TEXAS HIPLEX 1978
FIELD OPERATIONS SUMMARY
LP-73

TEXAS DEPARTMENT OF WATER RESOURCES

OCTOBER 1978

TEXAS HIPLEX 1978 FIELD OPERATIONS SUMMARY

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1. INTRODUCTION

The purpose of this report is to fulfill the responsibilities of the Department of Water Resources to document the daily operations during the 1978 Texas HIPLEX field program when cloud seeding was conducted and when data from aircraft, radar, special surface instruments, and rawinsondes were collected. The data analyst is provided an overview of each day's weather events as observed from the ground and the air. This report includes a weather summary for each HIPLEX day, surface and airborne weather observations and the status of equipment during the period. This overview should help the data analyst identify days of special interest, case study days, and in general, place the enormous amount of atmospheric and cloud physics data collected during the field program in perspective with what was observed.

All the days were listed in chronological order beginning with June 1, 1978 and ending with July 31, 1978. A weather summary, which includes a morning surface map, a summary of the day's weather events, and the day's surface weather observations were recorded for all days. Debriefing notes and aircraft observation forms were included only for the days the aircraft flew, whether it was a seeding mission or a sampling mission. All weather summaries, observations, and debriefing notes are presented in the appendix.

Table 1 summarizes the 1978 Texas-HIPLEX field operations. This table identifies meso-scale days, HIPLEX operational days, cloud sampling days, and non-operational days.

Table 1. Summary of Texas HIPLEX Operations for June and July (with the number of cloud-seeding missions given in parentheses).

MONTH	DAY	MESO-SCALE DAY		HIPLEX OPERATIONAL DAY			
				Go			No-Go
		Go	No-Go	Seeding Performed	No-Seeding Performed	Sampling Only	
JUNE	1	X			X		
	2	X[2]				X	
	3		X				X
	4	X			X		
	5	X		(3)			
	6	X		(1)			
	7	X		(1)			
	8		X				X
	9		X				X
	10		X				X
	11		X				X
	12		X				X
	13	X		(3)			
	14	X[1]					X
	15		X				X
	16		X				X
	17		X				X
	18		X				X
	19		X				X
	20		X				X
	21		X				X
	22		X				X
	23		X				X
	24		X				X
	25		X				X
	26		X				X
	27	X[2]					X
	28	X[2]				X	
	29	X				X	
	30	X		(1)			
JULY	1	X		(1)			
	2		X			X	
	3		X	(3)			
	4		X				X
	5		X				X
	6		X				X
	7		X				X
	8		X				X
	9		X				X
	10		X				X
	11		X				X
	12		X				X
	13		X				X
	14		X				X
	15		X			X	
	16		X				X
	17	X			X		
	18		X				X
	19		X				X
	20		X	(1)			
	21	X					
	22	X				X	
	23	X		(1)			
	24	X				X	
	25	X[2]					
	26		X	(1)			
	27		X				X
	28		X				X
	29		X				X
	30		X				X
	31		X				X

[1] "Rapid Scan" day

[2] A partial mesoscale day (rawinsondes were launched at 3-hr intervals beginning at 1600 LDT)

2. WEATHER SUMMARY

During the 1978 Texas-HIPLEX Program, Mr. William Alexander, Texas Department of Water Resources, was responsible for providing an operational forecast for each HIPLEX day and for making surface weather observations on a routine basis. Following each day a weather summary was prepared describing the morning synoptic features significant to the day's weather events as observed and recorded at the weather station in Big Spring, Texas.

In order to consolidate the summaries, some of the meteorological terms were abbreviated. This should not cause the reader any difficulty because many of the abbreviations are in standard use by the National Weather Serivce. The day's "convective index" classification was listed at the bottom of each summary page. A description of each "convective index" may be found in Table 2.

Following each summary page is the day's surface weather observations. These observations were made and recorded on a routine basis with the first observation normally made at 0800 LDT and the last observation normally made at 1700 LDT. Slight variations to this schedule often occurred due to workload and operational needs. For each observation, Mr. Alexander recorded the time the observation was made, current weather conditions, sky conditions, wind direction and speed, and temperature. Due to the relatively flat terrain. throughout the Texas-HIPLEX area, Mr. Alexander had a clear, line of sight view of the sky conditions over all of the target area.

Table 2. Class Definitions of the Convective Index

Class No.	Definition
1	Clear or cirrus and non-precipitating mid-level altocumulus or altostratus
2	Mid-level clouds with virga or RW-; no low level clouds
3	Non-precipitating low level convective clouds (i.e. stratocumulus to small congestus)
4	Towering cumulus with virga but no rain reaching ground
5	Towering cumulus with light rainshowers which developed within the operational area either randomly or in lines, no cumulonimbus observed
6	Similar to 5 with cumulonimbus and thunderstorms which developed within operational area in addition to towering cumulus
7	Mesoscale cumulonimbus system which developed W-SW of operational area due to upslope and/or dry line-sfc trough and moved across operational area as line of thunderstorms or rainshowers
8	Mesoscale cumulonimbus system developed along synoptic feature (i.e., front or short wave aloft) and moved across operational area as line of thunderstorms or rainshowers
9	Widespread precipitation from overcast nimbostratus with embedded cumulonimbus

3. AIRCRAFT OPERATIONS SUMMARY

A total of four aircraft participated in the 1978 Texas HIPLEX field program. These aircraft included a Lear Jet for on-top seeding and cloud physics measurements, a turbo-charged Navajo for on-top seeding, an Aztec for cloud-base seeding and for making cloud-base measurements, and the MRI Navajo for making cloud physics measurements. (Note: the cloud-base measurement package was not available until July 1, 1978).

All cloud seeding during the 1978 field program was accomplished using silver iodide flares. Cloud-base seeding was performed by dispensing silver iodide crystals in the updraft under the visible cloud by burning 20 gm silver iodide flares mounted on each wing of the airplane. Cloud-top seeding was accomplished in growing cumulus clouds in the $-10^{o}C$ region by dropping 30 gm silver iodide flares into the cloud in desired numbers.

Emphasis was placed on seeding isolated growing cumulus clouds that developed up to at least the $-10^{o}C$ level. If no isolated growing cumulus clouds were available, turrets associated with convective complexes were selected and seeded as an event in the same manner that an individual growing cumulus cloud was treated.

At every 1000 LDT (1500 GMT) stand-up weather briefing, the aircraft observers were given standard forms to record certain meteorological parameters and to log any significant weather phenomena as they observe them. If a flight were conducted during the day, the air crews were debriefed shortly after each flight unless it was decided to wait until the following morning when the debriefing would take place prior to the next stand-up briefing.

The debriefing sessions were informal with all participating aircraft crews present. Because the cloud sampling aircraft crew was unaware of the seeding mode at the time of the debriefing they were debriefed first,

followed by the cloud-base aircraft and then the on-top seeding aircraft crews.

The debriefing notes and the aircraft observations forms were included in this report. Often the notes and aircraft observations were redundant because the crews would use their observation forms during debriefing. However, additional information can be found in the notes that were not included on the aircraft observation forms, because a round table open discussion between crews often brought out useful meteorological information that the observer was not able to write down at the time of occurrence.

4. EQUIPMENT STATUS

During the 1978 Texas-HIPLEX program, atmospheric and cloud physics data were measured and recorded by surface and airborne instruments.

4.a. Surface Instrumentation

A network of 16 special surface stations recorded 10-minute averages of wind speed and direction, temperature, relative humidity, and pressure each hour, on the hour, every day during the field program. Table 3 is an inventory of the surface data collected during the period June 1 through July 26, 1978.

Rainfall data were recorded by 81 fence-post raingages and 81 recording raingages. The recording raingages operated very well during the field program with only minor and infrequent problems occurring.

Data were collected by two radar systems, the FPS-77 radar located at the Big Spring Municipal Airport and the M-33 radar located at Snyder. The FPS-77 radar was only able to collect and record selected data from the Plan Position Indicator scope during the two-month period. No RHI information was collected during June and July due to equipment failure.

Table 4 lists the periods of recorded radar data collected by the M-33 radar system located at Snyder Texas. Complete volume scans were made with the 10-cm (S-band) radar for those periods except as indicated. The 3-cm (X-band) data were recorded on those days marked with an asterisk. Wave guide failure occurred at 2307 GMT on June 28 and resulted in rather limited data on June 29 and 30. The radar functioned well on all other days.

Table 3. Inventory of Surface Data by Station During the Summer of 1978 for the Texas HIPLEX Area for the Period June 1 through July 26.

Station	Data Missing		
	Temperature	Relative Humidity	Pressure
Seminole	None	None	6/1-6/2*: 01-11* 6/14-6/16: 03-12
Andrews	None	None	None
Lamesa	None	None	6/1-6/7: 01-11
Tahoka	6/1: 01-14	6/1: 01-14	6/1: 01-14 7/1-7/4: 12-11
Lenorah	6/1: 01-19	6/1: 01-19	6/1: 01-19
Post	None	None	None
Gail	None	6/2-6/5: 15-14	None
Garden City	None	None	6/1-6/3: 22-11
Vincent	6/1: 01-09	6/1: 01-09	6/1: 01-09 7/15-7/17: 13-13
Walsh Watts	None	None	None
Clairemont	None	None	None
Snyder	7/26: 11-24	6/1: 01-11 7/26: 11-24	6/1: 01-11 7/26: 11-24
Rotan	None	None	None
Sweetwater	None	None	None
Robert Lee	6/29-6/30: 17-11	6/29-6/30: 17-11	6/29-6/30: 21-11
Big Spring	None	None	None

*Inclusive dates and times (CDT).

Table 4. 1978 HIPLEX Radar Inventory - (10 cm)

Snyder, Texas

Date		Time (GMT)	Comments
June	2	1430-0225	* Data missing 1850-2340
	5	1608-0250	*
	6	1440-2145	*
	7	2205-0017	*
	13	1922-0035	*
	28	2100-2307	Data intermittent after 2145
	29	2007-0224	Data intermittent after 2139
	30	1920-0155	* Data intermittent after 2046
July	1	1947-2355	*
	2	1952-0150	
	3	1827-0455	*
	15	2137-0110	
	20	2005-2320	
	22	1849-0120	*
	23	1330-0010	*
	24	1650-0020	*
	26	1938-0548	* Severe wind loading after 0325
	30	2052-0025	*

* X-band data available also.

4.b. Airborne Instrumentation

Atmospheric soundings were collected on 19 days at four locations. On most days, sounding data from Robert Lee, Post, Midland, and Big Spring, Texas were collected at 3-hour intervals beginning at 1500 GMT and ending at 0300 GMT. Occasionally, the first soundings of the day were launched at 2100 GMT and the last ones at 0300 GMT. Table 5 is an intentory of atmospheric soundings collected during the 1978 Texas-HIPLEX field program.

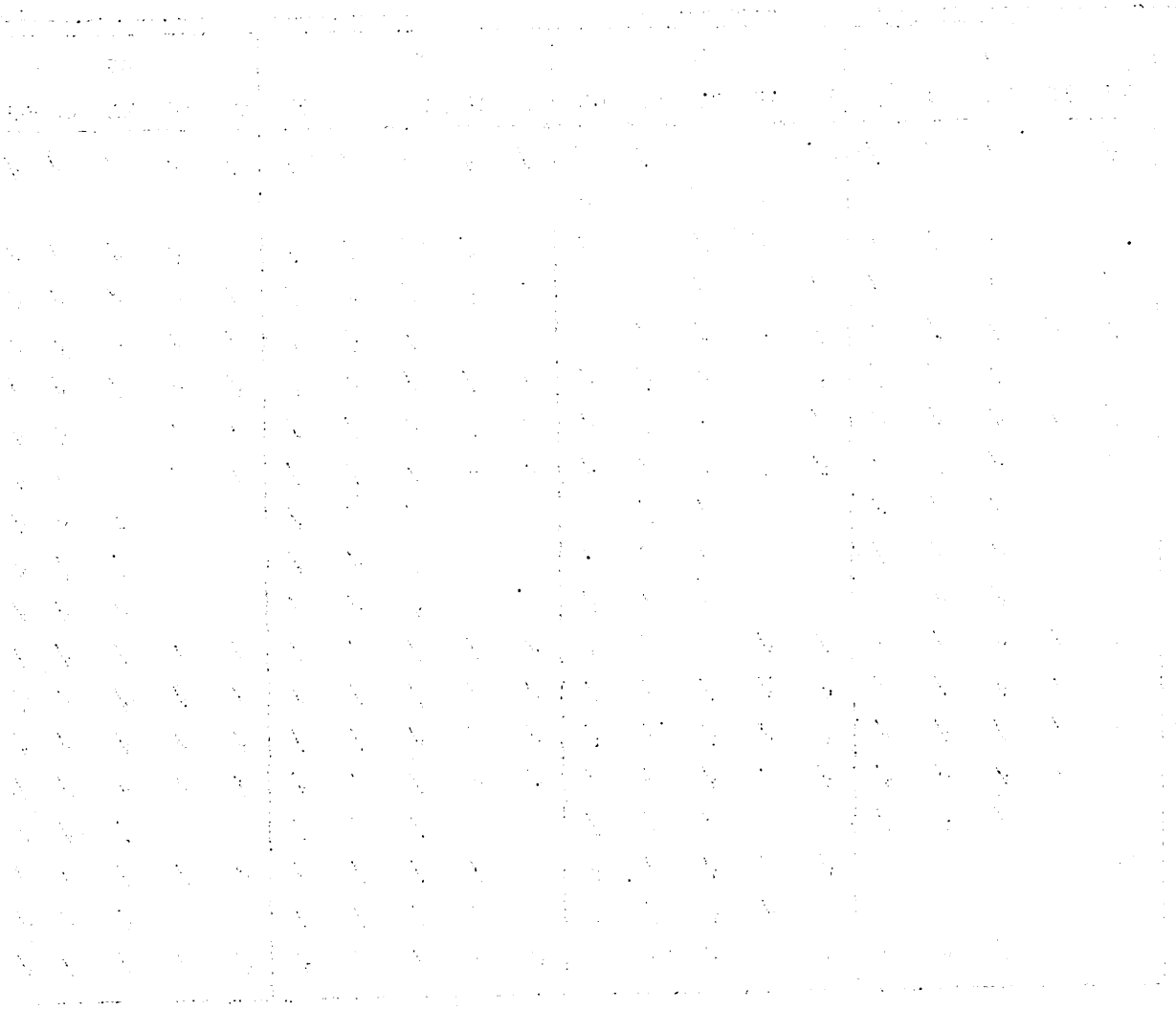
All cloud physics instrumentation aboard the Lear Jet and MRI Navajo seemingly functioned extremely well throughout the field program. The cloud physics package aboard the cloud-base aircraft was installed and made operational on June 30, 1978. The package operated without any obvious problems during the month of July.

One mission was cancelled due to aircraft failure. On July 22, the MRI cloud physics aircraft had to return to base before the mission was completed because the pilot's seatbelt broke.

Table 5: RAWINSONDE SOUNDINGS INVENTORY - Texas HIPLEX 1978

	RL					PO					MA					BG				
	15	18	21	00	03	15	18	21	00	03	15	18	21	00	03	15	18	21	00	03
June 1-2	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
June 2-3							✓	✓	✓	✓										
June 4-5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
June 5-6	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
June 6-7	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
June 7-8	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
June 13-14	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
June 14-15	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
June 27-28			✓	✓	✓			✓	✓	✓			✓	✓	✓			✓	✓	✓
June 28-29			✓	✓	✓			✓	✓	✓			✓	✓	✓			✓	✓	✓
June 29-30			✓	✓	✓			✓	✓	✓			✓	✓	✓			✓	✓	✓
June 30-01	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
July 1-2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
July 17-18	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
July 21-22	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
July 22-23			✓	✓	✓			✓	✓	✓			✓	✓	✓			✓	✓	✓
July 23-24	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
July 24-25							✓	✓	✓	✓		✓	✓	✓	✓		✓	✓	✓	✓
July 25-26			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Times are GMT
RL-Robert Lee
PO-Post
MA-Midland
BG-Big Spring



APPENDIX

WEATHER SUMMARIES AND OBSERVATIONS

Abbreviations used in the Weather Summaries.

I. Surface Observations
   A. Clouds and cloud descriptors
      1. General descriptors
         a. BD-blowing dust
         b. CIG-ceiling
         c. D-dust
         d. F-fog
         e. FBNK-fog bank
         f. GF-ground fog
         g. HIR, HIER-higher
         h. HZY-hazy
         i. K-smoke
         j. LWR-lower
         k. LYR-layer
         l. SQLN-squall line
         m. VSBY-visibility
      2. Low clouds
         a. CU-cumulus
         b. ST-stratus
         c. SC-stratocumulus
         d. CU HU-cumulus humilis
         e. CU MDRCRS-cumulus mediocris
         f. CU CONG-cumulus congestus
         g. TCU-towering cumulus
         h. NS-nimbostratus
         i. CB-cumulonimbus
         j. CBMAM-cumulonimbus mammatus
      3. Middle clouds
         a. AC-altocumulus
         b. AS-altostratus
         c. ACCAS-altocumulus castillanus
         d. ACSL-altocumulus standing lenticularis
         e. ACMAM-altocumulus mammatus
      4. High clouds
         a. CI-cirrus
         b. CS-cirrostratus
         c. CC-cirrocumulus
   B. Precipitation Observations
      1. Pcpn-precipitation
      2. R-rain
      3. RW-rain shower
      4. TRW-thunderstorm
      5. SPRKL-sprinkle
      6. L-drizzle
      7. A- hail

Abbreviations (cont.)

8. precipitation intensities
   a. -- very light
   b. - light
   c. + heavy
   d. ++ very heavy
   e. x intense
   f. xx extreme
   g. U unknown

C. Descriptive
1. N-North
2. E-East
3. S-South
4. W-West

And combinations thereof, i.e. NE--northeast, SSW--south-southwest, etc.

5. ABV-above
6. ALQDS-all quadrants
7. BINOVC-breaks in overcast
8. CONTUS-continous
9. CLR-clear
10. CLRNG-clearing
11. DNS-dense
12. DSNT-distant
13. FQT-frequent
14. HRZN, HZN-horizon
15. HVY-heavy
16. ISLD-isolated
17. LTG-lightning
18. LTGCA-lightning cloud-to-aircraft
19. LTGCC-lightning cloud-to-cloud
20. LTGCG-lightning cloud-to-ground
21. LTGIC-lightning in cloud
22. MVMT-movement
23. MVG-moving
24. NMRS-numerous
25. OCNL-occaisional
26. RPDLY-rapidly
27. SCT-scattered
28. BKN-broken
29. OVC-overcast
30. SLD-solid
31. T-temperature
32. T_d-dewpoint temperature
33. THN-thin
34. UKN,UNKN,UNK-unknown
35. XCP,XCPT-except
36. XTM-extreme

Abbreviations (cont.)

II. Forecast Abbreviations

A. General

1. Nrn-Northern
2. Ern-Eastern
3. Srn-Southern
4. Wrn-Western

And combinations thereof, i.e. NErn--Northeastern, SSWern--South-southwestern, etc.

5. °C-degrees Celcius
6. CI-Convective Index
7. °F-degrees Fahrenheit
8. FCST-Forecast
9. LL-lowlevel
10. LLM-lowlevel moisture
11. M-meter
12. mb-millibar
13. N_{at}-Normalized airmass temperature
14. N_{pw}-Normalized precipitable water
15. op area-Texas HIPLEX operational area
16. OVR-over
17. PW-precipitable water
18. SFC-surface
19. Z-Zulu time (Greenwich Civil Time)

B. Synoptic

1. ALF-aloft
2. AMS-airmass
3. airmass types
   a. mT-maritime tropical
   b. cT-continental tropical
4. aprs-appears
5. CONVG-convergence
6. DSPT-dissipate
7. DSPTG-dissipating
8. DVLP-develop
9. DVLPG-developing
10. fm-from
11. fnt-front
12. front types
   a. mP-maritime polar
   b. cP-continental polar
13. H-high pressure center
14. L-low pressure center
15. LW-long wave trough
16. mdtly-moderately
17. NVA-negative vorticity advection
18. NVM-negative vertical motion
19. PVA-positive vorticity advection
20. PVM-positive vertical motion
21. stg-strong

Abbreviations (cont.)

22. stbl (unstbl)-stable (unstable)
23. stnry-stationary
24. SVRWX-severe weather
25. Tstm-thunderstorm
26. WK-weak
27. WKNG-weakening
28. SHTWV-short wave trough

III. Station Identifiers

A. West Texas
1. ABI-Abilene
2. AMA-Amarillo
3. CDS-Childress
4. DHT-Dalhart
5. DRT-Del Rio
6. ELP-El Paso
7. GDP-Guadalupe Pass
8. LBB-Lubbock
9. MAF- Midland Air Terminal
10. MRF-Marfa
11. P07-Sanderson
12. PVW-Plainview
13. REE-Reese AFB
14. SJT-San Angelo

B. Central Texas
1. ACT- Waco
2. AUS-Austin
3. CLL-College Station
4. COT-Cotulla
5. DFW-Dallas-Ft. Worth Interregional Airport
6. GRK-Grey Field, Killeen
7. JCT-Junction
8. SAT-San Antonio
9. SPS-Wichita Falls
10. TPL-Temple
11. TYR-Tyler

C. New Mexico
1. ABQ-Albuquerque
2. CAO-Clayton
3. ANM-Carlsbad
4. CVS-Clovis
5. DMN-Deming
6. FMN-Farmington
7. GNT-Grants
8. GUP-Gallup
9. HMN-Holloman AFB

Abbreviations (cont.)

10. HOB-Hobbs
11. LVS-Las Vegas
12. OMN-Socorro
13. SAF-Santa Fe
14. SVC-Silver City
15. TCC-Tucumcari
16. 4CR-Capitan
17. 4SL-Cuba

D. Oklahoma
1. ADM-Ardmore
2. BVO-Bartlesville
3. CSM-Clinton
4. END-Enid
5. FSI-Fort Sill
6. GAG-Gage
7. HBR-Hobart
8. LTS-Altus
9. MLC-McAlester
10. OKC-Oklahoma City
11. PNC-Ponca City
12. TUL-Tulsa

E. Kansas
1. CNK-Chinook
2. CNU-Chanute
3. DDC-Dodge City
4. EMP-Emporia
5. GCK-Garden City
6. GLD-Goodland
7. HLC-Hill City
8. HUT-Hutchinson
9. ICT-Wichita
10. LBL-Liberal
11. MHK-Manhattan
12. P28-Medicine Lodge
13. RSL-Russel
14. SLN-Salina
15. TOP-Topeka
16. 1K5-Elkhart

F. Colorado
1. ALS-Alamosa
2. COS-Coloraod Springs
3. LIC-Limon
4. LHX-La Junta
5. PUB-Pueblo
6. TAD-Trinidad
7. 4LJ-Lamar

G. State Abbreviations
1. Tx-Texas

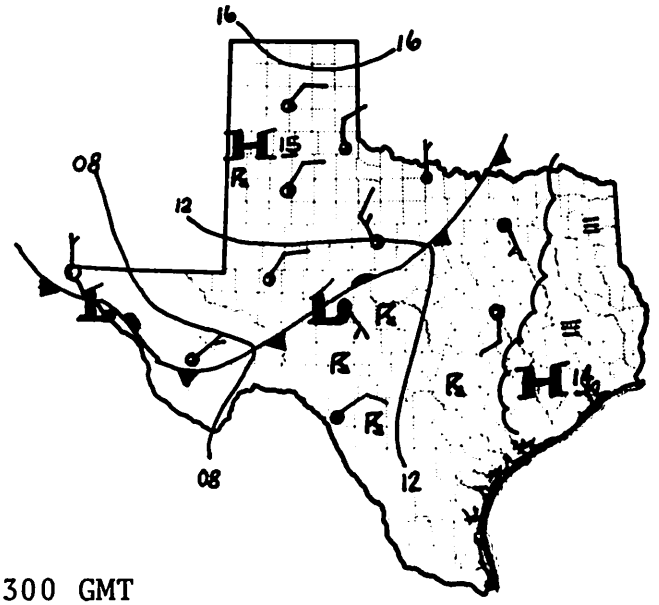
Abbreviations (cont.)

2. Ok-Oklahoma
3. Ks-Kansas
4. N.Mx-New Mexico
5. Colo-Colorado

H. Regional abbreviations (Texas)

1. STx-South Texas
2. CentTx-Central Texas
3. ETx- East Texas
4. WTx-West Texas
5. Pndl-Panhandle
6. SPlns-South Plains
7. T-P-Trans-Pecos
8. NCentTx-North Central Texas

Summary - 1 June 1978



1300 GMT

DAY BEGAN WITH ACCAS W-NW AND CONDITIONS RELATIVELY UNSTABLE. 500 MB TEMP - 12.3°C, BUT LFM PROGGED -8 BY 00Z. FORECAST WAS FOR OP CONDS.

