.2 ppb
NO ~ 0.08 ppb
NO_{1/3} ~ 45 ppt

151317 Unknown spikes on O₃

1514 end leg will zero

152339 start 7.5k' leg (15 min)

152530 Time check - we are within 1 sec of NOAA

1531 increase in NO₂ here

~~1545~~ 1600 steep descent

360/30 150/20 - waypoints for intercomparison -
legs 15 min legs
Gill

UND Citation Flight Notes

Name Stitt Job Proj 1 Date July 5 96
 Time used, (CST, GMT, etc.): MDT Program STEPAN

Time	Comments
1454	Takeoff will go to 9k' to get mass in mixing layer
	76/52 89/45
	88/47 70/56
1508	Heading for above coordinates at 9k' to sample low level
1509	PCASP Pump on 370 and top
1520 - 1523	088/51 some updraft in regions below pass
1523	climb to 24k' for anvil along ^{south} edge of cloud
	083/59 088/52 axis of anvil
1528	Below anvil above us and to our 9:00 position
1534	24mi downwind of cell 24k'
1539	2nd pass at 24k' in region of small main cell - anvil descending due to subsidence of large anvil overhead.
1547	25 mi core of 096/32 for storm no
1549	Oscillation on O ₃ ?
1550	Going through large anvil at 27k' & climbing.

08/01

101/28.5

UND Citation Flight Notes

Name _____ Job Page 2 Date 5 July 96

Time used, (CST, GMT, etc.): _____ Program _____

Time

Comments

1555

1558 start turn

1603

1609

1613

1618

1620

1624

1629

1644

1650

1654

~~1700~~

1706

1715

1720

1725

1725*

Next pass at 29k' ~ 33 mi' downwind.

Had to deviate ^{right} due to embedded cells.

103/65 71/45 line of cells anvil east
new convection west.

anvil edge, north side.

H734 CN here, setting up next pass at 33k'
NO₂ increase?

climb from 33k' to 35k' to mid pass

Brian reports 1 ppb of NO

Shadow or - reads less than 201 cap - pass. Lk softness
ing.

~~climb to 35k'~~ right turn due to traffic

Climbing pass through anvil

Some embedded updraft here

094/51

103/57

097/76

Lost some ac power - no signal on NO₂ + O₃
checking out problem

Peek up in tops of anvil at 42-43k'

IDP sees Brake bar - on all the time in clear air

Heading toward main cell at 43k' g

115/73

Brake ~~to~~ in cloud at 43

way back to
f(4 a loc)
5400'

UND Citation Flight Notes

Name Shin Job STERAD Date 5 July

Time used, (CST, GMT, etc.): MDT Program Page 3

Time	Comments
1731	lost some power due to pump as before most instruments off line - data system on
1739	Heading along azimuth axis, no data, but no no other.
1745	Returning to base - still no power.

STEREO 9 July 96

1351 TAXI FOR TO

1405 Delay for ATC - take off

1412 Heading to initial point NO2 ~~mode~~ mode from auto, then
zero.

1418 Side slip shows noise - maybe water/ice or drone

1420 Vent wind is garbage or DAS - needs work

075/60 75kt, tra 275

1500 40k'

075/75

1440 Went through main cell, then along anvil axis
at 35k' abt 5k' below h. g. out point, will take
clear air sample next, downwind of anvil.

070/80 067/85

1452 Back in going toward main cell

1459 Turn north to get downwind of main electrical
activity - will start spiral downwind. of main
activity

1514 Leaving spiral to get clear air at 25k'

1517 ~~to~~ 360 turn for clear air sample and good view
of anvil or vides - ~~to~~ 35 min also taken

1523 level at 24k' for calcs while RTB

1537 Going through anvil from severe storm over DIA while we
are heading home. 20/16 T/TD ATIS R

PCASP pump off today due to large cloud layer

9 July 96 Flight 2

1710 Taxi - no GPS - walk check

1719 Sidslip has noise in rain
with electrical activity
Large storm Anvil

1723 Cryo has blown fuse 333/15 20 mi

1730 lightning seen in cloud
abrupt change in sidslip - radar maybe iced over

1735 Spikes in NO₂/NO_x here
000/35

1749 SRAA southbound leg at 26k'

1759 Start northbound leg at 29k' (climb in tower point)

1805 Roll seems screwed up here?

1808 Start southbound leg - will climb to 34k'

1815 end leg will climb to 35 to try and get clear air

1826 IN northbound leg at 20 mi farther east NO₂ increase
Anvil higher to west and lower to east - maybe in evaporation
region here - small crystal haze in and out of tops

1833 Break off and head East to try and find new NO_x

1837 Descend to 30k' to stay in anvil while we go east
to find highest level of NO_x →

1840 NO_x & CO decrease as we descend above anvil

1842 will climb to do a profile 29k' to ~~33~~ 34k'

1844 PCASP Pump on

1845 in small ice crystals NO_x increasing.

1852 increase in NO_x above the anvil.

1904 ~~at~~ holding at 37k' trying to get higher

88923

9 July Page 2, Flight 2

1913 CN flew low^{*} - unknown reason
PCASP Pump probably froze up, will shut off
Spikes in NO₂ - maybe due to startup of large pump

91263

1921 finished spiral at 35k' will descend to 33k' and
fly along the axis of the swirl towards home.

1926 Descending toward west, NO_x increasing as we go into swirl

1931 Descend to 31k' after hold at 33k' for ATC

1942 Hitting tops of some overshooting tops

1947 on west edge - upwind of storms - clear air sample here at 31k'

1955 in area of just above mammatus-like features

See videos and 35 mm hand held - not well defined, but
more ragged - some increase in temp. possible

1959 In another storm swirl + etc on way home

045/100

2352

6

1752

STERAO

10 July 96

Smith

1607

TAXI

1614

off PCASP on

040/66

024/60

50

130/25-70

1627

Heading to good taking storm - 0700 not connected, will fix it.

1636

Starting run in lower half of upshear part of anvil

1641

Hitting main region

1646

" again

circle left to

1651

on north side of anvil will hit upshear side again

1654

climb to 36k' to hit upshear side

1701

Pass in upshear anvil 37k' new cell to NW

1713

~~Finished~~ Finished one pass ~ 15 mi downwind of 38k'

Now starting second pass ~ 30 mi 38k' - near top of anvil

1720

Finishing 38k' pass, will ascend to 39k' & reverse

1724

in very top of anvil

1732

Starting ~~next~~ next run 37k' southbound (Mamur below)

173300

Strong sink here

173806

High O₃, NO₂ as we exit cloud

173932

TAS = 140 ms⁻¹ TAS = 149 kts (?) CoPilot 155 kts

1749

In Bottom of anvil

10 July 96 page 2

- 1758 PCASP Pump off - appears to be oscillating
1800 Deviation for ADC - had to turn back north will descend
to pick up lower regions
1807 Starting into anvil will descend for 294' South bound leg
1812 End South bound pass will repeat tower.
1816 29 mi downwind of core - Northbound pass 274'
1821 Start spiral ascent through anvil here
1838 In evaporating remains of anvil - tiny crystals here
1850 Completed spiral ascent will fly toward overshooting tops
anvil higher to west. Saw high stone above anvil
1901 Going through some overshooting tops here ~ 1000' above tops
1907 Clear of cloud - taking zeros + RTB
1916.9 Strong
15 sec ahead of Chill on our time
1922 Noise at ZDC - pulled breaker

322/40

STERAO 12 July 96 STT&

- 1420 TAXI 326/40
- 1445 Sideslip just dropped to -6 m/s as we left cloud + turned on heat to reduce.
- 1652 Trying to setup upwind spiral through anvil
- 1701 1st base of anvil - will commence spiral soon
- 170235 in spiral QDP appears to be working.
336/28
- 171227 Cryo mirror temp follows ~~air~~ temp in cloud
- 1713 Lost reverse flow temp - see later Trace -
Right hand side of data display doesn't agree with F3 display
- 1720 Rebalanced dewpoint.
- 1722 ~1 ppm NO - at 35 trying for higher
- 1724 at top of anvil 330/28
- 1731 Commencing 1st tips of thin anvil here.
- 1737 Near Anvil top in Blue northbound leg - 15 mi downwind just above west of anvil.
- 1740 Lost Power on DAS + Parallel inverter
- 1757 Back up again on reduced power - no CO + Cryo
continue anvil sampling, only 2DC probe - took out
GPS
- 1807 2nd ~~sample~~ northbound leg at 33k'
- 1713 good correlation between 2DC + NO₂
- 1818 Strong peak in NO/NO₂ here in very thin anvil.

323/18

354/13 043/23

320/16

STEP 12 July Page 2

- 182330 Set up southward leg 31K'
1828 ~~with line present~~
- 1837 at of anvil on South side
1844 out of main part, but ^{a bit more clear ahead.} must turn back due to fuel will
turn back and try to go towards main cell.
- 184600 in between layers
- 1851 Making along axis pass towards main cell 3K'
1858 Break out of anvil briefly + will pick up a
piece of the main cell on the North-east side of it.
- 1900 Hitting a piece of main cell on the north side
1908 RTB

129/31.5

~~129/31.5~~

13 July Stereo Page 1

Stills

150734

TAKC

052/27

1522

Holding at 8 for ATC

1531

Trying to get to condense anvil - CO is sick

1541

in Base of anvil trying to set up spiral

1546

Start upward spiral. embedded cell nearby

S2/37 60 88/45

111/21

1600

Lost Power (!) will try and reset

1609

Back up 120/27

1614

(clear space between anvils, going toward another anvil being worked by P. 3)

1618

Starting + anvil pass 33-34 4-

1622

TAS is low? SAS says 88 kts

154/21

1623

Break out for a moment.