BY LATE MORNING THE CASTILLANUS HAD DSPED AND STRATO-CUMULUS HAD DEVELOPED. LLM HIGH OVER AREA, WITH CONVECTIVE TEMP 87°F.

CUMULUS APPEARED BY VERY LATE MORNING, TEMPS REMAINED IN MID 70's WITH NE SFC WIND. HOWEVER, BY MID-AFTERNOON CS FROM TSTMS APPROX 150-175 MILES W-SW BEGAN TO APPEAR. THE CELLS THEMSELVES WERE ALSO VSBL SCT CUMULUS PREVAILED OVER OP AREA.

SCT CUMULUS REMAINED OVER AREA UNTIL EARLY EVENING. BY THIS TIME A CS OVC DECK ALSO COVERED THE OP AREA. SEVERE TSTMS HAD

DEVELOPED APPROXIMATELY 50 MI FROM OP AREA, WEST OF SEMINOLE. THESE STORMS WERE MVG SE AND ENTERED THE OPERATIONAL AREA JUST AFTER DARK. HEAVY PRECIP RPTD OVER WERN PCTNS OF OP AREA DURING NIGHT.

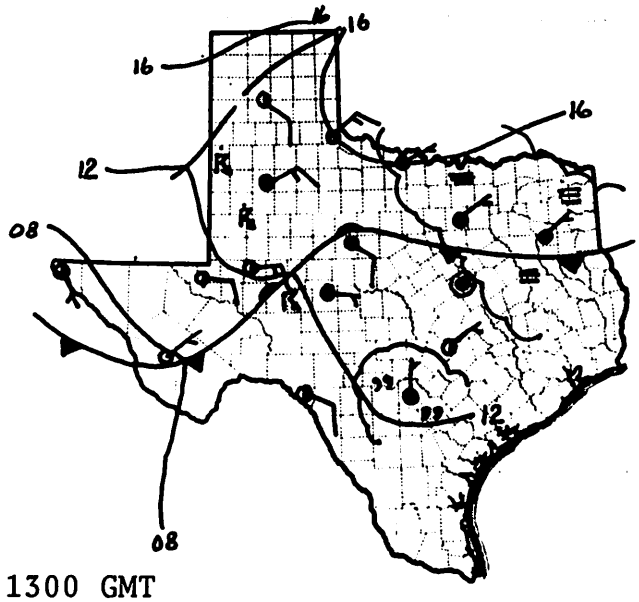
DAY CLASSIFIED A 3.

Weather Observations
1 June 1978

TIME (CDT)	
0655	SCT AC-AS; FEW ACCAS DSNT NW; CB DSNT NW-N; T = 59°F; WIND CALM
0750	SCT AC; ACCAS SW-NW; CB DVPG DSNT NW; VIRGA DSNT NW; T = 62°F; WIND 02008
0955	CLR. FEW S C SW-W-WNW; ACCAS W-NW; T = 72°F; WIND 01510; FEW SML CU SE; CS SE HRZN
1110	CLR. CU S-SW; AS-AC, S-SW-W-WNW; T = 75°F; WIND 05012; FEW CI WNW
1300	CLR. CUMULUS-SC S-SW-W; AS S-W-NW; FEW CI SSW; T = 79°F; WIND 05010
1400	CLR. CUMULUS SE-S-SW-W-NW; FEW AC-AC SL S-SW AND NW; CB DSNT SW; T = 82°F; WIND 07002
1450	SCT CUMULUS; CS SW HRZN; T = 82°F; WIND CALM; K SW
1555	SCT CUMULUS; CI-CS S-SW; T = 85°F; WIND 14001
1650	SCT CUMULUS; CI-CS SE-SW; T = 85°F; WIND 35003
1855	FEW CU; BKN VBL OVC CS; DRK DSNT W-NW; T = 83°F; WIND 07006
2055	FEW CU; OVC CS; CB WNW DSNT; T = 81°F; WIND 07008 CB MVG SLOWLY ESE

FORECAST BUSTED

Summary - 2 June 1978



1300 GMT

ACTIVITY FROM PREVIOUS EVENING CONTINUED INTO MID-MORNING WITH .31 INCH RECORDED AT THE STATION. ACTIVITY MVD E BY LATE MORNING, WITH ADDITIONAL DEVELOPMENT OCCURRING ALONG A SFC TROUGH IN ERN N. MX.

SOUNDING QUITE MOIST AND UNSTABLE, WITH OVER 3 CM PW AND LI =-5.4.

DURING EARLY AFTERNOON LINE CB BEGAN DEVELOPING DSNT W-SW-S AND MVG E BY LATE AFTERNOON ACTIVITY BEGAN TO DEVELOP WITHIN THE OP AREA.

WITH MOIST UNSTABLE AIRMASS AND SFC TROUGH MVG E, A TORNADO WATCH WAS POSTED 2014 VALID 2045Z - 0200Z, COVERING MOST OF THE OP AREA. WITH THIS THE OPERATION SHUT DOWN FOR THE DAY.

DAY CONSIDERED A 6.

Weather Observations
2 June 1978

TIME (CDT)	
0700	FEW CU ALQDS; STFRA ALQAS; CBMDM OVHD-W; T W-OVHD: LN CB SW-NW; OVC CS; LTGUCCG W-NW AND OVHD; T = 68°F; WIND 07005 TR - AT STN, TR INCSG STN PRES 928.8
0750	OVC CU-CB; TRW-AT STN 68/M/09008; 929.3; LTGICCG SW-W-NW AND OVHD
0855	⊕ CB; FEW LWR SCUD ALQAS; TRW AT STN; DRK ALQDS XCP WN-N; T = 67°F; STN PRES 930.3
0955	⊕ CB; FEW SCUD ALQDS; BINIVE NW; CB DSNT NW; T = 63°F; WIND 04012; 930.9
1150	FEW CU; 21/18.6/BKN AC-AS; TCI BLDG SW-S; CB RUU DSNT E; WIND 07516G23 T = 70; T_w = 65.5 T_d = 17.5°C = 63.5°F
1350	25.4/21.6 STN PRES 931.1; SCT CU: FEW AC ALQDS; CS DECK NW-N AND E-SE; LN CB DVLPG RPDLY S-SW; WIND 05010 G27 T_d = 20.1°C
1455	78/68
1455	25.5/20.4 930.6/SCT CU;LN TCU-CB BLDG S-SW-W; CS S-W-NW; FEW AC-AS ALQDS; WIND 05517 T_d 18.6
1550	929.9 25.4/20.1/WIND 08012/ FEW CU; AC; LINE CB BLDG S-SW-W-WNW; SCT CS 78/64 ⇒ T_d = 17.7
1650	929.7 24.2/19/5/T_d = 17.3/WIND 07014/BKN CU/OVC AC-CS; CB-RWU DSNT W-NW AND S-SW; FEW CU CONG SE-S

FORECAST VERIFIED

TEXAS HIPLEX 1978 AIRCRAFT DATA

DATE 6 / 2 / 78 FLT. # 1 MISSION NO. _____

A/C CREW A. Roberts, E.Lobel, Gary Hix

TAKE-OFF TIME (CDT) 1200 LAND TIME (CDT) 1310

ADVISED POSITION Lamesa

TEMP PROFILE (1000 Ft.)

	3	4	5	6	7	8	9.3	10	11	12	13.3	14.3	15	16	17	18	19	20
ASDG						+10	6	4	3	0	-2	-4	-5.5	-7	-8	-10		
DSDG																		

TIME TO -5°C (Min) _____ TIME TO -10°C (Min) _____

TIME TO ADVISED POSITION: 40 (Min)

MISSION DATA

TURRET #	PENT TIME (CDT)	GM AgI	ALT (Ft)	AMB TEMP (°C)	ACFT HDG	TURRET LOC (VOR/DME)	CLD PENT SPD (kts)	CRUISE SPEED (kts)	AgI DROP INT (sec)	UPD (Ft/min)	TURB
						/					
						/					
						/					
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AIRCRAFT CLOUD AND WEATHER OBSERVATIONS

TEXAS HIPLEX 1978

DATE 6/2 FLIGHT ~~MISSION~~ NO. 1 AIRCRAFT TYPE Navajo

TIME (CDT)	OBSERVED PHENOMENA
	There were at least 2 layers of clouds.
	First deck of small strato Cu between 5.5 and 6.5 k ft.
	The next layer's base was at 12.5 k ft, tops at 17.5 - 18 k ft.
	We encountered some heavy precip, mostly ice at 13 to 16 k ft
	over about 15 min. of flight.
	Once on top, we observed an old anvil and otherwise flat
	top layer over about a 30 mi diam area.
	Center advised us about our restricted flight space - 4-5 mis.
	around Midland.
	Decision was made at the radar to return.

OBSERVER _____

TEXAS HIPLEX 1978 AIRCRAFT DATA

DATE 6 / 2 / 78 FLT. # 1 MISSION NO. _____

A/C CREW Chuck, Alan, Bruce

TAKE-OFF TIME (CDT) 12:20L LAND TIME (CDT) 13:15L

ADVISED POSITION North of Webb, 30 DME

TEMP PROFILE (1000 Ft.)

	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
ASDG	18	16	15	13	11	8	5	3										
DSDG	17	13	15	13	10	9	5											

TIME TO -5°C (Min) -- TIME TO -10°C (Min) --

TIME TO ADVISED POSITION: 30 (Min)

MISSION DATA

TURRET #	PENT TIME (CDT)	GM AgI	ALT (Ft)	AMB TEMP (°C)	ACFT HDG	TURRET LOC (VOR/DME)	CLD PENT SPD (kts)	CRUISE SPEED (kts)	AgI DROP INT (sec)	UPD (Ft/min)	TURB
						/					
						/					
						/					
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AIRCRAFT CLOUD AND WEATHER OBSERVATIONS

TEXAS HIPLEX 1978

DATE 6-2-78 MISSION NO. 1 AIRCRAFT TYPE Aztec

TIME (CDT)	OBSERVED PHENOMENA
12:35	Lower cloud base at 5500 MSL. Cloud layer's southern edge
	started at Webb and continued for 26 DME. Its width continued
	to each horizon.
	Upper cloud layer height estimated at 10500 MSL.
12:50	Rain first encountered at 320° at 40 DME. An updraft of 200
	ft/min associated with rain.
	Returned to Webb due to lack of cloud development. Center
	advised aircraft to operate within 5 mi. of Midland.

OBSERVER Bruce

June 2, 1978 Debriefing Notes

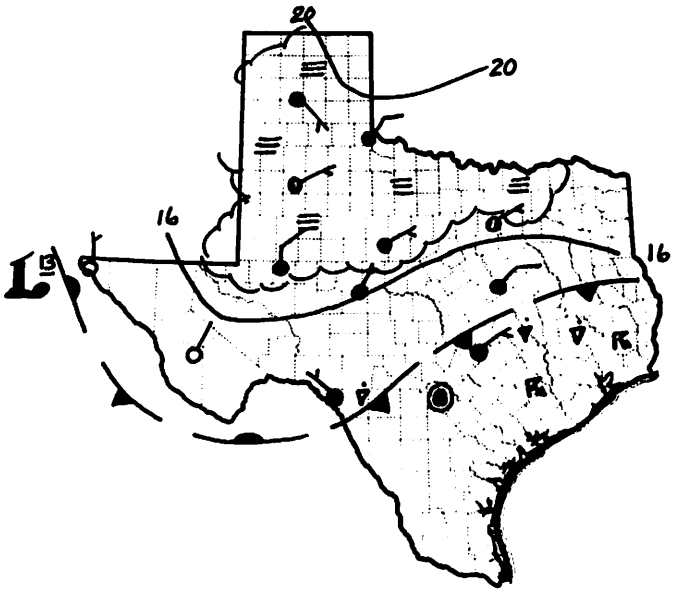
MRI

MRI cloud physics aircraft and Aztec took off at 1700 Greenwich Mean Time (GMT) and were directed by radar toward the Northwest. MRI climbed to 18,000 ft. MSL ($-10^{o}C$) but was unable to find growing cumulus due to ice shield at altitude. MRI was later vectored out of area by the FAA due to T-38 traffic and returned to base.

AZTEC

Aztec reported cloud base at 10,500 ft. MSL. Light rain was observed at cloud base. Aztec did not seed and returned to base with MRI.

Summary - 3 June 1978



1300 GMT

DAY MARKED BY ADVECTION OF QUITE DRY AND STABLE MID AND UPPER LEVEL AIR, GRADUALLY DRYING TO THE SURFACE. TOTAL PRECIPITABLE WATER ABOUT HALF (0.73") OF PREVIOUS DAY (1.44"), AND ALMOST ALL BELOW 850 MB ON 12Z MAF SOUNDING. AIRMASS QUITE STABLE AND RIDGING SIGNIFICANT AT 500 MB.

EARLY AM, SKY OVC WITH HEAVY STRATUS, E06 AND HAZE. MOISTURE SHALLOW AND BY LATE MORNING HEATING LIFTED CLOUD COVER TO BKN CUMULUS. BY EARLY AFTERNOON THE SURFACE HEATING HAD PRODUCED RAGGED CALVUS-TYPE CONGESTUS AND SML TCU. HOWEVER, MID-LEVEL DRYING TOOK OVER AND ONLY A FEW CUMULUS REMAINED BY LATE AFTERNOON. SKY ALMOST CLEAR BY DUSK.

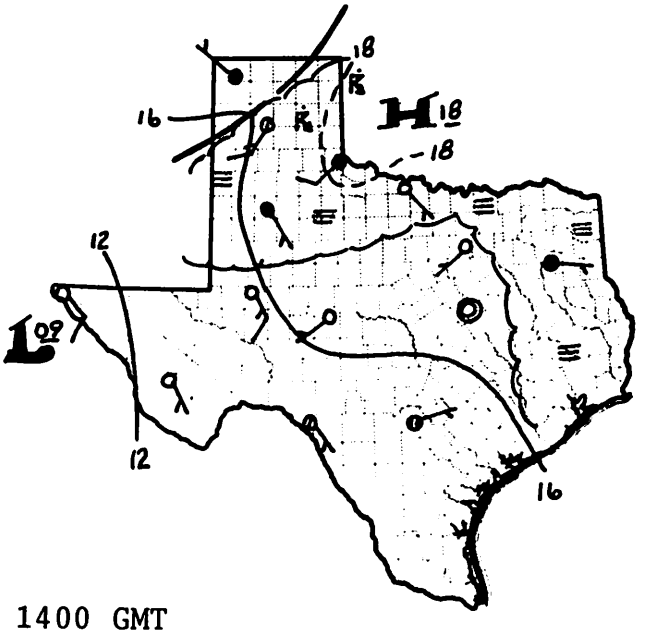
DAY CLASSIFIED A 4.

Weather Observations
3 June 1978

TIME (CDT)	
0650	OVC SC; VSBY 20 928.9/17.6/16.3/BINOVC NW HRZN: WIND 02005
0800	OVC ST; L NW; 12 930.0/18.0/16.8/ WIND CALM
0855	OVC ST; F VSBY 6 930.5/19.1/18.3/WIND 01006
0955	OVC ST; HAZY VSBY 6 931.0/20.5/19.2/WIND 02008/ BINOVC OVHD, DRK E T_d = 18.6
1150	BKN CUMULUS: FEW CU CONG ALQDS; T = 75°F; WIND 04505
1255	BKN CUMULUS: FEW CU CONG-SML TCS ALQDS; T = 78°F
1450	SCT CUMULUS; FEW SML CU CONG ALQDS: T = 82°F
1700	FEW CUMULUS; T = 83°F

FORECAST VERIFIED

Summary - 4 June 1978



1400 GMT

AIRMASS MORE UNSTABLE AND MORE MOIST THAN PREVIOUS DAY, AS SFC TROUGH IN PANHANDLE IS TRIGGERING NUMEROUS TSTMS ACROSS THE PHDL. SCATTERED CUMULUS ELSEWHERE ARE DEVELOPING MID-MORNING.

THROUGHOUT THE AFTERNOON ONLY SCATTERED CUMULUS HUMILUS DEVELOPED, EXPT FOR SOME TCU IN SERNMOST PCTNS NEAR SAN ANGELO.

LATE AFTERNOON, THE ANTICIPATED TSTMS BEGAN DEVELOPING. HOWEVER, THE PHDL SFC TROUGH HAD NOT MOVED AS EXPTD, AND THE ACTIVITY WAS DEVELOPING TOO FAR WEST. TSTMS WERE FORMING IN ERN N. MX. FROM TCC TO ROW MVMT WAS EAST AT 25-30 KTS.

THE TSTMS MADE IT TO THE OP AREA ABOUT 0400 GMT.

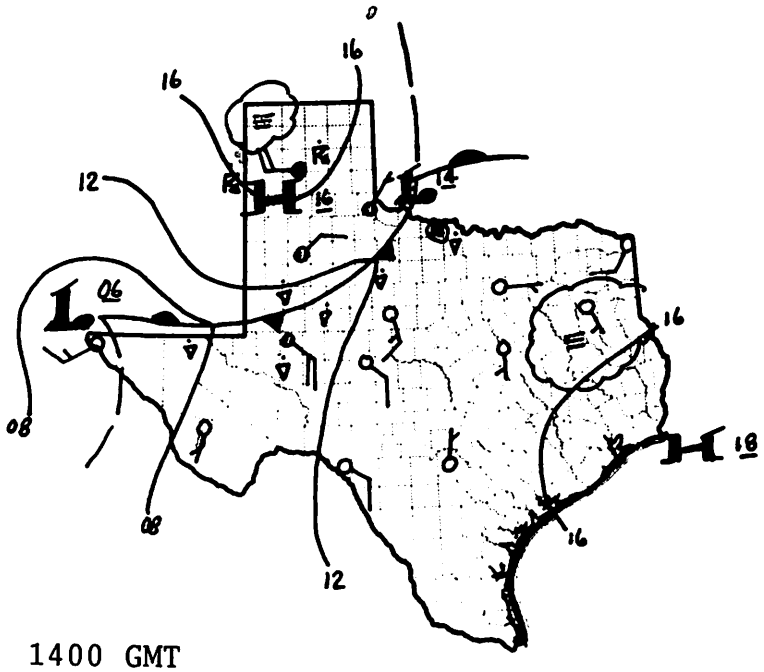
DAY CLASSIFIED A 3.

Weather Observations
4 June 1978

TIME (CDT)	
0750	BKN SC; HAZY; T = 64°F; 13004
0850	CLR. SML CU S: HZY: T = 69°F; WIND 15005
0955	SCT CUMULUS; T = 73°F: WIND 16510
1200	SCT CUMULUS; T = 78°F; WIND 16510
1450	SCT CUMULUS: T = 82°F; WIND 12506
1555	SCT CUMULUS; T = 84°F; WIND LV
1650	SCT CUMULUS; T = 84°F; CS DSNT NW: WIND 12009
1850	FEW CUMULUS; T = 81°F; BKN CS; WIND 11006
2150	OVC CS: LN CB DSNT W-N-NNE

FORECAST BUSTED

Summary - 5 June 1978



1400 GMT

DAY BEGAN WITH A STRONG SURFACE TROUGH LYING ACROSS THE OPERATIONAL AREA, AND A SHT WV - COOL POOL SYSTEM AT 500 MB OVHD-W OF OP AREA. MODERATE AMTS OF MOISTURE AND AMS UNSTABLE.

SCATTERED CUMULUS, AC AND CI WERE OBSERVED DURING A.M., TCU ALLQUADS BY EARLY AFTERNOON, WITH CB BUILDING RAPIDLY BUT CAPPING AT 25 K EARLY AFTERNOON. SOUNDING INDICATED AN INVERSION AT THAT LEVEL. HOWEVER, BY LATE AFTERNOON, SURFACE TEMPS HAD REACHED THE LOW 80^{o}S AND STRONG TSTMS DEVELOPED IN THE NW PRTN OF THE OP AREA. A SEVERE WEATHER (TORNADO) WATCH WAS ISSUED FOR THE SRN PCTN OF THE OP AREA, VALID 2100-0200 GMT.

DAY CLASSIFIED A 6.

Weather Observations
5 June 1978

TIME (CDT)	
0700	SCT CUMULUS, SCT AC-AS; CL-CS S-W-N; FEW CU CONG N-E; T = 64°F; WIND 11006
0800	BKN CU-AC-AS; ACCAS-TCU ALQDS; RWU E; CS S-W; T = 67°F; WIND 08510
0900	BKN AC; ACCAS ALQDS; RWU E-S AND W; T = 69°F; WIND 12010 CS S-W-NW
0955	BKN AC; ACCAS-RWU S-SW-W N AND E; T = 72°F; WIND 145186
1200	SCT CUMULUS; BKN N V SCT AC-AS; CI-CS ALQDS; T = 78°F; FEW TCLL-RWU ALQDS; WIND 16018
1300	SCT CU; SCT AC; FEW ACCAS - TCU ALQDS; CB BLDG RPDLY N-NE; CB N; T = 79°F; WIND 11516G23
1355	SCT CUMULUS: SCT AC-AS; FEW CI VSBL ABV;T = 81°F; WIND 13010
1450	BKN CUMULUS; FEW AC-CI VSBL ABV; T = 82°F; WIND 13510
1520	TORNADO WATCH #188 ISSUED FOR OP AREA BETWEEN 1600 AND 2100 CDT
1550	SCT V BKN CU; CONGESTUS ALQDS; RWU S; T = 82°F; WIND 14008-16KTS
1700	SCT CUMULUS; TCS ALQDS; LN CB DSNT SW-W, NW-N; T = 82°F; WIND 12516; LT616 NW; TRWU NW-N

FORECAST VERIFIED

TEXAS HIPLEX 1978 AIRCRAFT DATA

DATE 6 / 5 / 78 FLT. # 1 MISSION NO. 1

A/C CREW A. Roberts, E.Lobel, R. Hospelhorn

TAKE-OFF TIME (CDT) 1147 LAND TIME (CDT) 1425

ADVISED POSITION E1

Time hack
Navajo
114952

WWS
115000

TEMP PROFILE (1000 Ft.)

	3	4	5	6	7	8.3	9	10.3	11	12	13	14	15	16	17	18	19	20
ASDG	22	18.2	16	14	12	9	8	5	4	3	0.7	-1	-3	-6	-7.2	-10	-12	
DSDG																		

TIME TO -5°C (Min) 30 TIME TO -10°C (Min) 39

TIME TO ADVISED POSITION: 15 (Min)

MISSION DATA

PASS ~~TURRET~~ #	PENT TIME (CDT)	GM AgI	ALT (Ft)	AMB TEMP (°C)	ACFT HDG	TURRET LOC (VOR/DME)	CLD PENT SPD (kts)	CRUISE SPEED (kts)	AgI DROP INT (sec)	UPD (Ft/min)	TURB
1	124005		18.9	-11	260	125 / 15	120			127/13 500	
2	124630		18.9	-11	090	130 / 13	115	graupel		120/12, 125/14 700	
3	125700		18.8	-11	260	102 / 17	115	graupel		112/17 1000	
4	130640		18.8	-11	080	/	120			-500 104/19 +500 102/20	
5	131550		18.9	-11	260	/	120			090/20 1000	SW
6	132325		18.9	-11	090	/		graupel		080/24 500	
7	133450		18.8	-11	260	/	120			270/31 -500	
Sounding on the W of the cloud						/					
	133900	started				/					
	140500	completed				/					
Howard County Airport					VOR #1 VOR #2	135 /4.9 137 /4.9					
Signal Mont.					VOR #1 VOR #2	126 /13.5 127 /13.5					
						/					
						/					
						/					
						/					

TEXAS HIPLEX 1978 AIRCRAFT DATA

DATE 6 / 5 / 78 FLT. # 1 MISSION NO. 1

A/C CREW Chuck, Bruce

TAKE-OFF TIME (CDT) 12:00 LAND TIME (CDT) 14:00

ADVISED POSITION Northeast of Webb

TEMP PROFILE (1000 Ft.)

Time Take	G	/	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
12:00	24	ASDG	22	18	15	13	10	9	6	3	4	2								
13:38	27	DSDG	23	19	16	14	11	9	7	5	6	2								

TIME TO -5°C (Min) -- TIME TO -10°C (Min) --

TIME TO ADVISED POSITION: 12:20 L (Min)

MISSION DATA

TURRET #	Flares Fired PENT TIME (CDT)	GM AgI	ALT (Ft)	AMB TEMP (°C)	ACFT HDG	TURRET LOC (VOR/DME)	CLD PENT SPD (kts)	CRUISE SPEED (kts)	AgI DROP INT (sec)	UPD (Ft/min)	TURB
1	12:56	20	12.3	2	120	120 / 14		120	45S	500	S
	12:57	20	12.3	2	330	120 / 16		120	45S	300	S
	12:58	20	12.4	2	295	115 / 15		120	45S	300	S
	12:59	20	12.5	2	120	120 / 16		120	45S	200	S
						/					
DATA			12.5	1	170	100 / 16				200	
			12.6	0	170	110 / 20				100	
Under			12.7	-1	200	110 / 19				400	
Cloud			12.3	2	240	115 / 22				300	
Times			12.5	1	22.0	115 / 21				200	
not recorded			12.4	1	020	110 / 19				200	
			12.6	1	130	090 / 29				200	
						/					
						/					
						/					
						/					

S-Slight

AIRCRAFT CLOUD AND WEATHER OBSERVATIONS

TEXAS HIPLEX 1978

DATE 6-5-78 MISSION NO. 1 flight 1 AIRCRAFT TYPE Aztec

TIME (CDT)	OBSERVED PHENOMENA
12:00	Take Off Data Winds 140 / 20
	Clouds ALTO Cu base 5.7K
	Temp. 24°C
12:14	Light Rain 9.8K (078 - 13)
	Light sleet (074 - 27)
	Rain at (079 - 28) lasting through (079 - 29)
	1°C at 12.2K
12:54	Rain out of target cloud 11.8K (125 - 10)
	Smooth bases with light rain
	Area beneath cloud free of clouds all the way to surface
	Daimeter at base ~3-4 NM

OBSERVER Bruce

June 5, 1978 Debriefing Notes

Mission No. 1

Take Off: 1647 GMT
Seed Mode: Cloud Base
Amount: 240 gms (AgI)
Rate: 3 (20 gm flares) per 45 secs.
Seed Time: 1756 to 1759 GMT
Cloud Type: Isold Growing Cumulus
Cloud Location: 120/14 BGS VOR to 120/16 BGS VOR
Mission Aircraft: Cloud Physics (MRI) and Aztec
Land Time: 1925 GMT

MRI

Cloud base was observed at 13,500 ft. MSL during climb-out to the sampling altitude of 18,000 ft. MSL (-11°C). First cloud observed was iced out at altitude and showed no new development. It was not considered a good test case.

The aircraft next climbed to 19,000 ft. MSL where a second cloud was observed to be growing to altitude. The top seemed to be slightly fuzzy. This cloud was chosen as the test case.

1st Pass 1740.05 GMT

Max updraft located on southwest edge of cloud. Max updraft observed to be 1000 ft/min. Cloud was growing and seemed to be moving eastward. No liquid water was observed nor any other type of precipitation.

2nd Pass 1746.30 GMT

Light graupel observed with no liquid water. Updraft was maintained.

3rd Pass 1757.00 GMT

Same as 2nd Pass Aircraft at 18,800 ft. MSL (-11°C).

4th Pass 1806.40 GMT

Light graupel observed. Downdraft noticed for the first time. A Δh may have occurred during 3rd and 4th Pass.

7th Pass 1834.50 GMT

Possible dissipation stage. Only downdraft observed. No precipitation.

No noticeable entrainment was observed. Diameter of test case estimated at 840 m.

AZTEC

Seeding occurred at 1756 to 1759 GMT in a 300 to 400 ft/min. updraft below the visible cloud. Cloud base was observed to be at 12,500 ft. MSL.

Light to Moderate precipitation was first observed at cloud base at approximately 1838 GMT.

June 5, 1978 Debriefing Notes

Mission No. 2-S

Take Off: 2008 GMT
Seed Mode: On Top
Amount: 480 gms (AgI)
Rate: 1 (30 gm flare) per second
Seed Time: 2030 GMT plus 16 seconds
Cloud Type: Complex
Cloud Location: 308/41 BGS VOR
Mission Aircraft: Lear Jet

Lear

New development was observed on west side of complex. Aircraft seeded newest turret growing through 18,000 ft. MSL.

1st Pass at 2030 GMT

Turbulent with good liquid water content (LWC) and small graupel. Turret was seeded at 18,000 ft. MSL. Cloud diameter was estimated to be 2-5 km, however, the aircraft may have flown into the mother cloud.

2nd Pass at 2032.5 GMT

Turbulent, good LWC with small graupel. Altitude 20,500 ft. MSL.

3rd Pass at 2036 GMT

Ice concentrations observed to be up with LWC down. Altitude 23,000 ft. MSL.

4th Pass at 2040 GMT

Smooth ride, all ice and no LWC observed. Altitude 24,000 ft. MSL.

Complex observed to be dissipating.

June 5, 1978 Debriefing Notes

Mission No. 2-P

Seed Mode: On Top
Seed Time: 2052 GMT plus 14 seconds
Amount: 420 gms (AgI)
Rate: 2 (30 gm flares) per second
Cloud Type: Isold Growing Cumulus
Cloud Location: 305/29 BGS VOR
Mission Aircraft: Lear Jet

Lear

Observed isold cell growing from cumulus congestus. Considered to be primary target.

1st Pass at 2052 GMT

Cell was seeded at 18,000 ft. MSL. No ice observed, mostly liquid water. Moderate turbulence was experienced.

2nd Pass

System observed to be more congestus, seemingly developing into a complex.

3rd Pass

Crew believes this pass was made through a new cell and not the seeded cell. Pass was turbulent with good liquid water content.

At 2102 GMT, a second cell in the complex was seeded using 16, 30 gm flares at a rate of one (1) per second. Four (4) passes were made with the Lear climbing with the growing turret. Initial seeding was at 18,000 ft. MSL. This cell was located at approximately 305/24 BGS VOR, upwind of the previous seeded cell. Lear crew recalled that the LWC was good at the start of the cell's life history with ice concentrations increasing with time. Second pass was at 2104 GMT, third pass at 2108 GMT and last pass at 2111 GMT.

A third turret of the same complex was seeded. Turret was located on the western side of complex.

1st Pass at 2114 GMT

Turret was seeded on western edge in the clear air at 18,500 ft. MSL. Lear seeded the turret by keeping it down wind. Ten (10) 30 gm flares were released at one second intervals. The turret was located at 300/29 BGS VOR.

2nd Pass

Large water drops were observed at 19,000 ft. MSL. One drop estimated at 5 mm (diameter). Rime ice and graupel was observed as well as good LWC.

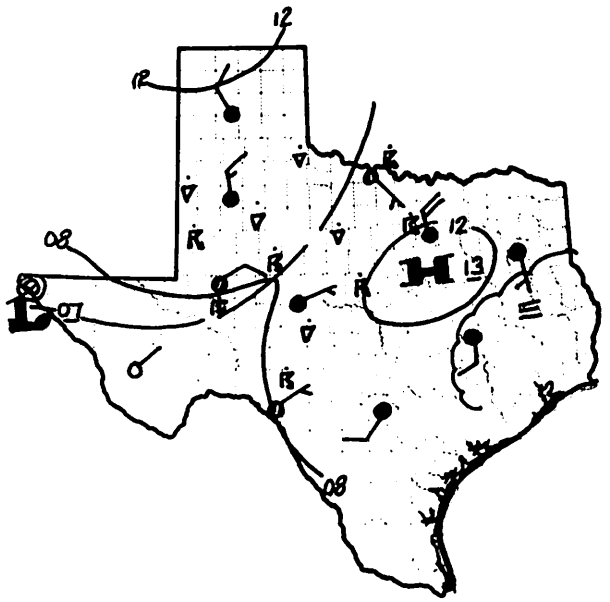
3rd Pass

Observations taken at 23,000 ft. MSL. Rime ice and graupel was observed as well as good LWC.

4th Pass

Observation taken at 25,500 ft. MSL. Crew could not recall observations.

Summary - 6 June 1978



1300 GMT

DAY BEGAN WITH SURFACE TROUGH LYING SE OF OP AREA, WITH CONSIDERABLE MOISTURE AND EXTM INSTABILITY LYING OVER OPERATIONAL AREA. A 500 MB TROUGH LAY W OF STATE FM COLORADO TO NR ELP, WITH CONSIDERABLE MOISTURE ALOFT.

WIDESPREAD ACTIVITY WAS OCCURRING DURING A.M. HOURS OVER OP AREA, WITH OVER 1/2 INCH (.56) PRECIPITATION FALLING AT THE STATION.

THIS ACTIVITY SLOWLY WEAKENED DURING THE MORNING AS IT MVD SE, BUT LEFT QUITE COOL (59^{o}F AT 11 A.M.) AIR OVER OP AREA.

BY MID AFTERNOON TEMPS WERE INTO THE MID 70'S AND ACCAS WAS SCATTERED OVER OP AREA. BY LATE AFTERNOON THE LONG WAVE TROUGH BEGAN TO TRIGGER A LINE OF TSTMS IN ERN N. MX. THESE

STORMS DVLPD RPDLY AND MOVED ERLY 75 KTS. A TORNADO WATCH WAS POSTED EFFECTING THE WRN PCTN OF THE OP AREA. THE TSTMS ENTERED THE OP AREA ONE HOUR BEFORE SUNSET.

DAY CLASSIFIED A 6.

Weather Observations
6 June 1978

TIME (CDT)	
0745	OVC CUMULUS; BINOVC; RWU-TRWU SW-NW AND SE; T = 63°F; WIND 06518
0905	BKN V OVC AC-CU; FEW SCUD ALQDS; FEW SPRK L AT STN; CB-TRWU SWS N-NE-E AND S; L SW-W; T = 65°F; WIND 06508
0950	BKN CU - TCU-CB ALQDS; CB W LN CB NW-NE MVG ESE; T = 66°F; WIND 07005
1055	OVC CU-CB; BINOVC, HIR CLDS VSBL; TR - AT STN; T = 59°F; WIND 01510
1155	ⓓ SC; CB SE-S NW-N; TRWU SE-S NW-N; LTGICCG SE-S; T = 62°F; R - AT STN; WIND 05018
1305	SCT AC-AS ACCAS LNS S-SW-W AND NNW-NE; CB NE; TRWU NE; T = 70°F; SCT CC ABV: WIND 07519G25
1355	FEW CU-AS ACCAS NW-N-NE-E-SE; CB-TRWU NE-SE MVG E; AS SCT; FEW CI-CS NW-N; T = 72°F; WIND 07518
1450	SCT AC-AS; LN ACCAS-CB N-NE; TRWU NE; CB ANVIL SSW-ENE; T = 74°F; CS DSNT W-NW; WIND 09010
1550	SCT AC-AS; FEW ACCAS NW N-NE-E; CB DSNT S-SE; CI-CS SCT; T = 76°F; WIND 09016
1650	SCT AC; ACCAS OVHD-W; LG CB CS ANVIL WSW-S-E-NE MVG NE; CB TPG DSNT NW-N; T = 78°F; WIND 08010

FORECAST VERIFIED

TEXAS HIPLEX 1978 AIRCRAFT DATA

DATE 6 / 6 / 78 FLT. # 1 MISSION NO. 3

A/C CREW A. Roberts, E. Lobel, R. Hospelhorn

TAKE-OFF TIME (CDT) 1218 LAND TIME (CDT) 1505

ADVISED POSITION E4

TEMP PROFILE (1000 Ft.)

	3	4	5	6	7	8	9.1	10	11	12	13	14	15	16	17	18	19	20
ASDG		14	12.2	10.5	10.2	10	7	5	4	2	0	-2.5	-4	-7	-8			
DSDG																		

TIME TO -5°C (Min) 27 TIME TO -10°C (Min) _____

TIME TO ADVISED POSITION: _____ (Min)

MISSION DATA

~~TURRET~~ # PASS	PENT TIME (CDT)	GM AgI	ALT (Ft)	AMB TEMP (°C)	ACFT HDG	TURRET LOC (VOR/DME)	CLD PENT SPD (kts)	CRUISE SPEED (kts)	AgI DROP INT (sec)	UPD (Ft/min)	TURB
	130435		17.0	-8	270	058/ 15	130				
1	131205		16.8	-7.8	140	095/ 6	130	120	grau	1500 095/5	bumpy
2 in	133015		17.0	-9	070	120/4 exit /	120	130	graupel	1 500	steady
out	13 3415		18.4	-10		065 / 18					
3 in	13 3815		18	-10	240	/		135	3950 4020	500 for 10 sec 500 for 10 sec	
out	13 4250		18.6			065 / 13		less precip.	4100	1,000 for 20 sec	
4 in	13 4640		18.1		060	062 / 17	130	130	small grpl	up in the SW	
out	13 4940		18.5			062 / 25	blow off N			500 steady	40 sec
5 in	13 5615		17.9		240	060 / 28	130		light ice	500 10 sec -300 15 sec	
out	13 5810		18.0			062 / 23	135			5830 -500 5850 +1000	
6 in	140630		17.7		060	065 / 29	125		light ice	no Up	
out	14 0800		17.8			064 / 32					
7 in	14 1450		15.0	-5?	240	/					
	14 1535					/					
After shedding the ice went back to 18 k ft./ Did not find anything to study in the											
45 min. we had left so we returned to base/											

AIRCRAFT CLOUD AND WEATHER OBSERVATIONS

TEXAS HIPLEX 1978

DATE 6-6-78 MISSION NO. 4 AIRCRAFT TYPE MRI Navajo

TIME (CDT)	OBSERVED PHENOMENA
	We flew through a system south of Big Spring.
	It had inbedded Cu, little updraft, mostly precip., small
	graupel in some areas. Nothing to work with after we broke out
	on the other side. Radar told us about a cloud at 070 / 1.0
	Made one pass through an older cloud then moved onto a good
	looking, growing Cu tops probably 20 to 22 k ft.
	On our first pass cloud did not seem organized, had holes
	in the middle. We had gone through the entire line. Waited
	for the P-Navajo to do the seeding. Cloud organized--no more
	holes with a growth area on the SW. Updrafts up to
	1500 ft./min. Ice pellets observed on the first pass intensi-
	fied and then diminished to no precip. Cloud dissipated in
	approximately 30 min.

OBSERVER E. Lobel

AIRCRAFT CLOUD AND WEATHER OBSERVATIONS

TEXAS HIPLEX 1978

DATE 6-6-78 MISSION NO. 3 flt. 1 AIRCRAFT TYPE CRMWD Navajo

TIME (CDT)	OBSERVED PHENOMENA
12:31	095 / 29.5 observed Mammatus to south
12:33	100 / 34.8 1st Rain in cloud alt. 16.1 k
12:51	115 / 62.8 Broke into clear after climb
12:58	Mostly status below
13:02	275/ 44 Snow in cloud
13:04	095 / 38.1 cleared the clouds (Exit)
13:05	085 / 27.9 observed target cloud
13:15.33	Exit cloud 050 / 17.7 15 sec, Light Rime Ice
13:21	060 / 5.5 -12°C alt. 20.9k
	1st seeding pass, moisture, slight turb.
13:50	070 / 21 185-19.5 Mid-level ice cap

OBSERVER _____

June 6, 1978 Debriefing Notes

Mission No. 3

Take Off: 1718 GMT
Seed Mode: On Top
Amount: 520 gms
Seed Time: 1828 GMT to 1832 GMT
Cloud Type: Complex
Cloud Location: 125/5.7 BGS VOR
Mission Aircraft: Cloud Physics (MRI) and P-Navajo
Land Time: 2013 GMT

MRI

Departed Big Spring in a southeast direction. In cloud from 13,000 ft. MSL to 17,000 ft. MSL during climb out. Observed some embedded cells. Aircraft observed growing cell at 095/06 BGS VOR. This cell was considered to be a complex and was selected as a test case.

1st Pass 1810 GMT

Heading 240 at 16,800 ft. MSL aircraft experienced turbulence with snow and 1/4 inch rime ice. Max updraft 1680 ft/min. at 095/05 1305 VOR.

2nd Pass at 1830.15 GMT

Entered cloud at 17,000 ft. MSL ($-9^{o}C$ to $-10^{o}C$) heading 070. Max updraft was 500 ft/min. steady throughout pass. Larger and heavier graupel was observed with continued rime icing. Pass was smoother, i.e. less turbulence. Exit at 1834.15 GMT at 18,400 ft. MSL at 065/18 BGS VOR.

3rd Pass at 1838.15 GMT

Entered at 18,000 ft. MSL heading 240. Updraft seemed variable about 500 ft/min. . Max updraft was observed on southwest side to be 1000 ft/min. for 20 seconds. Less precipitation was observed. Exited at 1842.15 at 18,600 ft. MSL at 065/13 BGS VOR.

4th Pass at 1840 GMT

Entered at 18,100 ft. MSL heading 060 at 062/17 BGS VOR. Max updraft of 500 ft/min. was observed, on the southwest side of cell. Updraft lasted for 40 seconds. Smaller precipitation was observed. Blow off was observed toward the north. Exited at 1849 GMT at 18,500 ft. MSC at 062/25 BGS VOR.

5th Pass at 1856 GMT

Entered at 060/28 BGS VOR at 18,000 ft. MSL heading 240. Less precipitation was observed. Updraft was 500 ft/min. for 10 seconds then 500 ft/min. down, then 1000 ft/min. up just before exit. Exited at 062/23 BGS VOR at 1858 GMT.

6th Pass at 1906 GMT

Entered at 065/29 at 17,800 ft. MSL heading 060. No updraft or ice observed. Exited at 064/34 at 1908 GMT.

7th Pass at 1914

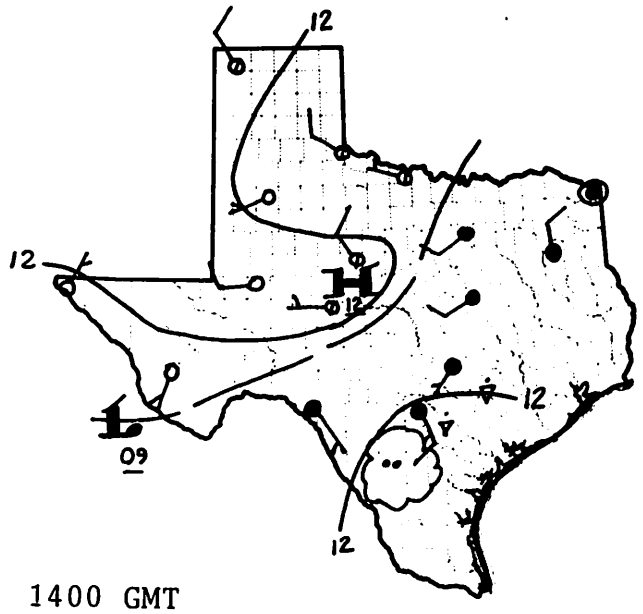
Entered at 15,000 ft. MSL ($-5^{o}C$). Observed only downdraft. Exited at 1415 GMT.

P-NAVAJO

In cloud from 10,000 ft. MSL to 20,000 ft. MSL during climb. Heading was to the southeast. Aircraft took 14 minutes to reach $-5^{o}C$ and 22 minutes to reach the $-10^{o}C$ level.

The test case cloud was seeded at 1828 GMT at 20,400 ft. MSL on a 070 heading. Max updraft was 2000 ft/min. and light to moderate turbulence was encountered during seeding pass. Aircraft seeded along wind direction and released twenty-six (26) 20 gm flares.

Summary - 7 June 1978



1400 GMT

SLT WNW SFC FLOW OVER OPERATIONAL AREA MOST OF DAY WITH LIGHT LLM AND MDLY STABLE AMS. HOWEVER, 500 MB TROUGH REMAINED DIRECTLY OVER OP AREA AT 12Z, AND QUITE COLD (-13°C) AIR REMAINED AT 500 MB.

CUMULUS DEVELOPED BY EARLY AFTERNOON, WITH LARGE CBS NOTED NE-E HORIZONES (ABOUT 100-125 MILES). ACTIVITY LIMITED DURING AFTERNOON OVER OP AREA, AS 500 MB TROUGH MVD BY AREA DURING AFTERNOON. LATE AFTERNOON, HOWEVER, AIRMASS ACTIVITY DEVELOPED IN THE N END OF OP AREA AND MVD SLOWLY SE. SYSTEM WAS WEAK, EMITTING LITTLE PRECIPITATION. TOPS ABOUT 30 K.

ALL ACTIVITY DISSIPATED BY 0000 GMT.

DAY CLASSIFIED A 6.

Weather Observations
7 June 1978

TIME (CDT)	
0800	CLR. FEW AS WNW-NW; HAZY W HRZN; T = 62°F; WIND 29004
0900	CLR. FEW AS-AC WSW-W-NW-NNW; T = 63°F; WIND 28004
1050	CLR. FEW AS SW-W-NW-N; ISLD AC-ACCAS SW; T = 70°F; WIND 32002
1200	CLR. AS W-N; FEW AC W-N; FEW CU NW; T = 73°F; WIND 28010
1350	SCT CUMULUS: FEW CB NW S; LG CB LN DSNT NNE-ENE; T = 78°F; WIND 30010
1450	SCATTERED CU; FEW CU CONG SE-S-W; CB DSNT N-NE; T = 78°F; FEW CI DSNT W; WIND 38012
1550	SCT CU; CU CONG SSW-S-SE; T = 80°F; FEW CS W; WIND 30016
1620	(SP)SCT CU; CU CONG ALQDS; CB RWU N-NE AND ESE: T = 80°F; WIND 29012
1650	SCT CU; CU CONG ALQDS; FEW TCU SW, CB N MVG SE; T = 80°F; WIND

FORECAST VERIFIED

TEXAS HIPLEX 1978 AIRCRAFT DATA

DATE 6 / 7 / 78 FLT. # 1 MISSION NO. 4

A/C CREW A. Roberts, E. Lobel, B. Shaff

TAKE-OFF TIME (CDT) 1657 LAND TIME (CDT) 1910

ADVISED POSITION Ej

TEMP PROFILE (1000 Ft.)

	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
ASDG	23	20	16.1	14	10	8	6	3	2	0	-2	-4	-6	-8	-9			
DSDG																		

TIME TO -5°C (Min) 27 TIME TO -10°C (Min) _____

TIME TO ADVISED POSITION: _____ (Min)

MISSION DATA

TURRET #	PENT TIME (CDT)	GM AgI	ALT (Ft)	AMB TEMP (°C)	ACFT HDG	TURRET LOC (VOR/DME)	CLD PENT SPD (kts)	CRUISE SPEED (kts)	AgI DROP INT (sec)	UPD (Ft/min)	TURB
1	173543		17	-10	280	330 / 20.5		110	snow	down-drf	
	173647					/				-300 E 330/21	
2.1	174130		16.8			304 / 25	120		wet snow	+500 307/26	
	174232					/		110			
3.1	175022		17	-10	090	316 / 22	120		small ice +	downdrf W 1000E	bumpy
	175205					342 / 18		115	+	500 downdrf	
3.2	181017		17.4		080	310 / 19	115		precip.	W downdr	
3.3	180741		17.3		340	304 / 23	120		holes, no lwc	-100010 bumpy	
	180835					312 / 25					
4.1	181030		17		270	306 / 29	130	bumpy	Updr.	down E-500 W+800	40 sec. Steady
	181113		.5 gm lwc						updraft		
4.2	181405		17	-10	090	306 / 29	120	bumpy	dwndr	-300	
	181436	out				/					
5	181554		16.9	-10	140	309 / 23	130			no up no down	bumpy
			.5	gm lwc	max	/					
	181644	out				/					
3.2	182149		16.7		310	/			precip.	downdrf ESE -1000	
	182232	out				302 27	.5 gm lwc		sft grp.	updr +1500	

(continued next page)

(CONT. FOR PREVIOUS PAGE)

TEXAS HIPLEX 1978 AIRCRAFT DATA

DATE 6/ 7 / 78 FLT. # 1 MISSION NO. 4

A/C CREW _____

TAKE-OFF TIME (CDT) _____ LAND TIME (CDT) _____

ADVISED POSITION _____

TEMP PROFILE (1000 Ft.)