1637

lightning strike ~~near~~ here maybe or in off radar

1642

out of anvil here

151/28

1647

climbing back into anvil for 39 k' heads SW

1657

in clear between layers

1704

IAS = 172 kts (nose pitot) 140 kts (pilot)

1711

NO2/O3 well correlated here 125/49

1718

Start spiral descent through anvil.

1719

check for leaks near pilot static wing

1724

Shift to pilot nose - TAS looks much better

1726

Rebalance Dep point

1728

IAS = 160 Cupilot = 172 kts (nose pitot)

1749

Temps in "Model 200" don't agree with CHS of screens

097/71

080/93

089/91

15 July 96 STERAO

St. #4

16:10 TAXI 120/ 146/120 106/65 091/65
 16:30 Try to get east, but unable ATC 088/68
 089/75

16:45 Rebedace Depart

1657 Descent from 214' near cloud to cloud base

1654 Cloud base sample here heading 090

1709 unable to get through the line, so will climb on western side.

1733 1/1 Starting into region just above mamma. photo taken 30 sec prior

173805 Pass through small cell

1749 095/78 d-h.ing just in base of anvil

1759 Starting into base of anvil will try cut ascend just near and above mamma.

180045 into base of anvil

1808 IDC on (power sees etc)

1814 Finish spiral in upstair side of anvil 27-33k' some spikes of Nox observed. will R&B due to fuel.

1820 RTB

16 July 96 STERAO - Intercomp STTS

1147:0

MXC

1211-1212

Ferry to intercomparison site IAS/ = 200 kts SIAS/ = 196 kts

1222

First intercomparison leg 9.5k^{cupilot} start ^{data}

(two minute run) they appear to be ~ 75 feet higher

1235

START mk-comparish 13.5k' 2 min zero at start and end of leg.

1259

Cabin pressure change here

1301

Start 1000' AGL Leg (4600' ASL)

1308

End intercomparison

1322

level at 26 k' for calcs.

1327

Trace = -10.97 Trace = -8.75

1345

IAS ~~182.7~~ Pitot = 214 kts SIAS/ = 182.2 Pitot wing

1345

Pitot = ~~215~~ 215 kts SIAS/ = 210.2 kts Pitot nose

1410

HAOP shot = series of movie, checking Temp vort Rec flow against one another - Left side display don't agree with right.

030/35 -38

STERAD 16 July 96

SH/M

1545

TAXI

1559

302/32

Rebalanced Depoent

1607

Below base sample - strong NO₂ signal

1612

Second pass below pore. also high NO₂

1618

down to 9k' on north side to see what lower is like

1619

Probably hit our own plume or one from a large power plant that is directly below. - Power plant may confuse matters

324/27

1621

Spinning up on north side - outside of cloud.

341/23

1640

Moved spiral to center of storm and continued

1714

Finished spiral pass near 25k', went down axis and did spiral in downwind area 35k' to 25k',

1715

Heading toward main cell remains along anvil axis at 35k'

1717

Juvel above us and ahead of us 

1720

Turning into anvil, main off right wing at 25k' - temp increase

1723

Turn south to begin X section

1727

North Bend X section pass climbing to 28k' & 27k' on entry

1738

South Bend leg at 31k'

1743

NB leg climbing 31 to 33k'

040/38

1749

Didn't finish leg at 35k', but started spiral descent - cloud highest point is a 36000'.

19 July 96 STERAD

STF11

2:49

TRXL

7:57

Rebalance Deepport

8:02:00

1st pmt at 165 kts

(1)

8:06:42

1st pmt at 180 ~ 10 high

(2)

8:10:04

2nd 144 ~ 10 u

(3)

8:13:20

3rd 190 ~ 20-30

(4)

8:16:39

1st 160 ~ 20 high

(5)

8:19:55

2nd 160 ~ 0 high

(6)

8:23:00

3rd 160 ~ 20 high

(7)

21.2 20.3 9.6

8:27:10

1st 140 ~ 20 high

(8)

380 ~ 12 ~ 1

~~8:27:10~~

8:30:35

2nd 140 ~ 10 high

(9)

8:33:40

3rd 140 ~ 2 high

(10)

8:36:52

4th 160 ~ 2 high

(11)

8:37

RTB

1753 Spirally down through remnants of ancil
1756 leaving area after spirally down to 236'