	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
ASDG																		
DSDG																		

TIME TO -5°C (Min) _____ TIME TO -10°C (Min) _____

TIME TO ADVISED POSITION: _____ (Min)

MISSION DATA

TURRET #	PENT TIME (CDT)	GM AgI	ALT (Ft)	AMB TEMP (°C)	ACFT HDG	TURRET LOC (VOR/DME)	CLD PENT SPD (kts)	CRUISE SPEED (kts)	AgI DROP INT (sec)	UPD (Ft/min)	TURB
3.3	2518		17		120	301 / 27	130 .5 gm	lwc	some precip	+500 10	sec. WNW bumpy
	2618	out	top 25 k ft.			301 / 24			grpl. soft	downdr.	
6.1	183555		16.7		110	299 / 26	120		preci grpl.	+1000 20 sec	
	3705	out				/			E side water	-1000	
eeded? 6.2	4048		16.7	-10	280	/	125		water precip	down E-side downdr	-800
	4214		16	out		294 / 26					
6.3	4650		16.2		100	290 / 22	120		precip ice	+500	290/2
	4757	out				/					
6.4	5400		14		300	284 / 20	130		small grpl		
	5500					/					
						/					
						/					
						/					
						/					
						/					
						/					

AIRCRAFT CLOUD AND WEATHER OBSERVATIONS

TEXAS HIPLEX 1978

DATE 6-7-78 MISSION NO. 4 AIRCRAFT TYPE MRI Navajo

TIME (CDT)	OBSERVED PHENOMENA
	Directed to an area with an echo. The echo was from an old
	cloud, with anvil. There were some turrets connected to the
	parent cloud. Penetrated one that looked good. No water, no
	updrafts, some light graupel. There were good looking Cu's all
	around not connected to the main system, tops at 20 to 25 k ft.
	Penetrated quite a few. The really young ones had some
	updrafts and .5 gm lwc. On the second or third pass (about
	7-10 min) we observed precip., steady downdrafts and no lwc.
	That seemed to be true of all of them in the area. It
	seemed (from yesterday's discussion) that there was some
	moisture convergence at the time the first cloud was
	developing. The others did not make it, nothing to support
	them.

OBSERVER _____

June 7, 1978 Debriefing Notes

Mission No. 4

Take Off: 2207 GMT
Seed Mode: On Top
Amount: 180 gms (AgI)
Rate: 1 (30 gm) flare per second
Seed Time: 2330 GMT plus 6 seconds
Cloud Type: Isold Growing Cumulus
Cloud Location: 299/26 BGS VOR*
Mission Aircraft: Cloud Physics (MRI) and Lear Jet
Land Time: 0010 GMT

MRI

Aircraft penetrated first cell at 2235 GMT, at 17,000 ft. MSL (-10°C). Mostly downdraft with some snow observed. Exited at 2256 GMT.

Second cell was penetrated at 2241.30 GMT at 16,800 ft. MSL. The cell was located at 304/25 BGS VOR. Wet snow or slush was observed. Max updraft encountered was 500 ft/min. Exited cloud at 2243.32 GMT. Aircraft observed cell to be icing out.

A third cell was observed at 316/22 BGS VOR and was penetrated at 2250 GMT at 17,000 ft. MSL. Small ice was observed. Aircraft experienced both up and down drafts at about 1000 ft/min. This cell was not as wet as the 2nd cell. Exited at 2252.05 GMT at 332/18 BGS VOR.

Two passes were made on the next cell. It was believed that this cell may have been the second cell sampled.

1st pass at 2301.17 GMT heading 080 at 17,400 ft. MSL. Cell was located at 310/19 BGS VOR. Mostly 1000 ft/min downdraft was observed. Encountered some precipitation.

2nd pass was at 2307.41 GMT at 17,300 ft. MSL. Cell was located at 304/23 BGS VOR. Mostly downdrafts were observed. Exited at 2308.35 GMT.

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* Cloud location taken from MRI data sheet

A fourth cell was penetrated twice, however, the crew could not recall the first pass. The second pass was made at 2314.05 GMT at 17,000 ft. MSL ($-10^{o}C$) heading 080. The cell was located at 306/29 BGS VOR. Mostly downdraft was observed. Exited at 2314.36 GMT.

A fifth cell was penetrated. The crew reported that no updrafts or downdrafts were observed.

The sixth cell was the test case cell.

1st Pass 2335.35 GMT at 16,700 ft. MSL heading 110.

A 1000 ft/min. updraft for 20 seconds was recorded on the west side of the cell. Graupel was observed on the west side. On the east side of the cell 1000 ft/min. downdraft was observed and good liquid water. Aircraft exited at 2337.05 GMT.

2nd Pass at 2340.48 GMT at 16,700 ft. MSL ($-10^{o}C$) heading 280.

Good liquid water was observed, all downdraft at 800 ft/min. was observed during pass. Exited at 2342.44 GMT at 16,000 ft. MSL.

3rd Pass at 2346 GMT at 16,200 ft. MSL heading 100.

Ice pellets were observed. A 500 ft/min. updraft was observed on west side of cell. Exited at 2347.57 GMT.

4th Pass at 2354 GMT at 14,000 ft. MSL ($-5^{o}C$).

Only small graupel with no vertical motion was observed.

5th Pass at 2350 GMT

6th Pass at 2353 GMT

Observed lots of graupel, however, crew believes this observation was made in non-seeded cell.

LEAR JET

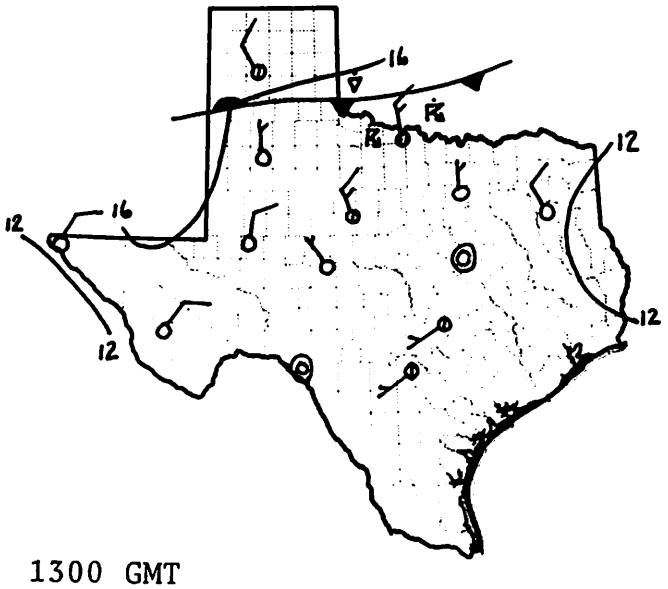
1st Pass at 2330 GMT

Turret seeded at 20,000 ft. MSL (-15°C) heading 190. Seeded one turret of complex. MRI crew believed test case to be an isolated growing cumulus. Project director ruled test case to be isolated growing cumulus.

3rd Pass at 2344 GMT

This pass was made through new turret at 20,000 ft. MSL. Small ice crystals were observed with growth on northwest side.

Summary - 8 June 1978



1300 GMT

THE 500 MB LW DROPPED FROM THE MID-MISS VLY TO E. TX. THIS A.M., WHILE AN ADDITIONAL PERTURBATION WAS TRIGGERING LIGHT TSTMS IN SW OKLAHOMA. THE OKLAHOMA ACTIVITY WAS WKNG AND MVG SE. RIDGING WAS SLOWLY TAKING OVER ALOFT OVR THE OP AREA, BUT COOL AIR AND CONSIDERABLE MOISTURE REMAINED OVER MOST OF N. MX. AND TX PNHDL AT 500 MB. UPPER FLOW BASICALLY MERIDIONAL.

FIRST CUMULUS WAS NOTED AT 1300 LOCAL, WITH A TEMP OF 79°F. ACTIVITY WAS RESTRICTED TO CUMULUS HUMILIS THROUGHOUT THE FORECAST PERIOD, BUT NUMEROUS TSTMS, SOME VERY HEAVY, DEVELOPED IN N. MX. AND TX PNHDL IN RESPONSE TO THE 500 MB MOIST COOL POOL AND ASSOCIATED WM FRONT. ACTIVITY MVD S, BUT DID NOT EFFECT OPERATIONAL AREA.

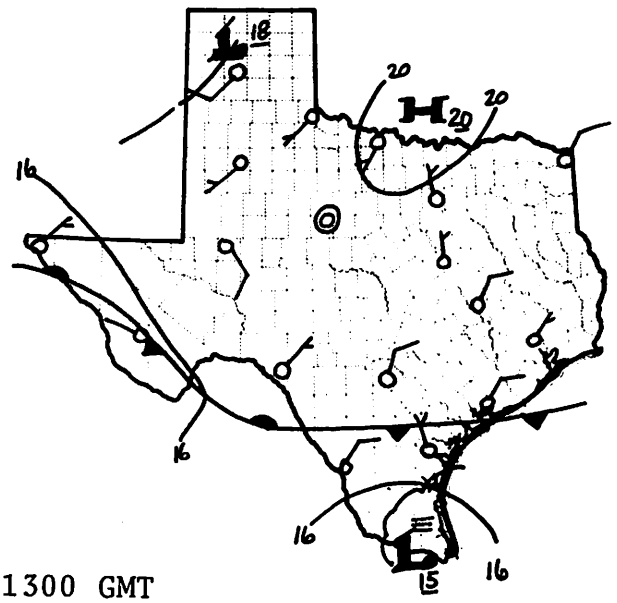
DAY CLASSIFIED A 3.

Weather Observations
8 June 1978

TIME (CDT)	
0800	SCT AC; T = 66°F; WIND 02008
0855	CLR. HAZE ON HZN NW-N; T = 69°F; WIND 02506
0955	CLR. T = 71°F: WIND 05014
1150	CLR. FEW CU N-NE; T = 76°F; WIND 04011
1450	SCT CUMULUS; T = 81°F
1600	SCT CUMULUS; FEW CI W-NW HRZN; T = 83°F
1800	SCT CUMULUS; SCT CI-CS; CS MAINLY SW-N; T = 84°F

FORECAST VERIFIED

Summary - 9 June 1978



1300 GMT

DAY HIGHLIGHTED BY DRY, STABLE, COOL AMS. TEMPS REMAIN COLD ($-12^{\circ}C$) AT 500 MB, BUT A MS DRY AND NRLY MERIDIONAL. WEAK SFC FLOW ADVECTING VERY LITTLE MOISTURE. NO SIGNIFICANT CONVECTION ANTICIPATED.

CLEAR SKIES REMAINED OVER THE OP AREA THROUGHOUT THE MORNING. BY 2000 GMT ONE OR TWO SMALL CUMULUS APPEARED MOMENTARILY. SKIES REMAINED CLEAR THROUGHOUT THE FORECAST PERIOD.

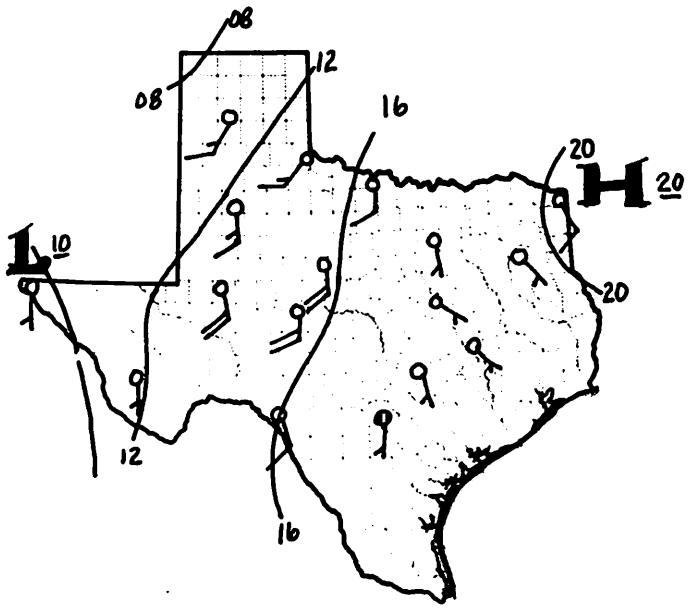
DAY CLASSIFIED A 1.

Weather Observations
9 June 1978

TIME (CDT)	
0700	CLR. T = 60°F; WIND 26003
0750	CLR. T = 61°F; WIND 21006
0900	CLR. T = 65°F; WIND 18005
0955	CLR. T = 70°F; WIND 18004
1100	CLR. T = 77°F; WIND 16008
1150	CLR. T = 78°F; WIND 13510
1350	CLR. SML CU W E; T = 82°F; WIND 06004

FORECAST VERIFIED

Summary - 10 June 1978



1400 GMT

A VERY DRY AND STABLE AMS OVER OP AREA TODAY (.58 INS PW, +4.6 LI). DRY LINE IN CENT N. MX. AND PNHDL PACKING PRESSURE FIELD AND PRODUCING QUITE STG (~ 20KT) SFC WINDS FM SSE. MOISTURE ADVECTION IS MODERATE, BUT VERY LITTLE SFC CONVERGENCE TAKING PLACE. UPPER AIR DRY AND STABLE OVER OP AREA, BUT MINOR SHT WV S OVR BIG BEND PROVIDING COOL AND MOIST AIR ALF TO PNHDL TX AND SRN N. MX. SKIES CLEAR OVER OP AREA.

SKIES REMAINED CLEAR THROUGHOUT THE FORECAST PERIOD. BY LATE AFTERNOON, EXPTD TSTMS DVLPED IN PNHDL AND SRN N. MX. THEIR MOVEMENT NOT EXPECTED TO EFFECT OP AREA. CB TOPS VSBL FROM OP AREA IN THE OTHERWISE CLEAR, WARM, WINDY AND DRY SKIES.

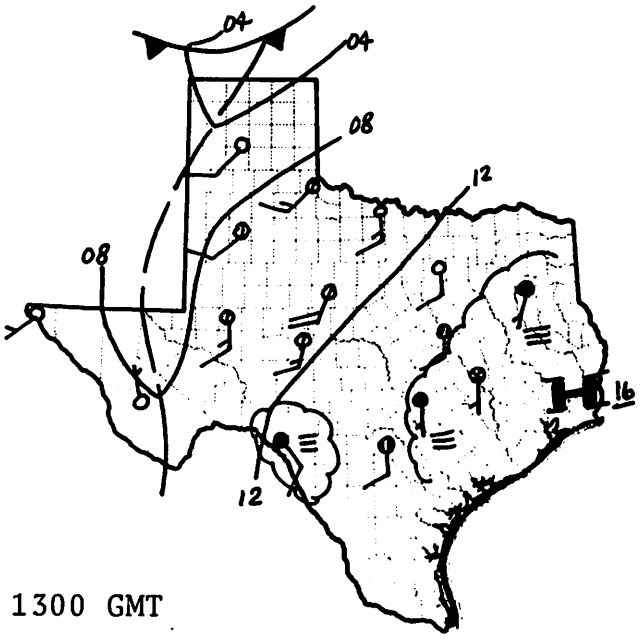
DAY CLASSIFIED A 1.

Weather Observations
10 June 1978

TIME (CDT)	
0750	CLR. T = 66°F;WIND 16019
0855	CLR. T = 70°F: WIND 17020
0955	CLR. DUST SW-NW-N HRZN, T = 75°F; WIND 16522G28
1155	CLR. HAZY SW-NW; T = 81°F; WIND 17020
1450	CLR. T = 86°F; WIND 18016G22
1755	CLR. T = 94°F; WIND 17520G26
1955	CLR. CI-CS S-SW-W HZNS; T = 88°F; WIND 16520G26

FORECAST VERIFIED

Summary - 11 June 1978



1300 GMT

RELATIVELY DRY AMS AND STRONG SUBSIDENCE ALOFT ARE EXPECTED TO REPRESS DEEP CONVECTION. A MDT SFC FRONT HAS MOVED TO A PSN IN SWRN KS. NO SIGNIFICANT TRIGGER LIES OVER OP AREA.

SKIES REMAINED CLEAR THROUGHOUT THE FORECAST PERIOD, EXCEPT FOR A FEW SML CUMULUS IN LATE AFTERNOON DUE TO SURFACE HEATING.

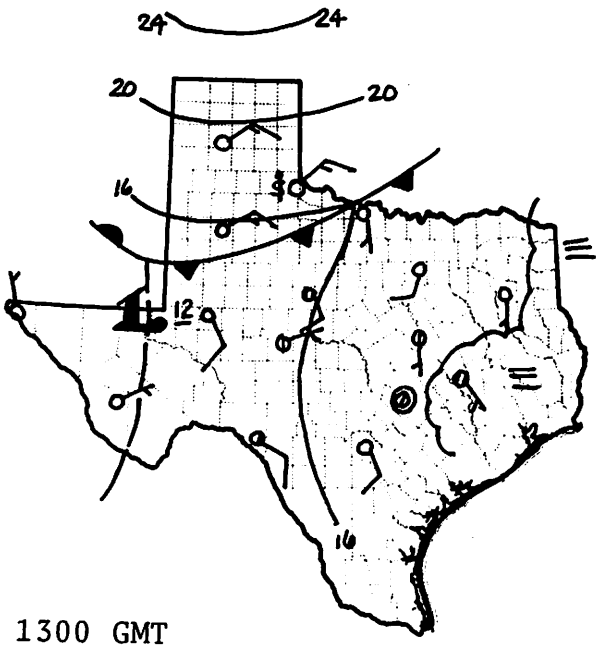
DAY CLASSIFIED A 1.

Weather Observations
11 June 1978

TIME (CDT)	
0800	CLR AC S-W-N; T = 72°F; WIND 17522G30
0850	SCT AC; T = 73°F; WIND 16518G27
0950	CLR FEW AC OVHD - W-N-NE-E; T = 78°F; WIND 18518G26
1050	CLR SML AC OVHD; T = 80°F; WIND 19514G20
1150	CLR T = 86°F; WIND 20015G23
1450	CLR T = 93°F; WIND 20012G18
1755	CLR T = 99°F; WIND 19516G21
1950	CLR FEW SML CU-AC; WIND 20018G26

FORECAST VERIFIED

Summary - 12 June 1978



1300 GMT

DAY CHARACTERIZED BY HVY LLM, WITH UNUSUALLY COOL TEMPS ALF. AMS EXTMLY UNSTBL, WITH 18Z SOUNDING DATA SHOWING LI = - 8.5, TT = 60.9. A SURFACE FRONT LIES ACROSS OP AREA, MVG SLOWLY S, AND DRY LINE LIES E OF GDI AND MRF.

SKIES REMAINED CLEAR THROUGHOUT OPERATION PERIOD, WITH CUMULUS ALQUADS. BY LATE AFTERNOON TCU BEGAN DEVELOPING NW OF OP AREA. MVMT WAS TO THE N, AS A 700 MB H LAY OVER OP AREA.

SYSTEM DEVELOPED INTO STRONG LINE OF CBS BY 2200 GMT, WITH MAX TOPS 57000' AND HAIL RPTD IN LINE. SYSTEM NEVER ENTERED OP AREA.

EARLY EVENING (0000 GMT) CBS BEGAN DEVELOPING ALG FRONT, NOW STNRY, TO THE NE OF OP AREA. THESE TOO BECAME QUITE INTENSE (47000') AND MVD N ONLY CONGESTUS DEVELOPED OVER OP AREA.

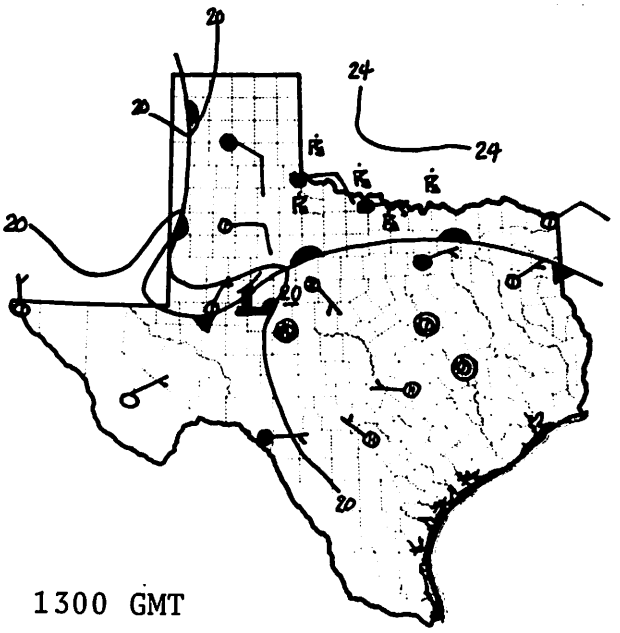
DAY CLASSIFIED A 3.

Weather Observations
12 June 1978

TIME (CDT)	
0755	CLR FEW ST SE-SW; SML CU WSW; T = 74°F; WIND 16010
0850	THN SCT ST; T = 74°F; WIND 15510
0950	CLR FEW SC ALQDS; ACCAS WNW: T = 79°F; WIND 17506
1050	CLR. FEW CI DSNT S; T = 84°F; WIND 09003; WIND SHFTG GRDLY
1150	CLR FEW CI-CS DSNT S; FEW CU E-SE-S; T = 87°F; WIND 12006
1350	CLR FEW CU ALQDS; T = 91°F; WIND 11012G18
1455	CLR FEW CU ALQDS; CB DSNT SW; T = 92°F; WIND 07512
1550	CLR FEW CU ALQDS; FEW CU CONG NW NE; T = 92°F; WIND 11010
1615	CLR FEW CU ALQDS; TCU DSNT NW; MDT CU NE-E; T = 94°F.
1655	CLR FEW CU ALQDS; CU CONG NW NE-E; LN TCU-CB DSNT NW-NNW; TCU NW; T = 93°F; WIND 09010G16
1850	CLR LN CB DSNT W-NW; CB DSNT NE

FORECAST BUSTED

Summary - 13 June 1978



1300 GMT

DAY BEGAN WITH LIGHT WINDS, SFC - 300 MB, AVERAGE MOISTURE AMOUNTS, BUT WITH VERY COLD (-12°C) AIR AT 500 MB. AMS HIGHLY UNSTABLE. 500 MB RIDGING NOT PRONOUNCED AT 12Z, AND NOT EXPECTED TO BE SO OVER NEXT 12 HRS. LI = -8, TT = 57.

FIRST CUMULUS NOTED AT 1400 GMT, WITH SFC TEMP OF 78°F. BY 1500 GMT CU CONGESTUS WAS OBSERVED, AND FIRST CBS WERE SIGHTED NEAR FRONT AT SYNDER BY 1900 GMT. LINE OF CBS DEVELOPED IN THIS VICINITY DURING THE AFTERNOON, EXTENDING FROM SYNDER-SWEETWATER AREA IN A BROKEN LINE NW TO LAMESA AND N TO LUBBOCK. MAX TOPS 50000', WITH INTENSITY LEVEL 5.

DAY CLASSIFIED A 6.

Weather Observations
13 June 1978

TIME (CDT)	
0700	FEW SCUS NE-E; FEW CU NE S; ⏀ V ⊕ CS; T = 72°F; WIND CALM
0755	FEW ST AND AC; THN BKN CI-CS; T = 75°F; WIND CALM
0855	FEW CU S: BKN CI-CS; T = 78°F; WIND 12006
1005	SCT CUMULUS; CU MAINLY E-S; SCT CI; T = 82°F; WIND 19510 MDT CU SSE
1355	SCT CU; CU CONG ALQDS; TCU-CB NE; T = 89°F; WIND LV
1455	SCT CU; CU CONG ALQDS; TCU NNW; CB NE; T = 90°F; WIND 13016
1550	SCT CU; LN TCU-CB NW-N-NE; LTL MNMT; T = 90°F; WIND 14012
1650	SCT CU; LN CB NW-NE; T = 92°F; WIND 12014

FORECAST VERIFIED

TEXAS HIPLEX 1978 AIRCRAFT DATA

DATE 6 / 13 / 78 FLT. # 1 MISSION NO. 5

A/C CREW A. Roberts, E. Lobel, R. Hospelhorn

TAKE-OFF TIME (CDT) 1425 LAND TIME (CDT) 1725

ADVISED POSITION E2

TEMP PROFILE (1000 Ft.)

	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
ASDG	26	23	20	17	14	11	10	7	6	5	0	0	-2	-5	-9	-9.5	-10	
DSDG																		

TIME TO -5°C (Min) 43 TIME TO -10°C (Min) 51

TIME TO ADVISED POSITION: _____ (Min) no time lapse film

MISSION DATA

TURRET #	PENT TIME (CDT)	GM AgI	ALT (Ft)	AMB TEMP (°C)	ACFT HDG	TURRET LOC (VOR/DME)	CLD PENT SPD (kts)	CRUISE SPEED (kts)	AgI DROP INT (sec)	UPD (Ft/min)	TURB
	150250 end		13.0	0		030 / 33					
			15.0			/		wet		1000 ft	
	150522		19.0	-10	320	022 / 35					bumpy
	150534					/					
south turrets	152117		18.9	-10	100	/	125			2000	bumpy
			19.3			/					
	152237	out				/					
1	155500		18.7	-10	340	009 / 38	120			1000	
1	155717 out					/				updraft in between	
			18.2		285	003 / 43	125			-700	
	155901	out				/					
2	160000		18.0		030	008 / 40	160			down on south	
	160329					/				+1000 008/41	
3	161000		17.6		120	/			precip.	down on west -1000	
	161405	out				/	130		soft ice	updrf. on east	
	165011		17.8		030	/				updrft 004/41	
	165043	out	17.9		030	104 61		no base			bumpy

AIRCRAFT CLOUD AND WEATHER OBSERVATIONS

TEXAS HIPLEX 1978

DATE 6-13-78 MISSION NO. 5 AIRCRAFT TYPE MRI Navajo

TIME (CDT)	OBSERVED PHENOMENA
	Passed through a layer of strato Cu, bases at 7.5k ft. 13°C.
	There was one cloud that made it--it was "icing out" by the
	time we got there. Turrets on the west side no vigorous, very
	wet. Went around the cloud to the south. Found 2 turrets
	that were very turbulent growing into the ice blow off. Too
	much natural seeding -- decided not to work those. Came back
	to the west - approxi. half hour elapsed time - no turrets and
	mother cloud was all ice.
	Found two other turrets off to the west mostly downdraft inside
	the cloud. Updraft on the west side. Seeded and cloud
	dissipated. Two other penetrations thru what looked like
	clouds at our level (18-19k ft). Bases were at 15-16k ft.
	Did a formation practice with Aztec coming home.

OBSERVER Elena Lobel

Aztec

TEXAS HIPLEX 1978 AIRCRAFT DATA

DATE 6 / 13 / 78 FLT. # 1 MISSION NO. 5

A/C CREW Pilot, Chuck, Bruce

TAKE-OFF TIME (CDT) 14:28 LAND TIME (CDT) 17:35

To TACH 2159.3

ADVISED POSITION Northeast of Webb

LAND TACH 2162.4

TEMP PROFILE (1000 Ft.)

G		3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
32	ASDG	29	25	21	17	14	11												
28	DSDG	27	26	22	19														

TIME TO -5°C (Min) _____ TIME TO -10°C (Min) _____

TIME TO ADVISED POSITION: 13 (Min)

MISSION DATA

TURRET #	PENT TIME (CDT)	GM AgI	ALT (Ft)	AMB TEMP (°C)	ACFT HDG	TURRET LOC (VOR/DME)	CLD PENT SPD (kts)	CRUISE SPEED (kts)	AgI DROP INT (sec)	UPD (Ft/min)	TURB
1	16:8:00	3	7.3k	13	010	005 / 44		110	45	.2	S
1/6	8:45	3	7.1	13	210	010 /			45	.5	
1/6	9:30	2	7.2		300	/			45	.5	
1/6	10:15	2	7.3		270	000 / 46			45		
1/6	11:00	2	7.4		270	005 / 45				.3	
1/6	12:05	2	7.5		000	000 / 45			45	.4	
1/6	13:00	2	7.5		140	000 /				.3	
1/6	13:45	2	7.5		140	000 / 42				.2	
1/6	14:00	2	7.5	13	290	005 / 42		110		NA*	
						/					
	TOTAL	20				/					
						/					
						/					
						/					
						/					
						/					

*I missed recording this data.

AIRCRAFT CLOUD AND WEATHER OBSERVATIONS

TEXAS HIPLEX 1978

DATE 6-13-78 MISSION NO. 5 AIRCRAFT TYPE Aztec

TIME (CDT)	OBSERVED PHENOMENA
14:28	TO Wind 150/20 T 34°C
14:39	Reach cloud base 7.5k, Temp. 13°C
15:04	030/45 Western edge of Main cell, Cu Congestus w/sharp develop.
15:09	030/42 Due East of Aztec at 10 miles heavy rains w/lightning
15:10	Most clouds appear sharp, few "iced out"
15:15	035/41 Light rain encountered
15:17	030/42 Rain observed at 060 from plane; 10 mile band
15:24	Rain just East of Snyder, probably Verga
15:38	Circle pattern beneath main cell
15:53	015/40 Target cloud observed separated from Main cell,
	located with several (5) vertical cloud development. No
	rain assoc.
15:55	010/43 Target Cloud Reached
15:57	Surrounding area contains cumulus w/sharp edges and good
	initial development
16:14	Cloud falling apart, scattered pieces of Cumulus
16:23	Light rains at NNW of Snyder
	VOR/DME Check Temp 22

OBSERVER Bruce

June 13, 1978 Debriefing Notes

Mission No. 5

Take Off: 1925 GMT
Seed Mode: Cloud Base
Amount: 400 gms (AgI)
Rate: 3 (20gm) flare per second for 2 seconds then 2 (20 gm) flares per second
Seed time: 2108 GMT to 2115 GMT
Cloud Type: Complex
Cloud Location: 005/44 BGS VOR to 0000/45 BGS VOR
Mission Aircraft: Cloud Physics (MRI) and Aztec
Land Time: 2235 GMT

MRI

Aircraft took off to the northeast and made a pass through one cell at 2003 GMT at 13,000 ft. MSL. Updrafts were recorded at 1000 ft/min. on westside of cell. Good liquid water was observed.

A second pass through the same cell was made 15,000 ft. MSL. Cell located at 030/33. Good liquid water observed with updraft on west side of cell.

A third pass was made at 2005.22 GMT at 19,000 ft. MSL (-10^{o}C) heading 320. Cell located at 022/35. Little updraft observed with some turbulence.

Turrets in the area seemed to be dying out. No vigorous growth observed.

A second cell was sampled at 2021.17 GMT at an altitude of 18,900 ft. MSL (-10^{o}C) heading 100. Updrafts were observed at 2000 ft/min. on the west side of cell. Good LWC and some snow was observed.

Pelius cap was observed on the growing turret. Turrets in the area would grow into ice shield. Natural seeding was probably occurring.

MRI aircraft proceeded to west side of complex area to look for additional growth. Ice shield seemed to increase with time. Aircraft proceeded further west to get out from under ice shield.

The test case was identified at 003/45 BGS VOR.

1st Pass at 2055 GMT

Aircraft was at 18,200 ft. MSL heading 285. The cell was located at 003/45 BGS VOR. Good liquid water was observed. Downdraft was on the east side and an updraft was recorded on the west side of the cell. Exited at 2059 GMT.

2nd Pass at 2100 GMT

Observation made at 18,000 ft MSL (-10°C) heading 030. Cell located at 008/40. Downdrafts were observed on the south side of the cell and a 1000 ft/min. updraft was observed on the north side of the cell. Good liquid water was observed.

3rd Pass at 2110 GMT

Observation made at 17,600 ft. MSL heading 210. Soft ice with no liquid water was observed. Exited at 2114 GMT. Cloud could no longer be defined after exit.

Aztec

Seeding began at 2108 GMT in 200-500 ft/min. updrafts under visible cloud at 7,300 ft MSL. No scudd clouds were observed at cloud base.

Seeding terminated at 2114.30. Cell dissipated very rapidly after seeding ended. Cell went from solid to scattered to blue sky.

Precipitation was observed from mother cloud.

Discussion

Entrainment of dry air seemed to have dissipated cloud because the seeding did not have enough time to reach effective altitude.

June 13, 1978 Debriefing Notes

Mission No. 6-P

Take Off: 1945 GMT
Seed Mode: On Top
Amount: No Seed
Seed Time: 2037 GMT
Cloud Type: Isold Growing Cumulus
Cloud Location: 326/56 BGS VOR
Mission Aircraft: Lear Jet

Lear

Penetrated first cell at 2014 GMT at 20,000 ft. MSL heading 340. Cell located at 310/25 BGS VOR. Graupel was observed at about 10 to 50 per liter. Very little liquid water content. Cell iced out after penetration.

At 2035 GMT crew identified target cell as isolated growing cumulus.

1st Pass at 2037 GMT

Aircraft at 19,500 ft. MSL heading 270. Cell located at 326/56 BGS VOR.

Some ice and about 1gm/liter of liquid water on the west edge of the cell was observed.

2nd Pass at 2040 GMT

Observation at 20,700 ft. MSL heading 070. Cell located at 321/58 BGS VOR. 1 gm/liter of ice and about 1gm/liter of liquid water was observed. Cell was patch with dry areas. Tops estimated to be 25,000 to 30,000 ft. MSL.

3rd Pass at 2046 GMT

Observation taken at 21,000 ft. MSL heading 270. Location of cell was at 325/56 BGS VOR. Ice concentrations increased to 5 gm/liter on east side of cell and up to 20-50 gm/liter on the west side of the cell. Liquid water content was down on the west side and up to 1 gm/liter on the east side. Good graupel was also observed.

4th Pass

No updrafts were observed. All ice with some graupel. Smooth ride.

TEST CASE TERMINATED

June 13, 1978 Debriefing Notes

Mission No. 6-S

Seed Mode: On Top
Amount: 300 gms (AgI)
Rate: 1 (30 gm flare) persecond
Seed Time: 2059 GMT plus 10 seconds
Cloud Type: Complex
Cloud Location: 318/38 BGS VOR
Mission Aircraft: Lear Jet
Land Time: Approximately 2120 GMT

Lear

Test Case

1st Pass at 2059 GMT

Observation taken at 21,500 ft. MSL heading 190. Cell located at 318/38 BGS VOR.

2nd Pass at 2101 GMT

Observation at 22,600 ft. MSL heading 270. Cell located at 314/25 BGS VOR. Cell had vigorous growth with good liquid water content and some graupel.

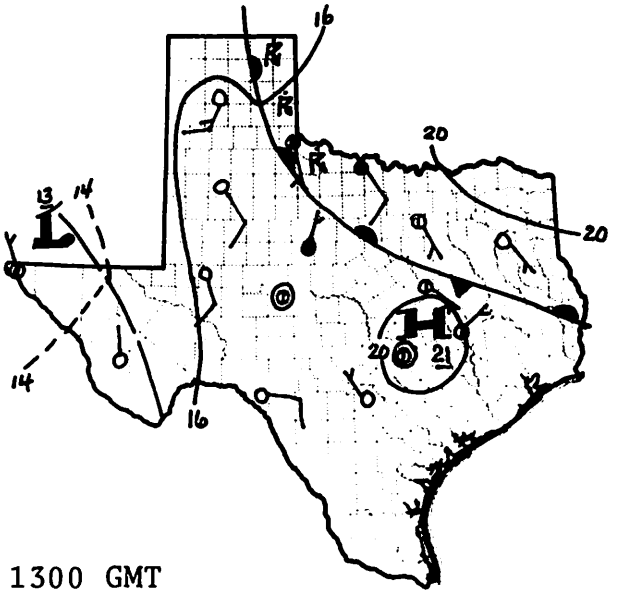
3rd Pass at 2105 GMT

Observation at 22,500 ft. MSL heading 240. Cell located at 325/37 BGS VOR.

4th Pass at 2108 GMT

Observations at 22,000 ft. MSL heading 030. Cell was located at 324/36 BGS VOR. Heavy graupel and little liquid water was observed.

Summary - 14 June 1978



1300 GMT

FRONT LYING FM SE TX TO NR ABI AND ERN PNDL NOW ACTIVE WM FRT PRODUCING RW, TRW AS IT MOVES NE AWAY FM OP AREA. A FEW VERY LT RW OCCURRING NE OF OP AREA, BUT DSPTG. AMS OVER OP AREA RELATIVELY STABLE AND MDLY MOIST. SSE SFC FLOW OVER OP AREA, WITH CLEAR SKIES AND AC - AS TO THE DSNT NE.

FIRST CUMULUS WAS OBSERVED BY 1700 GMT WITH TEMP = 86^{o}F. A SCT CUMULUS DECK WAS NOT OBSERVED, BUT "FEW CU ALQDS" WAS REPORTED THROUGHOUT THE FCST PERIOD. BY LATE AFTERNOON ACTIVITY BECAME STG IN N TEXAS AHEAD OF THE WM FRT, AND TSTMS HAD DEVELOPED IN SE N. MX. AND MVD E.

THE N. MX. STORMS, VERY HEAVY, MOVED INTO THE SEMINOLE-BROWNFIELD AREA BY NIGHT FALL, BUT DISSIPATED RAPIDLY.

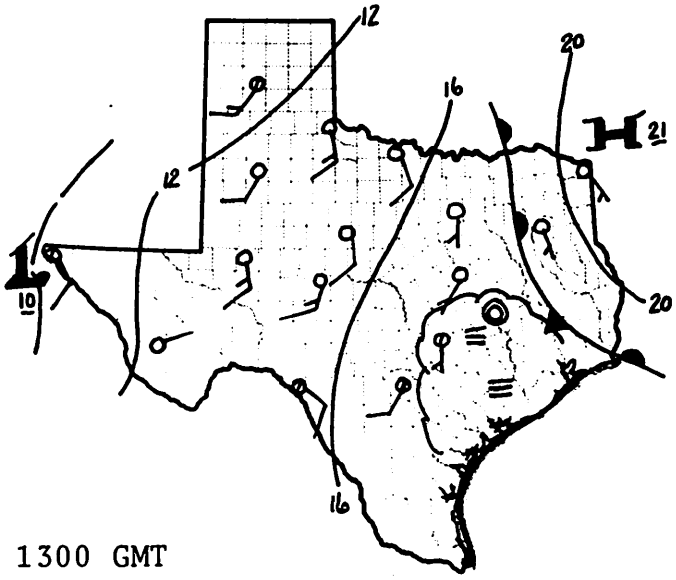
DAY CLASSIFIED A 3.

Weather Observations
14 June 1978

TIME (CDT)	
0750	CLR AC-AS NE-S; FEW CI-CS E-S; T = 72°F; WIND 16016
0850	CLR AS-AC DSNT NE-SE; T = 77°F; WIND 17018
1000	CLR BNK AC-AS NE-SE; CI DSNT SW; T = 80°F; WIND 16015G21
1050	CLR AS-AC-ACCAS BNK NE-E-SE; WIND 17513; T = 82°F; CI SW HRZN
1200	CLR SML CU NE-E-S; AC-AS NE-E; T = 86°F; WIND 15508-18
1350	CLR FEW CU ALQDS; T = 90°F; WIND 16514G21
1455	CLR FEW SML CU ALQDS; T = 93°F; WIND 15014G20
1555	CLR FEW SML CU ALQDS; CS W-NW HRZN; T = 93°F; WIND 15514G26
1850	SCT CS; T = 88°F; WIND 16010

FORECAST VERIFIED

Summary - 15 June 1978



1300 GMT

500 MB RIDGE EXTENDS ACROSS SRN MISS VLY TO OKLAHOMA SW TO SE N. MX. A WEAK DRY LINE LIES EAST OF THE ROCKIES AND ACROSS E CENT N. MX. TO ELP. CONDS LOCALLY MDTLY DRY AND STABLE. NO SIGNIFICANT TRIGGER EXISTS OVER OP AREA.

SKIES REMAINED CLEAR THROUGHOUT THE FORECAST PERIOD WITH ONLY A FEW ACCAS EARLY IN THE AFTERNOON. STRONG SE SFC FLOW CARRIED LITTLE MOISTURE, AS CONVECTIVE TEMP WAS NEVER ATTAINED.

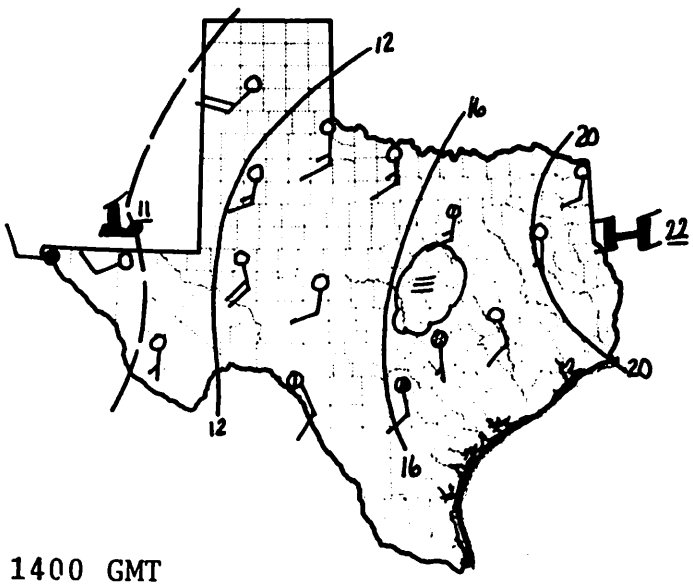
DAY CLASSIFIED A 1.

Weather Observations
15 June 1978

TIME (CDT)	
0800	CLR T = 71°F; WIND 18018G26
0855	CLR T = 75°F; WIND 16517G23
0955	CLR FEW SML AC NW, DSNT NW; T = 80°F; WIND 17518G25
1155	CLR FEW AC SW; T = 85°F; WIND 16516G21
1450	CLR FEW ACCAS SW-W-NW; T = 92°F
1755	CLR T = 96°F; WIND 16516G22

FORECAST VERIFIED

Summary - 16 June 1978



1400 GMT

AIRMASS QUITE DRY 850-700 MB, AND MDTLY STABLE (LI = -1.0). SFC DRYLINE LIES FM CAD TO HMN TO E OF ELP. 500 MB RIDGE STG OVER OP AREA, WITH 500 MB T = -6.3°C. FURTHER 500 MB RIDGING INDICATED BY LFM NEXT 12 HRS. SFC HTG WAS NOT ABLE TO PRODUCE CUMULUS DEVELOPMENT THROUGHOUT FORECAST PERIOD WITHIN OP AREA, AS T_c = 102°F. HOWEVER, VERY LATE IN THE AFTERNOON THE DRYLINE HAD ADVANCED TO THE TX.-N. MX. BORDER, FORCING THE LLM INTO CONVECTION WITH RID OF HIGH SFC TEMP. TSTMS DEVELOPED FROM N OF HOBBS TO SE OF CLOVIS, MVG SLOWLY NE (12 KTS). THIS MVMT CARRIED ONE 50000' CELL TO NW OF LAMESA (TRW+) BY 2330 GMT, BUT NOT INTO OP AREA. SOON AFTERWARD, CELL DSPTD.

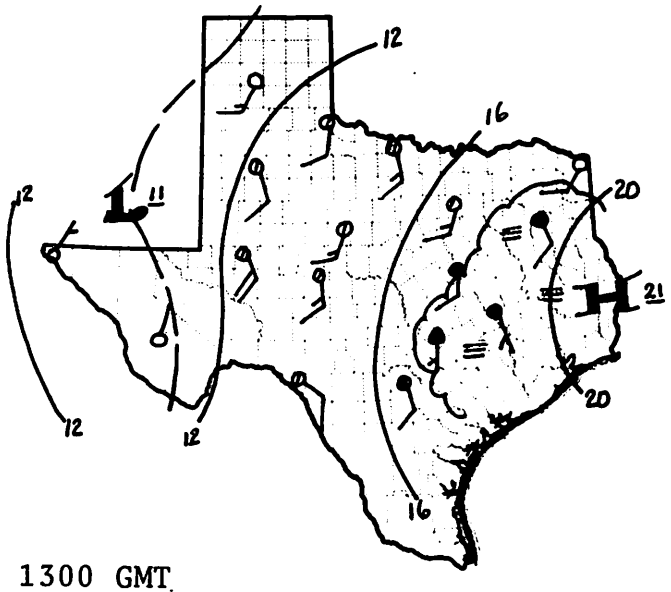
DAY CLASSIFIED A 1.

Weather Observations
16 June 1978

TIME (CDT)	
0755	CLR T = 72°F; WIND 15515G21
0850	CLR T = 74°F; WIND 16016G21
0950	CLR CI-CS DSNT W-NW; T = 80°F; WIND 17518G23
1150	CLR FEW CI SW-NW; T = 88°F; WIND 17019G23
1555	CLR FEW CI-CS SW-NW; T = 94°F; WIND 17520G24
1950	CLR CBS WNW AND NNW; MVMT UNKN; T = 90°F

FORECAST VERIFIED

Summary - 17 June 1978



1300 GMT

DRYLINE LIES FM TX PNDL TO S CEN N. MX. POLAR FRONT LIES ACROSS CENT PLAINS TO DRYLINE NR DNT AND INTO N CEN N. MX. SKIES SCT CI OVR OP AREA, WITH AMS MDTLY DRY AND STABLE. FNT MVG SLOWLY SSE AND DRYLINE MVG SLOWLY E.

SKIES REMAINED SCT CIRRUS THROUGHOUT THE FORECAST PERIOD, WITH A FEW TSTMS DVLPG IN DAVIS MTNS. AT 2330 GMT, HOWEVER, AN IMMENSE TSTM DEVELOPED NR LBB AND MVD S, BY 0030 GMT MEASURED 60000'. SYSTEM DEVELOPED ALG NWRN PCTN OF DRYLINE NR LBB IN WM AMS. ACTIVITY DSPTD SHTLY AFTER 0100 GMT, REMAINING JUST N OF OP AREA.

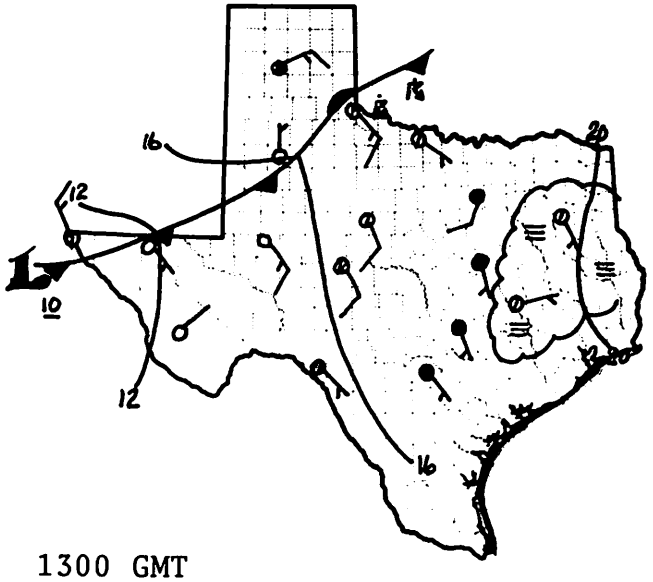
DAY CLASSIFIED A 1.

Weather Observations
17 June 1978

TIME (CDT)	
0700	SCT V BKN CI; T = 72°F; WIND 16016; SCUD S AND N-NE; HZY
0800	SCT CI; T = 74°F; WIND 16016G22
0855	SCT CI; T = 76°F; WIND 15515
0955	SCT CI; T = 80°F; WIND 16522G30
1255	SCT CI; T = 91°F; WIND 17015
1350	SCT CI; T = 92°F; WIND 16015G22
1500	SCT CI-CS; T = 94°F; WIND 15517G25
1600	SCT CI; T = 95°F; WIND 15513G21
1650	SCT CI; T = 95°F; WIND 16014
1755	SCT CI; CB N-NE; T = 95°F; WIND 17015

FORECAST BUSTED

Summary - 18 June 1978



1300 GMT

DAY CHARACTERIZED BY MDT MOISTURE LEVELS AT NMRS HTS, AVG INSTABILITY (+0.6 ON LI), AND A WK STRY FNT LYING FM CDS TO PVW TO E OF GDP. A WELL DEFINED 700 MB SHT WV EXISTS IN CENT N. MX. SFC WINDS SE 10-15 KTS.

FRONT REMAINED SLUGGISH THROUGHOUT MUCH OF AFTERNOON, BUT BEGAN MVG EWD LATE IN FCST PERIOD. TSTM DVLPD IN N. MX. LATE AFTERNOON AND MVD VERY SLOWLY E. OVER OP AREA SCT CUMULUS WERE OBSERVED. THE N. MX. TSTMS WERE VISIBLE FM OBSERVATIONS AT THE STATION.

DAY CLASSIFIED A 3.

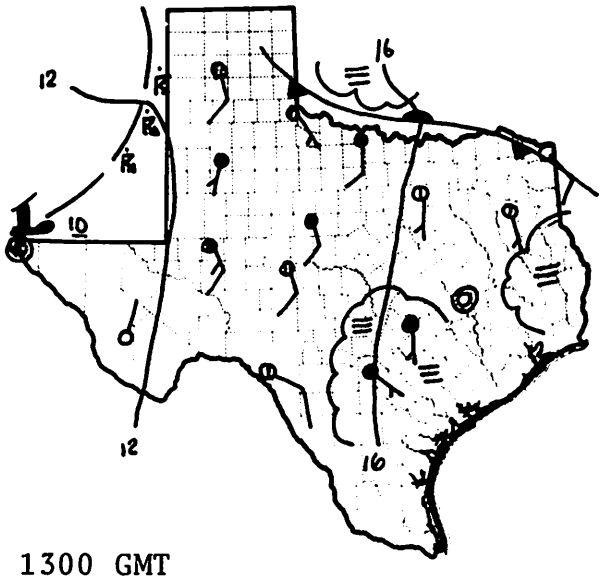
(NOTE: NSSFC ISSUED SRR TSTM WATCH #219 VALID FOR 6-11 PM CDT JUST SKIRTING THE OP AREA TO THE NORTH. THIS WOULD NOT HAVE EFFECT THE OP AREA.)

Weather Observations
18 June 1978

TIME (CDT)	
0700	SCT CI; HAZY; T = 70°F; WIND 14011
0750	BKN ST; FEW CI ABV; T = 71°F; WIND 14512; ST MVD IN RPDLY FM S
0905	SCT STRATO-CUMULUS; T = 75°F; WIND 15014
1000	CLR FEW SC ALQDS; HAZY; T = 77°F; WIND 15514G20
1100	CLR FEW CU ALQDS; FEW ACCAS N-NNE; T = 81°F; WIND 130010-20
1350	SCT CUMULUS; T = 88°F; WIND 15010
1700	SCT CUMULUS: T = 92°F; WIND 15512; CB DSNT NNW; SCT CI

FORECAST VERIFIED

Summary - 19 June 1978



1300 GMT

A WEAK WARM FRONT LIES ALONG THE RED RIVER WNW TO ERN PANHANDLE. A DRYLINE RUNS ACROSS LEE OF ROCKIES TO ELP. 500 MB RIDGING PERSISTS OVER AREA. AIRMASS STABLE (LI = +2.2) AND DRY (PW = 0.82). NO SIGNIFICANT TRIGGER EXPECTED TO EFFECT THE OPERATIONAL AREA. SURFACE FLOW SSE.

A FEW STRATUS AND STRATO CUMULUS WERE NOTED DURING THE MORNING UNDER CIRRUS, AND BY 1600 GMT CUMULUS WERE PRESENT WITH THE CIRRUS. A SCATTERED CUMULUS LAYER WAS OBSERVED AT 1655 GMT.

ONLY A FEW CUMULUS WERE OBSERVED IN THE OP AREA THROUGH THE FORECAST PERIOD: BY 0100 GMT. A CB WAS OBSERVED TO THE DISTANT WEST.

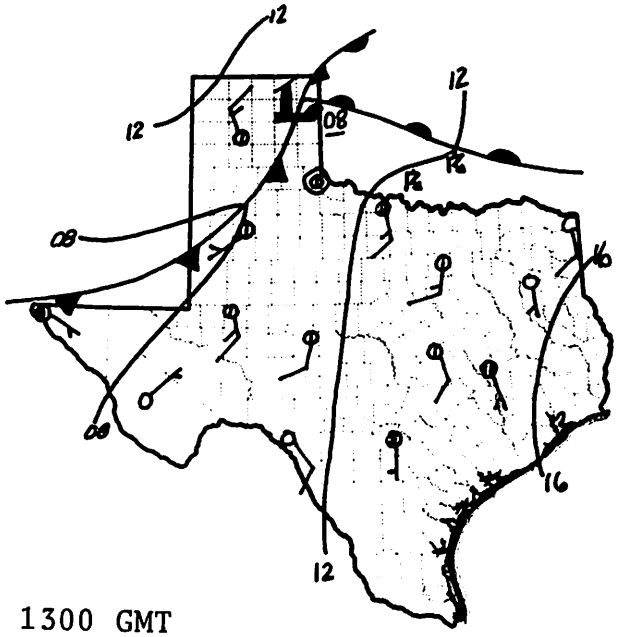
DAY CLASSIFIED A 3.

Weather Observations
19 June 1978

TIME (CDT)	
0800	SCT AC-AS; BKN CI; T = 73°F; WIND 14010-18
0900	FEW AS-AC; FEW SC W-N; T = 75°F; WIND 17514, BKN CI
0950	FEW SC ALQDS; BKN V OVC CI-CS; T = 77°F; WIND 17010
1100	FEW CU ALQDS; BKN CI-CS; T = 81°F; WIND 16012
1155	SCT CUMULUS; BKN CI; T = 85°F; WIND 14010-15
1450	FEW SML CU; SCT CI; T = 92°F; WIND 16513
1555	FEW CU; SCT CI; T = 94°F; WIND 16514-18
1655	FEW SM CU; SCT CI; T = 93°F; WIND 15015; CB NW-NNW HRZN
1950	FEW SML CU; SCT CI; CB DSNT W; WIND 16012

FORECAST VERIFIED

Summary - 20 June 1978



1300 GMT

AN ACTIVE COLD FRONT LIES FROM A LOW IN ERN PNDL TO LBB AND ELP. AIRMASS UNSTABLE (LI = -4.5) 500 MB RIDGE PROVIDES LIGHT N FLOW OVER OP AREA ALF. LFM GUIDANCE SUGGESTS STRONG WM AIR ADVECTION THROUGH OOZ AT 500 MB. WM AND DRY LL LEVELS SHOULD NOT PRODUCE LL CONVECTION.

SCATTERED ALTOCUMULUS WAS OBSERVED THROUGHOUT THE A.M. HOURS, WITH A FEW ACCAS. THE AFTERNOON WAS CLEAR WITH A FEW AC AND CU LATE AFTERNOON.

EARLY EVENING, HOWEVER, THE FRONT WAS LYING STATIONARY NEAR LAMESA, AND A TSTM BUILT OUT OF ACCAS, BASES ABOUT 11000'. MAX TOP 44000' CELL DSPTD JUST AFTER DARK.

DAY CLASSIFIED A 6.

Weather Observations
20 June 1978

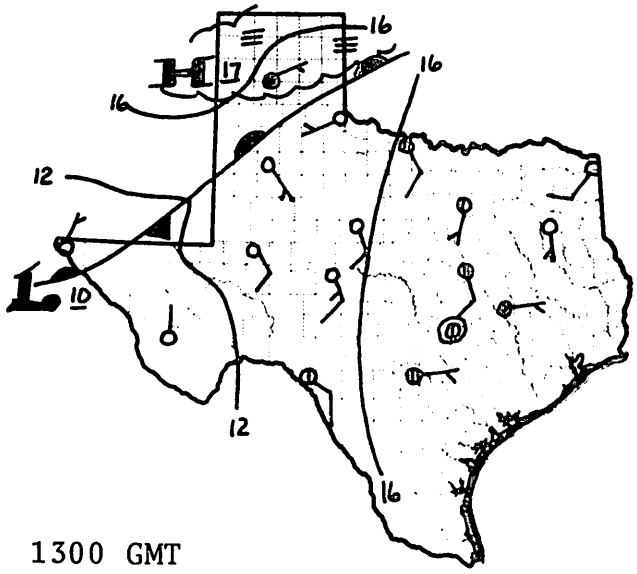
TIME (CDT)	
0800	SCT AC; TNN BKN CI; T = 75°F; WIND 17510G16
0900	SCT AC; SCT CI; T = 76°F; WIND 16514G22
0955	SCT AC; SCT CI: FEW ACCAS N; T = 81°F; WIND 18011 21
1100	SCT CI; FEW AC ALQDS; ACCAS N-NE; T = 85°F; WIND 1809G18
1400	CLR FEW SML AC E; T = 96°F; WIND 19009G16
1700	CLR FEW CU-AC ALQDS; T = 99°F; WIND 16010
1900	CLR LN CU-CU CONG W-NNW; T = 96°F
2000	CLR CB NW LTGICCG NW; TRWU NW

FORECAST BUSTED

June 20 Flight Debriefing

Time (GMT)	
	MRI Navajo headed to southend of line and observed complex with 2 to 3 turrets solid good case.
2212	1st Pass-17,900 MSL heading 150, cell located at 225/60 BGS VOR. Observed 1200 ft/min. updraft on NW side of turret 30 seconds duration of updraft. Some downdraft on SE side of turret. Tops at 25,000 ft. MSL. Tops looked solid.
2216	2nd. Pass-heading 330 at 17,900 ft. MSL, mostly downdrafts observed. Slight turbulence. Supercooled water. Probably missed updraft area.
2222	3rd Pass-17,400 ft. MSL (-5°C) heading 140 +500 ft/min. on northwest side, -1300 ft/min., downdraft on southeast. Observed supercooled water and rime icing on windshield out at 2223.50 GMT.
	4th Pass-17,000 ft. MSL heading 330, mostly downdraft supercooled water no ice crystals. Tops still solid.
2230	5th Pass-16,500 MSL updraft 1000 ft/min. on NE side. 1000 ft/min. down on SW side. Big drops observed by instruments, supercool water.
	Aztec
2227	1st Pass-at cloud base, at 1000 ft. MSL heading 120 at 230/18 MAF VOR 700 ft/min. downdraft in rain. Light rain and slight turbulence on NW side. At 2229 GMT still 700 ft/min. downdraft with heavy rain on SE side.
2231	2nd Pass-at 10,000 ft. MSL heading 330. 500 ft/min. updraft at 230/17 MAF VOR. Big drops observed on windshield.
	No seeding because cells were out of target area.

Summary - 21 June 1978



1300 GMT

A RELATIVELY UNSTABLE AIRMASS (LI = -3.1) AND RELATIVELY DRY (PW = 0.75"). A SFC FRONT LIES NRLY STATIONARY FROM CENT OK TO N OF LBB AND ELP. SFC WINDS SSE OVER OP AREA.

MORNING WAS CLR, WITH A FEW CIRRUS AND STRATUS. AFTERNOON REMAINED CLEAR, AS CONVECTIVE TEMPERATURE WAS 102°F. DURING EVENING, A LARGE (57000') TSTM DVLPD NEAR HOBBS, DSPTG QUICKLY.

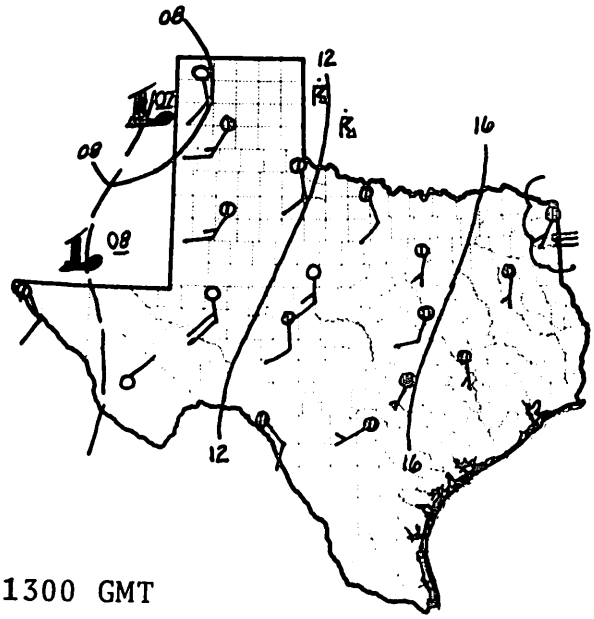
DAY CLASSIFIED A 1.

Weather Observations
21 June 1978

TIME (CDT)	
0755	CLR CI NNW; HAZY S-W-N; T = 73°F; WIND 15512-19
0855	CLR FEW SC ALQDS, INCSG; T = 75°F; WIND 15513-19
1055	CLR K H DSNT SW-NW; T = 82°F; WIND 13510-18
1155	CLR; T = 86°F; WIND 16510-18
1355	CLR; T = 90°F; WIND 17510-16
1755	CLR; T = 97°F; WIND 16014
2055	CLR; CB DSNT NW; WIND 15010

FORECAST VERIFIED

Summary - 22 June 1978



1300 GMT

VERY DRY LOW LEVELS, BUT MOIST AND COOL MID-LEVELS (500 MB) WERE PRODUCING ONLY MID-LEVEL CLOUDINESS. AC AND ACCAS WERE OBSERVED DURING THE MORNING HOURS OVER THE OPERATIONAL AREA, 850 MB FLOW SSW AND QUITE DRY. AMS QUITE STABLE (TT = 36, K = -2.5).

NO LOW LEVEL CONVECTION WAS OBSERVED THROUGHOUT THE FORECAST PERIOD, ALTHOUGH MAXIMUM TEMPERATURES WERE WELL OVER 100°F THROUGHOUT THE REGION.

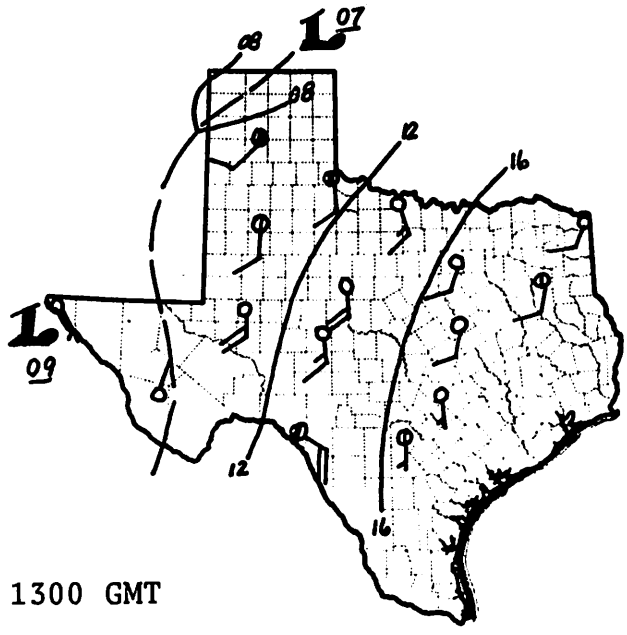
DAY CLASSIFIED A 1.

Weather Observations
22 June 1978

TIME (CDT)	
0800	CLR AC S-W-NNW; FEW CI S NE; T = 75°F; WIND 16511-20
0900	CLR AC SW-W-NW; FEW CI S; T = 76°F; WIND 18018G26
0955	SCT AC; FEW ACCAS W-NW, AC SW-N; T = 80°F; WIND 16520; FEW CI W-NW
1050	SCT CI; AC-ACCAS SW-N; T = 84°F; WIND 17516G23
1205	CLR FEW AC-ACCAS SW-NE AND NE; FEW CI W NW NE; T = 91°F; WIND 17016G24
1500	SCT AC-ACCAS; FEW CI WSW; T = 99°F; WIND 18014G21

FORECAST VERIFIED

Summary - 23 June 1978



1300 GMT

AIRMASS CHARACTERIZED BY VERY DRY LL TO 700 MB AND QUITE COOL AND MOIST CONDS AT 500 MB. AMS NOT PARTICULARLY UNSTABLE (-1.6 ON LI, 44.6 ON TT) AND DRY (0.64" PW).

ONLY A FEW ALTOCUMULUS OBSERVED OVER OP AREA DURING MORNING HOURS, WITH SSE SFC FLOW CAPPED BY SSW 850 MB FLOW, SEVERELY LIMITING LL MOISTURE ACCUMULATION. BY EARLY AFTERNOON, ONLY A FEW SML AC WERE OBSERVED IN AN OTHERWISE CLEAR SKY. BY MID-AFTERNOON SKIES WERE COMPLETELY CLEAR, AND REMAINED SO THROUGHOUT THE BALANCE OF THE FORECAST PERIOD.

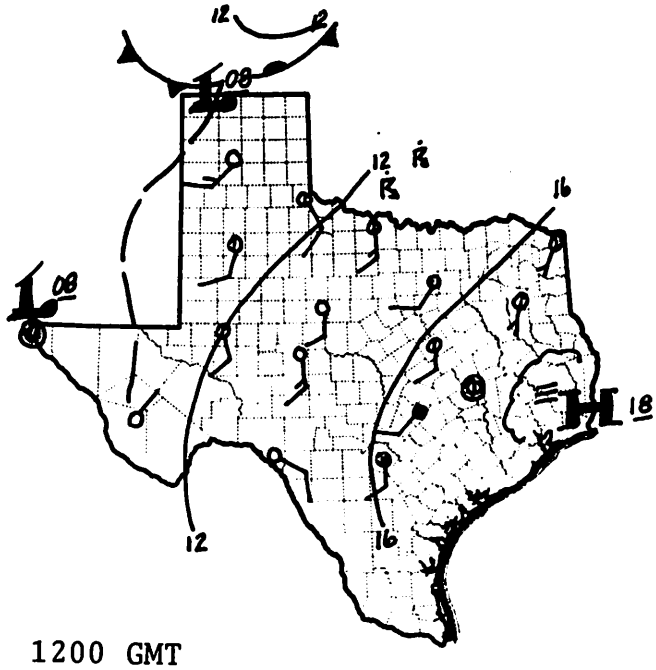
DAY CLASSIFIED A 1.

Weather Observations
23 June 1978

TIME (CDT)	
0755	CLR FEW AC W-NW; HAZY SW-N; T = 74°F; WIND 16510G18
0850	CLR AC-ACCAS W-N; T = 76°F; WIND 17016G24
0955	CLR AC W-N; T = 81°F; WIND 17512G23
1055	CLR AC WSW-N; T = 84°F; WIND 16514G22
1255	CLR FEW SML AC; T = 94°F; WIND 16514G20
1755	CLR; T = 102°F; WIND 17010

FORECAST VERIFIED

Summary - 24 June 1978



1200 GMT

DAY CHARACTERIZED BY RELATIVELY WARM, DRY, AND STABLE AMS, WITH VERY MILD 850-500 MB LAPSE RATE. A SFC FRONT DROPS THROUGH CENT KS TO A LOW N OF DNT AND BACK NW INTO COLORADO. FROM A DNT LOW A DRYLINE DROPS S OF DNT TO W OF ROW TO GDP. A SHT WV, STRONGEST AT 700 MB, LIES E OF AMA TO E OF DRT.

DURING THE A.M. HOURS SKIES WERE CLEAR, WITH THE EXCEPTION OF A FEW STRATUS, BRIEFLY GOING TO SCATTERED, AND A FEW AC-AS TO THE NW AND N, WHICH ALSO MOVED OFF QUICKLY TO THE NE WITH THE SHT WV.

SKIES REMAINED CLEAR THROUGHOUT THE FORECASE PERIOD, WITH ONLY A FEW CIRRUS FROM DSPTG TSTMS IN SE N. MX. APPEARING TO THE NW JUST BEFORE DARK.

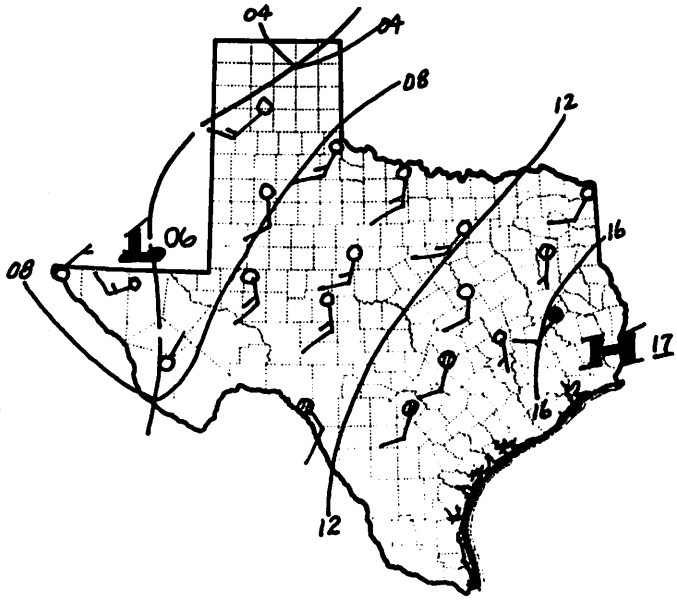
DAY CLASSIFIED AS 1.

Weather Observations
24 June 1978

TIME (CDT)	
0700	CLR ST BNK S HZN; AC-AS BNK WNW-N; T = 72°F; WIND 17510 HAZY S-W-N
0800	SCT ST; AC BNK DSNT NW-N; T = 72°F; WIND 17010-16
0900	SCT SC; AC BNK DSNT NW-N; T = 74°F; WIND 18512-20
0950	CLR SC ALQDS; T = 81°F; WIND 19513G24
1100	CLR; T = 85°F; WIND 19513G21
1255	CLR; T = 91°F; WIND 18514G20
1550	CLR; T = 100°F; WIND 18512G19
1855	CLR FEW CI WNW HRZN; T = 97°F; WIND 19010G16

FORECAST VERIFIED

Summary - 25 June 1978



1300 GMT

MODERATELY UNSTABLE, BUT QUITE DRY, SOUNDING OVER OP AREA DENOTED BY MORNING MIDLAND SOUNDING. A DRYLINE LIES FROM SW KS TO S OF DALHART TO S OF TCC TO ROW GDP. HOWEVER, ONLY A SLIGHT MID-LEVEL SHT. WV. IN CENTRAL NEW MEXICO WILL PROVIDE SUPPORTING DYNAMICS. CONDITIONS 850-700 MB DRY, ALTHOUGH THERE EXISTS MORE MOISTURE MID-LEVEL AT AMA. TSTMS EXPTD TO DEVELOP E CENT. N. MX. BY 0000 GMT AND MISS OP AREA TO NW.

SKIES WERE CLEAR THROUGHOUT FORECAST PERIOD, WITH MODERATE SSE SFC WINDS. BY 2300 GMT, HOWEVER,A FEW CBS BEGAN DEVELOPING IN ERN N. MX. TO NEAR MULESHOE. BY 0100 GMT ACTIVITY DEVELOPED TO A SCATTERED LINE, BUT WITH ONLY MDT PCPN, FROM NW OF BROWNFIELD TO NEAR LITTLEFIELD, MVG NE. ACTIVITY DSPTD SHORTLY THEREAFTER, AND DID NOT THREATEN THE OP AREA.

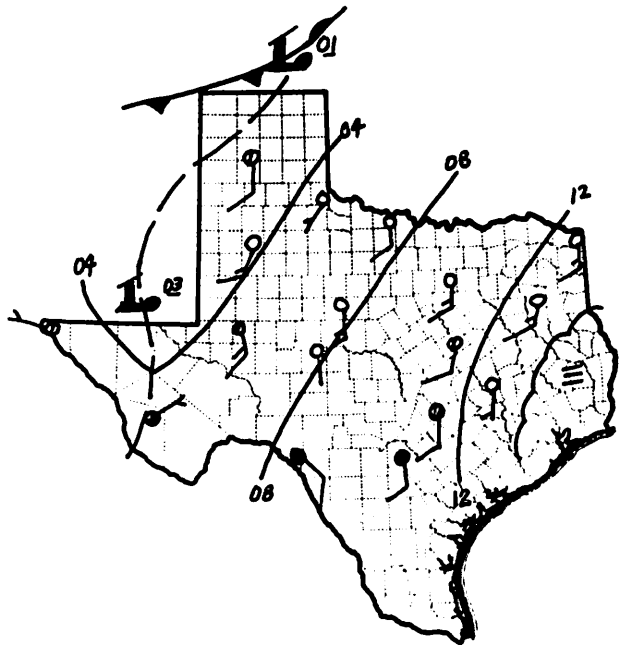
DAY CLASSIFIED A 1.

Weather Observations
25 June 1978

TIME (CDT)	
0750	CLR; T = 75°F; WIND 16017; FEW ST S NE-E
0905	CLR; T = 78°F; WIND 17015G23
0950	CLR; T = 81°F; WIND 18518
1050	CLR; T = 85°F; WIND 17510-18
1455	CLR; T = 97°F; WIND 16512
1850	CLR FEW CB DSNT NW-N AND SW; FEW CI

FORECAST VERIFIED

Summary - 26 June 1978



1200 GMT

A SURFACE FRONT LIES STATIONARY FROM SE KANSAS TO N OF AMARILLO, BEING WARM TO A LOW W OF CARLSBAD. A WELL-DEFINED DRYLINE LIES AHEAD OF FRONT EAST OF GDP AND MRF. LACK OF SIGNIFICANT LOW LEVEL MOISTURE WILL PRODUCE QUITE HIGH CLOUD BASES WITH CONVECTION TEMP OF 105°F. ACTIVITY EXPECTED TO DEVELOP IN ERN N. MX. TO NW OF OP AREA, BUT NOT MOVE INTO OP AREA.

NO LOW LEVEL CUMULUS OBSERVED THROUGHOUT FORECAST PERIOD, WITH EXCEPTION OF ONE OR TWO SML PUFFS LATE AFTERNOON. BY 0000 GMT HOWEVER, A LARGE LINE OF CBS DEVELOPED BETWEEN HOBBS AND MULESHOE BY 0010 GMT MAX TOPS REACHED 60000', BUT ONLY MODERATE PCPN WAS OBSERVED. ACTIVITY DISSIPATED BEFORE ENTERING OP AREA.

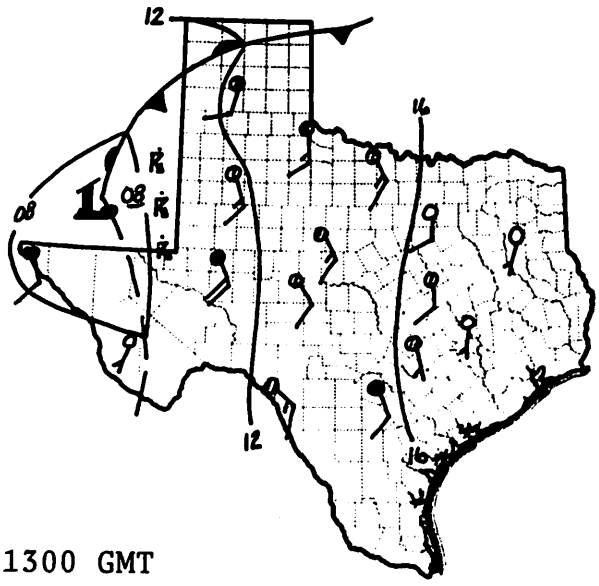
DAY CLASSIFIED A 1.

Weather Observations
26 June 1978

TIME (CDT)	
0750	CLR AC W-N; T = 74°F; WIND 17016 22
0900	SCT CI; FEW AC NW-N; T = 77°F; WIND 17516G24
0950	CLR FEW AC NW; CI S-W; T = 81°F; WIND 16511G22
1055	CLR FEW CI SW-NW; T = 84°F; WIND 16008-16; HAZY SW-N
1155	CLR FEW CI ALQDS; HAZY; T = 89°F; WIND 17010-18
1255	SCT CI; T = 92°F; WIND 17010-16
1355	SCT CI; T = 95°F; WIND 15010
1600	CLR CI-CS DSNT S-SW-W AND SE; T = 98°F; WIND 16510-16
1800	CLR FEW CI-CS DSNT W-NW; T = 96°F; WIND 15014
2000	SCT CI-CS; LN DB DSNT W-NW-N; T = 92°F; WIND 17016

FORECAST VERIFIED

Summary - 27 June 1978



1300 GMT

SOUNDING RELATIVELY DRY ABOVE 700 MB AT 1200 GMT , WITH CONSIDERABLE MOISTURE BENEATH 700 MB SUBSIDENCE INVERSION. WINDS LIGHT THROUGHOUT SOUNDING. A SURFACE FRONT LIES STATIONARY IN EASTERN NEW MEXICO. ACTIVITY IS EXPECTED TO DEVELOP IN ERN N. MX. TO W OF LBB. HOWEVER, 700 MB INVERSION WILL CAP EXPECTED CUMULUS OVER OP AREA.

SCT CUMULUS OCCURRED THROUGHOUT FORECASE PERIOD WITH SE SFC FLOW. CIRRUS WAS THIN BROKEN ABOVE BY LATE AFTERNOON, NUMEROUS THUNDERSTORMS DEVELOPED IN SE N. MX. AND PNHDL TX. ACTIVITY NEVER ENTERED OP AREA.

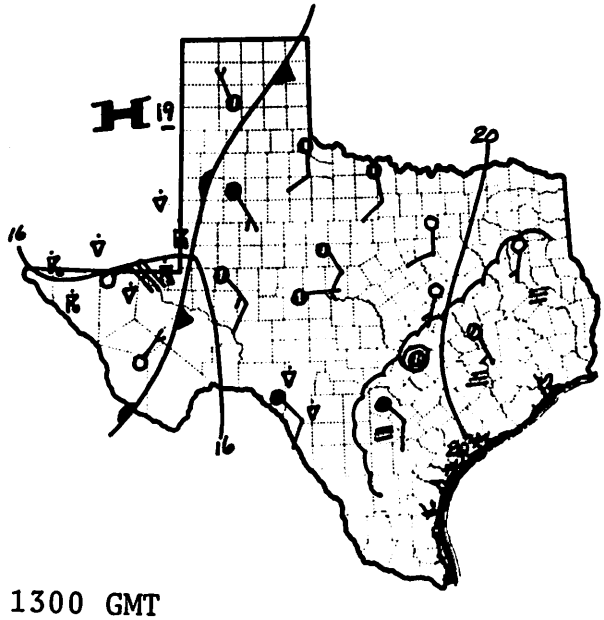
DAY CLASSIFIED A 3.

Weather Observations
27 June 1978

TIME (CDT)	
0655	SCT CI; FEW SC N-E; T = 72°F; WIND 15516; HAZY S-W-N
0750	SCT ST; SCT CI, CS DSNT SW-W; T = 73°F; WIND 14513G26
0850	SCT SC; THN BKN CI; T = 74°F; WIND 15515G26
0950	SCT SC; THN OVC CI; T = 78°F; WIND 16515G24
1200	SCT SC-CU; THN BKN CI; HAZY S-W-N; T = 85°F; WIND 15010G24
1300	SCT CUMULUS; THN SCT CI; T = 88°F; WIND 14012-18
1450	SCT CUMULUS; MDT CU ALQDS; THN BKN CI; T = 92°F; WIND 11010G22
1555	SCT CUMULUS; BKN THN CI; T = 93°F; WIND 14515G25
1655	SCT CUMULUS, THN BKN CIRRUS; T = 94°F; WIND 13510-20

FORECAST VERIFIED

Summary - 28 June 1978



1300 GMT

AMS MDTLY UNSTBL OVER OP AREA, WITH SFC FRONT LYING STATIONARY WEST OF OP AREA. EFFECT OF FRONT NOT ANTICIPATED TO TRIGGER CONVECTION OVER OP AREA, BUT APPROXIMATELY 10-12K' OF CLOUD DEPTH AND RW - EXPTD DURING EARLY EVENING DUE AMS CONVECTION.

STRATUS AND A FEW CBS OBSERVED DSNT NW-N EARLY AM, BUT DSPTD BY MID-MORNING. WINDS REMAINED SE THROUGHOUT FCST PERIOD OVER OP AREA. SCATTERED CUMULUS AND CU CONGESTUS OBSERVED THROUGHOUT AFTERNOON, WITH NMRS CBS TO DISTANT W-NW. A LINE OF CBS MOVED AS CLOSE AS SEMINOLE BY 2300 GMT, AND A FEW RW - DEVELOPED IN OPERATIONAL AREA BY 2300 GMT, DSPTG BY 0330 GMT.

DAY CLASSIFIED A 5.

Weather Observations
28 June 1978

TIME (CDT)	
0650	FEW ST; LN CB DSNT NW-N; BKN CS; T = 73°F; WIND 14010
0750	SCT AC-ACCAS; BKN CI-CS; CB DSNT SW AND NW; T = 76°F; WIND 15010
0950	THN BKN CI; CS BNK SW-N; FEW ST ALQDS; ST BNK S-SW; T = 80°F; WIND 15010-18
1100	THN BKN CI; FEW SC ALQDS; CS BNK SW-N; FEW CU CONG NW; T = 83°F; WIND 15012-18
1450	BKN CU: CIRRUS ABV; CU CONG ALQDS; T = 90°F; WIND 14508
1555	SCT CUMULUS; SCTV BKN; FEW CU CONG ALQDS; T = 92°F; WIND 14010-17
1655	SCT CU; CU CONG ALQDS; LN CB DSNT SW-W-NW; T = 92°F; WIND 14009G16
1755	SCT CU; TCU-CU CONG ALQDS; RWU E-SE-S, MVG N; T = 92°F; WIND 13010G17

FORECAST VERIFIED

TEXAS HIPLEX 1978 AIRCRAFT DATA

DATE 6 / 28 / 78 FLT. # 1 MISSION NO. _____

A/C CREW A. Roberts, E. Lohel, R. Hospelhorn

TAKE-OFF TIME (CDT) 1450 LAND TIME (CDT) 1815

ADVISED POSITION over the gage network

TEMP PROFILE (1000 Ft.)

	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
ASDG	28	24	22	18	16	12	10	8										
DSDG			24	22	19	16	13	10	8	6								

TIME TO -5°C (Min) _____ TIME TO -10°C (Min) _____

TIME TO ADVISED POSITION: _____ (Min)

MISSION DATA

~~TURRET~~ #	PENT TIME (CDT)	GM AgI	ALT (Ft)	AMB TEMP (°C)	ACFT HDG	TURRET LOC (VOR/DME)	CLD PENT SPD (kts)	CRUISE SPEED (kts)	AgI DROP INT (sec)	UPD (Ft/min)	TURB
152008		25 DME			090	/		130			
152930	102/45	1st turn 260				/		140			
155741	243/35	2nd turn 080				/		140			
161850	going up to 12k ft.					/					
162848	087/43	3rd turn 260				/		140			
165600	264/32	4th turn 080				/		140			
172500	065/46	5th turn 260				/		140			
175310	282/35	6th turn 080				/					
180300	stopped mapping, going south					/					
						/					
						/					
						/					
						/					
						/					
						/					
						/					

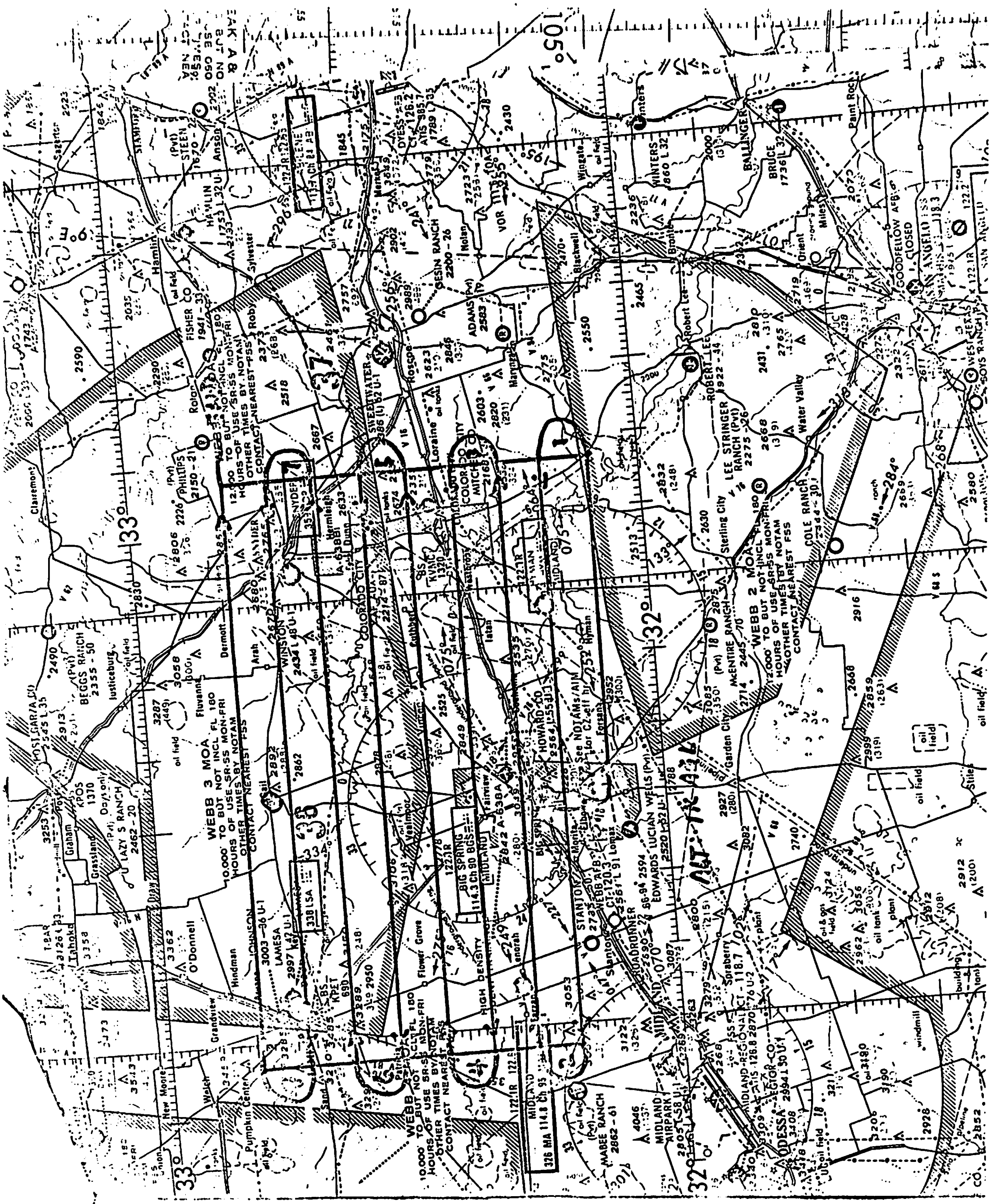
AIRCRAFT CLOUD AND WEATHER OBSERVATIONS

TEXAS HIPLEX 1978

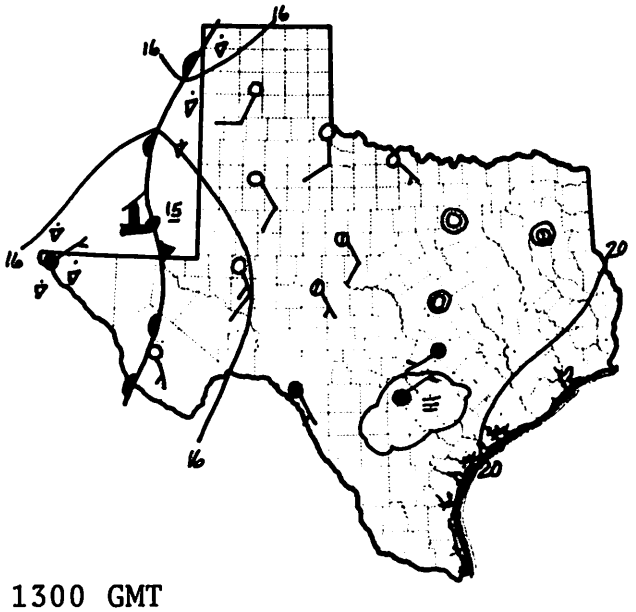
DATE 6-28-78 MISSION NO. _____ AIRCRAFT TYPE MRI Navajo

TIME (CDT)	OBSERVED PHENOMENA
	Mapped the meso-network area at 10000 ft. Noticed that the cloud
	bases, originally at 8.4k ft., +11 ^{o}C, went up to 9.4k ft. +9^{o}C.
	Went up and continued the mission at 12.0k ft. The clouds were
	generally 2 km in diameter, less than .2 gm/m^{3} of cloud matter.
	The depth was from 2000 to 10000 ft. Out of all the sampled
	clouds only had had 500 ft/min updraft. No precipitation
	was observed.

OBSERVER Elena Lobel


WEBB 3 MOA
WEBB 2 MOA
BIG SPRING
MIDLAND
SWEETWATER
COLORADO CITY
LAMESA
ODESSA
STANTON
SNYDER
ROBERT LEE
BALLINGER
WINTERS
GOODFELLOW AFB
HIGH DENSITY

Summary - 29 June 1978



1300 GMT

AIRMASS MDTLY MOIST TO 500 MB AND SOMEWHAT UNSTBL (LI = -1.6). A SFC FNT LIES STATIONARY FM ERN COLORADO TO ERN N. MX. AND E OF MRF. CONSIDERABLE CONVECTIVE RW & TRW ACTIVITY OCCURRING OVER AREA STRADDLING FRONT. SE FLOW SFC - 500 MB.

SCT CUMULUS AT NOON. CU CONGESTUS OCCURRED BY 1800 GMT AND A LINE OF CB DVLPD SHTLY AFTERWD TO DSNT SW-W-NW, MVMT NNE. BY LATE AFTERNOON THIS ACTIVITY THREATENED NW OPERATIONAL AREA. ALSO, SEVERAL ISLTD RW OCCURRED OVER OP AREA. LN CB DID NOT ENTER OP AREA.

DAY CLASSIFIED A 6.

Weather Observations
29 June 1978

TIME (CDT)	
0650	SCT AC-AS; SCT CIRRUS; T = 72°F; WIND 15010
0750	SCT AC; FEW CI; T = 71°F; WIND 15012
0855	SCT AC, FEW CI; LN CB BLDG DSNT SW-WSW; T = 75°F; WIND 16010-18
0950	SCT AC-AS, CS BNK SW-NW; LN CB DSNT SW-WSW AND DSNT W; T = 80°F; WIND 16514G20
1255	SCT CUMULUS; LN CB DSNT SW-WONW; FEW CU CONG NW; T = 90°F; WIND 17010G16
1350	SCT CUMULUS; CU CONG ALQDS; LN CB DSNT SSW-SW-W-NW; T = 92°F; WIND 16010-16
1500	SCT CU; FEW CU CONG NW-NE; LN CB DSNT SW-NW; T = 92°F; WIND 13014
1600	SCT CU; TCU ALQDS; CB DSNT SW-W; LN CB WNW-NW MVG E; T = 93°F; WIND 18010-16
1650	SCT CUMULUS; TCU ALQDS; ISLD SML RW NE-SE; LN CB SW-W-NW; T = 93°F; WIND 15016G22

FORECAST VERIFIED

MRI Navajo

TEXAS HIPLEX 1978 AIRCRAFT DATA

DATE 6/ 29 78 FLT. # 1 MISSION NO. _____

A/C CREW A. Roberts, E. Lobel, R. Hospelhorn

TAKE-OFF TIME (CDT) 1605 LAND TIME (CDT) 1815

ADVISED POSITION E1

TEMP PROFILE (1000 Ft.)

	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
ASDG		26.3	24.8	20.7	17.7	14.7	11.6	9.3	6.8	4.7	1.9	0	-1.4	-3.0	-4.7	-5.5		
DSDG		26.2	23.0	20.0	17.1	14.3	11.2	8.5	3.3	3.3	2.2	-.1	-1.7	-2.9	16.5 -4.5			

Did not go directly.

TIME TO -5°C (Min) 45 TIME TO -10°C (Min) _____

TIME TO ADVISED POSITION: _____ (Min)

MISSION DATA

Pass Complex	TURRET #	PENT TIME (CDT)	GM AgI	ALT (Ft)	AMB TEMP (°C)	ACFT HDG	TURRET LOC (VOR/DME)	CLD PENT SPD (kts)	CRUISE SPEED (kts)	AgI DROP INT (sec)	UPD (Ft/min)	TURB
1	171225	in		17.9	-5.5	150	225 / 60	130			+1200 171248	
	171307	out					/		supercooled			
2	171600	in			-6.8	330	/	125	water			
	171720	northern cell					/				-1000 on S	side
	171758	out					/		supercooled			
3	172238	in		17.4	-5	140	/	130	water		+500 -1300	lumpy
	172350	Out					/				+800	
4	172738	in		17.0	-5.4	330	/	115			-1000 SE side thruout	
	172831	out					/		raining			
5	173054	in		16.5		120	/		drops on the side		+1000 40 sec	
	173153	out					/				-1000 W side	
	173507	in		16.4		010	/	125	good lwc		+500 on N	
	173536	out					/					
	180000	started an intercomparison with the Aztec										
							/					
							/					

AIRCRAFT CLOUD AND WEATHER OBSERVATIONS

TEXAS HIPLEX 1978

DATE 6-29-78 MISSION NO. 7 AIRCRAFT TYPE MRI

TIME (CDT)	OBSERVED PHENOMENA
	The system we went to work was well on its way, large ice anvil
	and heavy showers (it looked that way from where we were).
	Went south underneath the anvil. Everything was well iced out.
	Found a small complex north of Odessa, made 5 passes thru it.
	It was a vigorous still growing complex with mostly supercooled
	water. Updrafts up to 1200 ft/min. on the north side and down-
	drafts up to 1300 ft/min. on the SE side. That is a good study
	of a natural cloud in its early development stages.
	Did an intercomparison with the Aztec on the way back.

OBSERVER Lobel

TEXAS HIPLEX 1978 AIRCRAFT DATA

DATE 6 / 29 / 78 FLT. # _____ MISSION NO. _____

A/C CREW Alan, Bruce, Mr. Potter

TAKE-OFF TIME (CDT) 1605 LAND TIME (CDT) 1715

ADVISED POSITION Northwest Section E1, E3

TEMP PROFILE (1000 Ft.)

Time G		3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1605 34	ASDG	31	29	25				15						2	0	- 1	- 5	- 6		- 9
1703 30	DSDG	27		25	20	17	14	12	10	8	6	4	1	0	- 2	- 3		- 5		

CLEAR AIR DSDG

TIME TO -5°C (Min) 1635 TIME TO -10°C (Min) 1643

TIME TO ADVISED POSITION: 1630 (Min)

MISSION DATA

TURRET #	PENT TIME (CDT)	GM AgI	ALT (Ft)	AMB TEMP (°C)	ACFT HDG	TURRET LOC (VOR/DME)	CLD PENT SPD (kts)	CRUISE SPEED (kts)	AgI DROP INT (sec)	UPD (Ft/min)	TURB
1	1646		21K	-12	290	330 / 54	160			?	S
						/					
						/					
						/					
						/					
						/					
						/					
						/					
						/					
						/					
						/					
						/					
						/					
						/					
						/					
						/					

AIRCRAFT CLOUD AND WEATHER OBSERVATIONS

TEXAS HIPLEX 1978

DATE 6-29-78 MISSION NO. _____ AIRCRAFT TYPE P-Navajo

TIME (CDT)	OBSERVED PHENOMENA
1605	Small Cu to WSW. Cu Hu mixed with Cu Con from a line from
	West to East extending to the North. Cirrus all along West
	Horizon.
1620	Rain (Suspected Verga) 210/6.8 just outside Big Spring.
1625	Small Cu now predominate in Northern area.
1630	Bases of Cu (10.5K). Some Cu Con heading 030, 000/12.7.
1640	Entered area beneath cirrus 320/26,4.
1646	Cloud entered hard fuzzy sides; sharp distant top.
	Inside of cloud contained ice and slight turbulence.
1715	Small Cu over Big Spring, some Cu Med.
	Hot left engine force early RTB.

OBSERVER Bruce

AIRCRAFT CLOUD AND WEATHER OBSERVATIONS

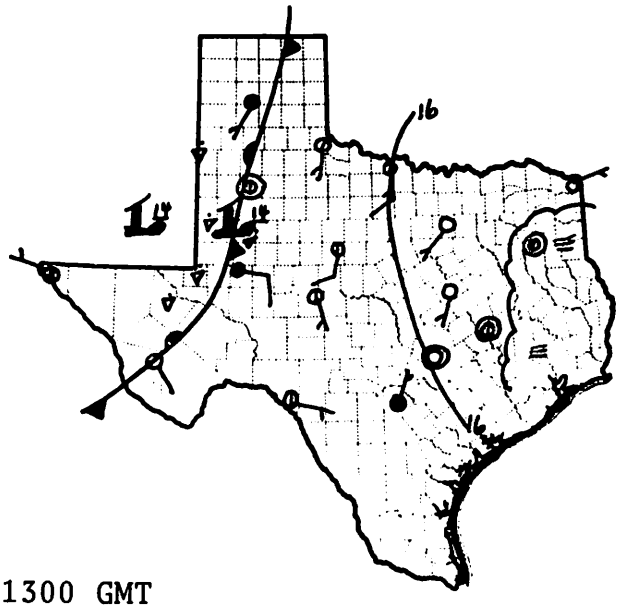
TEXAS HIPLEX 1978

DATE 6-29-78 MISSION NO. _____ AIRCRAFT TYPE PA-23 Aztec

TIME (CDT)	OBSERVED PHENOMENA
1609	2167.9 Cumulus humlis 30%. Dark NW.
1635	Cloud Bases 11,000.
	Hdg 210 to SW portion of line looking for new development.
1727	At 10,000 ft., downdraft heading 120. 230/18 MAF VOR. Light
	rain, slight turbulence. 700 downdraft in rain on NW side.
1729	700 downdraft. Heavy rain on SE side.
1731	Heading 330. 500 updraft 230/17 into light rain. Big drops.

OBSERVER Riggio

Summary - 30 June 1978



1300 GMT

A STATIONARY FRONT LIES FROM WESTERN KANSAS TO THE TEXAS PANHANDLE TO A LOW NEAR MAF TO E OF MRF. AIRMASS IS VERY MOIST (PW = 1.46 IN) AND MODERATELY UNSTABLE (LI = -1.6, K = 38). WIDESPREAD PRECIPITATION, BUT NONE SEVERE, IS ANTICIPATED.

ALTO CUMULUS CASTILLANUS OBSERVED DURING A.M. HOURS, WITH ESE SFC FLOW. BY LATE MORNING DEEP CONVECTION HAD BEGUN, WITH A LINE OF TCU/RU FORMING OVER OP AREA. ACTIVITY CONTINUED THROUGHOUT FORECAST PERIOD. DURING THE EARLY EVENING, A MODERATELY HEAVY THUNDERSTORM PASSED OVER THE STATION. FRONTAL PASSAGE LATE AFTERNOON DROPPED TEMP FROM 90 TO 82°F.

DAY CLASSIFIED A 6.

Weather Observations
30 June 1978

TIME (CDT)	
0750	SCT AS; SCT CI; ACCAS W-NW; T = 76°F; WIND 07003
0850	BKN AC-AS; BKN CIRRUS; ACCAS W-NW; T = 80°F; WIND 11010
1050	SCT CU; ⓓ AC-AS; ⓓ CI; TCU NE-E; T = 83°F; WIND 16510
1150	FEW CU; ⓓ AC-AS; CI ABV; LN TCU - RWU NW-NE-E; T = 83°F; WIND 17012G20
1350	SCT CU; SCT AC; SCT V BKN CI-CS; TCU-TWU-CB ALQDS; T = 87°F; WIND 17008-14
1455	ⓓ CU; ⓓ AC; ⊕ CS; TCU-CB RWU ALQDS; T = 89°F; WIND 15014 RW-AT STN
1550	BKN CUMULUS; BKN AC-AS; ⊕ CS; BINOVC; TCU - CB ALQDS; RWU NE NW; T = 86°F; WIND 24011; WSHFTD GRDLY
1650	SCT CU; ⓓ AC; ⊕ CS, BINOVC TCU CB RWU NE-SE; CB SW; T = 82°F; WIND 32012
1755	ⓓ CU; ⊕ CS; LN TCU-CB RWU S-NE; CB SSW MVG NNE; T = 82°F

FORECAST VERIFIED

TEXAS HIPLEX 1978 AIRCRAFT DATA

DATE 6 / 30 / 78 FLT. # 1 MISSION NO. 7

A/C CREW A Roberts, E. Lobel, R. Hospelhorn

TAKE-OFF TIME (CDT) 1205 LAND TIME (CDT) 1440

ADVISED POSITION E

TEMP PROFILE (1000 Ft.)

	3.1	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
ASDG	24.8	22.1	21	16.4	13.5	11.3	9.3	IC 8.6	6.2	4.4	1.6	-.2	-1.3	IC -2.2	-3.6			
DSDG																		

TIME TO -5°C (Min) _____ TIME TO -10°C (Min) _____

TIME TO ADVISED POSITION: _____ (Min)

MISSION DATA

TURRET #	PENT TIME (CDT)	GM AgI	ALT (Ft)	AMB TEMP (°C)	ACFT HDG	TURRET LOC (VOR/DME)	CLD PENT SPD (kts)	CRUISE SPEED (kts)	AgI DROP INT (sec)	UPD (Ft/min)	TURB
						/					
						/					
						/					
						/					
						/					
						/					
						/					
						/					
						/					
						/					
						/					
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						/					
						/					
						/					

MRI

HIPLEX NAVAJO LOG-1977

Date 6-30-78 Page No. 1

Site BGS Observer ESL

Tape No. 817

Take Off Time 1205 Land Time 1440

BMS Time _____ =Aircraft Time _____

Aircraft Time _____ =Radar Time _____

Altitude (29.92) = Initial _____ / Final _____

Time	Event #	Altitude (kft)	Temp (oC)	Cloud #	Pass#	Type of Pass	Comments (VOR, DME, HDG, Cl. Base HT., Foil)
		6.3	16				bases
							good lwc in all these clouds
124713		17.4	-5.3	1	1	IC	090/12, rain water drops
124940		17.2	-3.6	+1	2	IC	330 hdg. rain event 1 cloud
							light turb event 2 precip
12 5009		second	cell				
12 5047		out					
12 5358		17.1	-3.6				150 hdg. small drops precip
12 5400		out					
		16.7	-3.6				103/40 120 330 hdg.
							water + ice crystals
130423							-1000 20 sec. 023/29
		16.4					slight updraft

(continued next page)

MRI

HIPLEX NAVAJO-1977

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Observer ESL

Tape No. 017

	Time	Event #	Altitude (kft)	Temp (°C)	Cloud #	Pass #	Type of Pass	Comments (VOR, DME, HDG, Cl. Base Ht., Foil)
13	0510		out					
			16.5					360 hdg. N of premises
13	0533		out					-500
13	0756		16.5	-3.6				180 hdg., 120, small supercooled water
								008/44
13	0932							2D, TR + Lx not operating
	08		16.3	-3.1				180
13	2638		16	-2.4				pict 24 of big ice cloud 100 hdg.
13	3400		16	-2.3	2	1		350/20 160 hdg., water precip.
1	133420							+500, +800 large drops
								+1000
13	3435							+1800 +2000
13	3442		16.7					still +2000
	133500		out	of cloud				360/17 -4.7
13	3720		16.4	-4.1	2	2		340 hdg., 115
								precip. event 3 mostly water
								some ice crystals, large drops
13	3804							+1000 event 2

MRI

HIPLEX NAVAJO-1977

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Observer ESL

Tape No. 817

	Time	Event #	Altitude (kft)	Temp (°C)	Cloud #	Pass #	Type of Pass	Comments (VOR, DME, HDG, Cl. Base Ht., Foil)
13	3812							+1800 to the end
13	3834	17.2 out of cloud						300 hdg
13	4030		16.8		2	3		not sure same cloud
								130 hdg precip.
								downdraft on west side, heavy
				-3.7				precip. more than .5 gm water
13	4139							+1000
			17.2					360/20, 115, 110 hdg
13	4227	out of cloud						
			17	-5.3				210 hdg diff turret in the same
								+700, light rain 20 sec
								-1000 S side 10 sec. more precip
13	4507							no vertical water
								precip on S side
13	4634							pict 25 & 26 _____ window
								clouds we've been sampling
13	4910		16.5	-3.6				360 hdg, light precip.
13	4940							heavy precip

MRI

HIPLEX NAVAJO-1977

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Observer ESL

Tape No. 817

	Time	Event #	Altitude (kft)	Temp (°C)	Cloud #	Pass #	Type of Pass	Comments (VOR, DME, HDG, Cl. Base Ht., Foil)
13	5000			-2.9				+1000 no precip
13	5027		16.6	-4			another cell	downdraft -1000 on S side
								+1000 no precip
13	5150		16.4					change heading, new cell
								some up, precip large drops
13	5250							+1800, +2000 358/25
13	5314							+2500 355/25
			17.1	-5				precip changed the ice part 360 hdg
								-1000, ice mixed with supercooled
								water on the N end of line
		turn to south						355/34, lightning 16.8Kfeet
								event on for the last minute
13	5654	hdg. 180						16.5k ft.
13	5823							354/28 downdraft
			16.4	-3.4				+500, precip water again, graupel
14	0157							+1000 170 hdg 359/21
								+1500, 1800
			18.0	-6.4				+1000

MRI MISSION 7

HIPLEX NAVAJO-1978

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Observer ESL

Tape No. 817

	Time	Event #	Altitude (kft)	Temp (°C)	Cloud #	Pass #	Type of Pass	Comments (VOR, DME, HDG, Cl. Base Ht., Foil)
14	0410		out					360/15 45k ft tops
14	0503							150 hdg light precip
14	0533			-5.8				+1000
14	0557							-100 some downdraft
14	0714		out of cloud					
14	0914		16.4	-3.8				360 hdg
14	1157							+1000 graupel, heavy
								-1000?
14	1245							turning out
14	1600		16.6	-3.1				new turret 115 W of line
14	1636							-700 355/14
14	1711							+1000
			16	-2.7				downdraft
14	2009		out of cloud					
	1345		____	the target, lots of wind, lightning, raining heavy				
	1353		start	seeding				9 flares 45 sec intervals
				500 to 1500 ft/min updrafts 330, 360 hdg				
	1400		stopped seeding, 1 mile away from the rain					

ztec briefing notes

sampling in the rain

1430 stopped sampling

Aztec

TEXAS HIPLEX 1978 AIRCRAFT DATA

DATE 6 / 30 / 78 FLT. # 1 MISSION NO. 7

A/C CREW Chuck, Bruce

TAKE-OFF TIME (CDT) 12:00 LAND TIME (CDT) 14:25

ADVISED POSITION West and South of Big Spring: E-2

TEMP PROFILE (1000 Ft.)

	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
ASDG	25	21	19	15	13													
DSDG																		

12:07

TIME TO -5°C (Min) _____ TIME TO -10°C (Min) _____

TIME TO ADVISED POSITION: _____ (Min)

MISSION DATA

TURRET # / Rain Shaft	PENT TIME (CDT)	GM AgI	ALT (Ft)	AMB TEMP (°C)	ACFT HDG	TURRET LOC (VOR/DME)	CLD PENT SPD (kts)	Time In Rain Shaft CRUISE SPEED (kts)	AgI DROP INT (sec)	Down D UPD (Ft/min)	TURB
1	1241		6.8	16	030	045/ 17		10 sec	L	?	
2	1243		6.8	15	330	035/ 18		15	L	.6	
3	1245		5.5	13	210	025/ 17		30	L	.5	
4	1247		5.2	15	190	030/ 15		60	M	.6	
5	1255		7.2	10	340	090/ 12		15	L	?	
6	1257		7.0	12	360	050/ 14		10	L	.3	
7	1300		6.7	13	040	040/ 18		15	L	?	
8	1302		6.5	13	020	030/ 23		4	M	.8	
9	1309		6.4	11	360	030/ 26		120	L	?	
10	1313		6.5	12	260	010/ 25		30 sec	H	?	
1	1353	2.0	7.7	10	330	360/ 19		120	45sec	.5	
					340	360/ 20				1.0	
			7.9		360	360/ 25				1.3	
					350	360/ 26				1.5	
			8.0		330	360/ 28				.5	
Final Flare	1359	20	7.9	13	340	360/ 30		120	45 sec	1	

9 Flares Fired Over 6 min. Interval

ACTUAL SEEDING DATA Precipitation Data

AIRCRAFT CLOUD AND WEATHER OBSERVATIONS

TEXAS HIPLEX 1978

DATE June 30, 78 MISSION NO. 7 AIRCRAFT TYPE Aztec

TIME (CDT)	OBSERVED PHENOMENA
1210	010/6 Cu Con and Med mixed in area
1215	Cloud bases at 7k
1220	Cu Med tilting at 090/21
	Many Cu building straight and hard
1225	MRI Navajo penetrated cloud w/poorly defined base at 065/28
1237	Light rain 030/20; TRW to North
1240	Temp 16°C at 6.8k 030/17
1241	Heavy rain 045/17
1251	Temp 12°C 060/10 at 7k
1315	Dark rain showers, scud clouds 020/25
1346	Cloud to Ground lightning
1348	Scud clouds under same system 355/22
1350	Updrafts .5 - .7k
1400	Rain shafts 12-15 miles long. Smooth bases extending 2 miles
	West of line of showers

OBSERVER Bruce

June 30, 1978 Debriefing Notes

Mission No. 7-C

Take Off: 1700 GMT
Seed Mode: Cloud Base
Amount: 180 gms (AgI)
Rate : 1 (20 gm flare) per 45 seconds
Seed Time: 1853 GMT to 1859 GMT
Cloud Type: Complex
Cloud Location: 360/19 to 360/30 BGS VOR
Mission Aircraft: Cloud Physics (MRI) and Aztec
Land Time: 1940 GMT

MRI

1st Pass at 1834.20

Observation taken at 16,700 ft. MSL (-4.7°C) heading 160. Cell located at 316/17 BGS VOR. Observed 500 ft/min. at entry increased to 2000 ft/min. up through out the width of cloud. Exited at 316/17 BGS VOR.

2nd Pass at 1837.20 GMT

Observation taken at 16,400 ft. MSL (-4.1°C) heading 340. Mostly liquid water with some ice crystals. Observed 1000 ft/min. updraft at 1838.04 GMT then increased to 1800 ft/min. updraft at 1838.12 GMT. Exited at 17,200 ft. MSL heading 300.

3rd Pass at 1840.30 GMT

The crew was not sure if this pass was through the same cell due to the large number turrets in the area. Observations were taken at 16,800 ft. MSL heading 130. Good precipitation was recorded in downdraft on west side of cell. At 1341.39 GMT 1000 ft/min. updraft was recorded with good liquid water. Aircraft was at 17,200 ft. MSL heading 110.

4th Pass at 1841.39 GMT

Observation was taken at 17,200 ft. MSL heading 110. Cell located at 360/20 BGS VOR. Good liquid water was observed. Exited at 1842.37 GMT.

System developed into a line. It was decided to sample all the turrets along the developing line heading north.

1st Pass

Observation was recorded at 16,500 ft. MSL (-3.6°C) heading 360. At 1844.1 GMT Good Precipitation. At 1850 GMT 1000 ft/min. updraft but with no precipitation. At 1850.27 GMT 1000 ft/min. downdraft then 1000 ft/min. updraft was observed. At 1851.50 observed large drops up to 5 mm diameter. At 1852.50 observed 2000 ft/min. updraft at 358/25 BGS VOR. At 1853.14 GMT 2500 ft/min up was observed. Precipitation becoming ice at 17,100 ft. MSL (-5°C), then 1000 ft/min. downdraft with ice mixed with supercooled water.

2nd Pass at 1856.54 GMT

Observation at 16,500 ft. MSL heading 180.

Not much noticeable change from previous pass, updrafts were not as strong, some graupel and precipitation.

3rd Pass at 1909.14 GMT

Observation at 16,400 ft. MSL (-38°C) heading 360.

Observed lots of graupel with very heavy precipitation. Max updraft was 2500 ft/min.

Aztec

At 1845 GMT Aztec observed target cell. Had good scud clouds at cloud base with cloud to ground lightning. Good rain from the system.

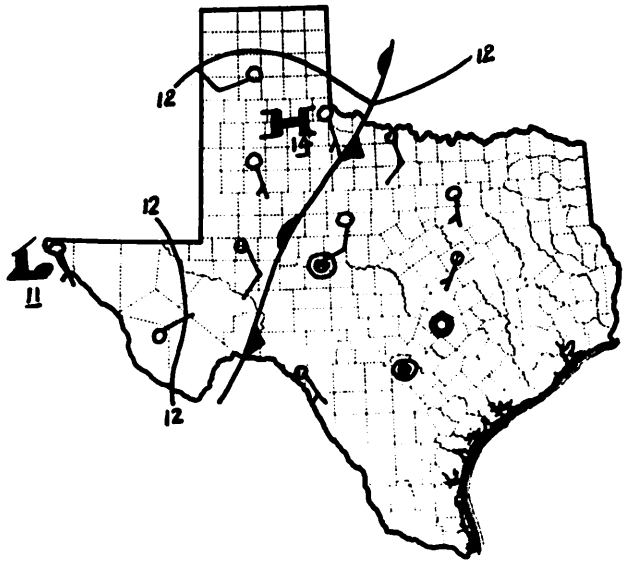
1st Pass

At 1853 seeded cell at cloud base in updrafts from 500 to 1500 ft/min. at 360/19 to 360/30 BGS VOR. Seeding aircraft was heading 360, updrafts were on the south west side of cells. No noticeable change in precipitation during seeding.

2nd Pass

Heading 180 sampled rainshafts. Light to moderate rain was observed. Made two more sampling passes in rainshafts. Lightning intensity increased after seeding.

Summary
1 July 1978



1300 GMT

QUITE MOIST AND UNSTABLE AMS REMAINS OVER AREA, WITH WEAK STNRY FRONT LYING OVER CENTRAL PORTION OF OP AREA. SKIES BROKEN MID-LEVEL AND UPPER LEVEL, WITH A FEW ACCAS. 500-700 MB TROUGH REMAINS JUST WEST OF OP AREA.

FIRST CUMULUS APPEARED BY 1600 GMT, AND BY NOON FIRST ECHOES WERE ON THE RADAR SCOPE. ACTIVITY WAS MOSTLY RW, BUT A FEW CBS DEVELOPED BY MID-AFTERNOON WITH TOPS TO 45-50K. PRECIPITATION SCATTERED OVER AREA.

ACTIVITY DIMINISHED AFTER 0000 GMT.

DAY CLASSIFIED A 6.

Weather Observations
1 July 1978

TIME (CDT)	
0750	BKN AC; FEW ACCAS BLDG SW; FEW CC ABV; T = 72°F: WIND 13006
0900	BKN AC-AS; BKN CC-CS; FEW ACCAS; T = 75°F; WIND 17006-13
0955	SCT AC; FEW CI; T = 79°F; WIND 17506-16
1105	FEW CU; SCT V BKN AC; FEW CI; T = 81°F; WIND 19010
1355	BKN CU; BKN AC; SCT CI; TCU-CB RWU ALQDS; T = 91°F; WIND 20006
1500	BKN CU; BKN AC; BKN CS; TCU-CB; TWU - TRWU ALQDS; LTGCG CIC S-SE; T = 86°F; WIND 04506; T NE-S MVG NW
1600	OVC CU; BINOVC; MULTIPLE LYRS VSBL ABV; TCU-CB RWU-TRWU ALQDS; T = 86°F: WIND 07010

FORECAST VERIFIED

MRI

HIPLEX NAVAJO LOG-1977

Date 7-1-78 Page No. 1

Site BGS Observer ESL

Tape No. 818

Take Off Time 1300 Land Time 1510

BMS Time _____ =Aircraft Time _____

Aircraft Time _____ =Radar Time _____

Altitude (29.92) = Initial _____ Final _____

Time	Event #	Altitude (kft)	Temp (°C)	Cloud #	Pass#	Type of Pass	Comments (VOR, DME, HDG, Cl. Base HT., Foil)
13 0836							Aztec in formation, high humidity, visibility 1 mile
		7	15				bases
							dry layer ********** 8 to 10 kft
13.3925		16	- 3	1	1		145 hdg 115 good liquid water content .5gm/m^3, precip event 3, cloud event 1
13 3959							+500
13 4003							+1000 5 side +1200
13 4021		out					
13 4345		17	- 4.2	1	2		340 hdg 125 knts
13 4405			- 3.4				+700
13 4416							+1000
13 4419		17.2 out	- 3.8				supercooled water

MRI

HIPLEX NAVAJO-1977

Page No. 2

Observer ESL

Tape No. 818

Time	Event #	Altitude (kft)	Temp (°C)	Cloud #	Pass #	Type of Pass	Comments (VOR, DME, HDG, Cl. Base Ht., Foil)
134703		17	- 4.2				penetration #27 looking south cloud tops 22 kft.
134920		16.9	- 4.2	1	3		195 hdg 120 knts., no vertical motion, was seeded, kept going thru cloud,
							some other turrets
135146							downdraft
135211		out					
135349		16.8	- 4.1	1	4		350 hdg 120 knts, changing hdg 024 knts.
135438							+500 short 032/29
135528		out					cloud dissipated
135750		16.5		2	1		105
135804							+800 hdg 120
		16.9	- 3.3				second cloud
135840							+600 ice crystals
135900		16.8					-1000 event 3 precipitation
135910							precipitation stopped
135923		out					+500
14 0855							penetration 28, showing penetration of the clouds for a general idea
141045		16.5	- 3.8	3	1		240 hdg 115 knts. no vertical motions
14 1130							+800 30/33 10 seconds, holes at our level

MRI

HIPLEX NAVAJO-1977

Page No. 3

Observer ESL

Tape No. 818

Time	Event #	Altitude (kft)	Temp (°C)	Cloud #	Pass #	Type of Pass	Comments (VOR, DME, HDG, Cl. Base Ht., Foil)
1244		out					
14 1500		in		4	1		
3040		out					
4200		in formation with Aztec at 7.2 kft.					
4245		precipitation event 4, Aztec on the left					
5349		end temp 17.1					
0200		another shower					
0331		large drops 45 dbz on the informer					
0400							

TEXAS HIPLEX 1978 AIRCRAFT DATA

DATE 7/1/78 FLT. # 1 MISSION NO. _____

A/C CREW A. Roberts, E. Lobel, R. Hospehorn

TAKE-OFF TIME (CDT) 1300 LAND TIME (CDT) 1510

ADVISED POSITION E 1

TEMP PROFILE (1000 Ft.)

	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
ASDG	27.2	23.9	21.1	18.0	15.0	12.8	10.4	8.3	7.6	5.2	3.5	1.9	0	-2.9	-4.2			
DSDG																		

TIME TO -5°C (Min) _____ TIME TO -10°C (Min) _____

TIME TO ADVISED POSITION: _____ (Min)

MISSION DATA

TURRET #	PENT TIME (CDT)	GM AgI	ALT (Ft)	AMB TEMP (°C)	ACFT HDG	TURRET LOC (VOR/DME)	CLD PENT SPD (kts)	CRUISE SPEED (kts)	AgI DROP INT (sec)	UPD (Ft/min)	TURB
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AIRCRAFT CLOUD AND WEATHER OBSERVATIONS

TEXAS HIPLEX 1978

DATE 7-1-78 MISSION NO. _____ AIRCRAFT TYPE MRI Navajo

TIME (CDT)	OBSERVED PHENOMENA
	Lots of Cumulus with 10 to 12 kft vertical development. Some organized and produced showers.
	Penetrations showed up to .5 gm of water with 1000 ft/min. updrafts. Clouds did not "last" very long. Did an intercom-
	parison with the Aztec in the precipitation.

OBSERVER E. Lobel

TEXAS HIPLEX 1978 AIRCRAFT DATA

DATE 7 / 1 / 78 FLT. # 1 MISSION NO. 8

A/C CREW Alan Bruce

TAKE-OFF TIME (CDT) 1300 LAND TIME (CDT) 1450

ADVISED POSITION North Hiplex Area

TEMP PROFILE (1000 Ft.)

Time		3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1300	ASDG	26	25	23	19	18	15	13	11	10	8	6	4	2	0	- 1	- 3	- 5	- 6	-8	-9	-11	
1437	DSDG		25	20	15	16	15	11	10	9	7	5	3	1	0								

Clear air descent.

TIME TO -5°C (Min) 1320 TIME TO -10°C (Min) 1326

TIME TO ADVISED POSITION: 1310 (Min)

MISSION DATA

Sec. in cloud	TURRET #	PENT TIME (CDT)	GM AgI	ALT (Ft)	AMB TEMP (°C)	ACFT HDG	TURRET LOC (VOR/DME)	CLD PENT SPD (kts)	CRUISE SPEED (kts)	AgI DROP INT (sec)	UPD (Ft/min)	TURB
5	1	1347	-48	22	-10	270	040 / 30	160		1	.5	S
15	2	1351		21	- 9	120	030 / 32	160		NF	1	S
5	3	1355		22	-12	040	045 / 41	160		NF	.5	S
21	4	1401		22	-10	110	035 / 32	16		NF	none	S
3/2	5/6	1404		22	-10	010	050 / 39	160		NF	none	S
15	7	1410		22	-11	350	030 / 33	160		NF	1K	M
10	8	1414		22	-10	120	020 / 35			NF	.3	S
13	9	1415		21	-10	305	030 / 38			NF	.3	M
45	10	1420		22		270	030 / 27			NF	.3-1-N	M
20	11	1424		20	-13	230	020 / 20			NF	1.5K	M
							/					
							/					
							/					
							/					
							/					
							/					

AIRCRAFT CLOUD AND WEATHER OBSERVATIONS

TEXAS HIPLEX 1978

DATE 7-1-78 MISSION NO. 8 AIRCRAFT TYPE P-Navajo

TIME (CDT)	OBSERVED PHENOMENA
1300	To sky Cumulus, some congestus with cirrus layers above. Rain
	observed 060 at 360/7.3 just NE of Howard County.
1305	Cloud base 6.5K. More Cumulus Med. to N and E.
1309	Layer of clouds 16· 7 K.
1310	Selected target clouds in general area small cumulus
	6 K below 17 K. Semi-circle of TCU popping above 17 K. 360/21.4 cumulus below 5-7. Clouds above 23 K by 1-2K.
1335	Hard in places, some clouds icing in Area.
1340	Icing anvil over-head from South 030/30.
1351	Turret 2 Water on Windshield, ice on forward edge wing.
1359	now over Tur 1, cannot determine true cloud.
1401	Tur 4 very icy, no updrafts // anvils now spreading.
1404	Turrets 5&6 little liquid water content.
1406	Several clouds producing anvils with blowoff N.
1410	Tur 7 Good liquid water 1½" ice on wing.
1415	Tur 9 Some water ice on wing.
1420	Tur 10 Water, rain drop, graupel.
1424	Tur 11 Ice, rain graupel beneath anvil.
1433	RTB
1437	Mammatus of anvil.

OBSERVER Bruce

AIRCRAFT CLOUD AND WEATHER OBSERVATIONS

TEXAS HIPLEX 1978

DATE 7-1-78 MISSION NO. 8 AIRCRAFT TYPE PA-23/Aztec

TIME (CDT)	OBSERVED PHENOMENA
1318	Bases 7500 13°C
1345	Sampling 035/26
1355	Bases 8000
1454	Rain Sample with Navajo

OBSERVER _____

July 1, 1978 Debriefing Notes

Mission No. 8

Take Off: 1800 GMT
Seed Mode: On Top
Amount: 150 gms (AgI)
Rate: 1 (30 gm flare) per second
Seed Time: 1847 GMT plus 5 seconds
Cloud Type: Isolated Growing Cumulus
Cloud Location: 040/30 BGS VOR
Mission Aircraft: Cloud Physics (MRI), P-Navajo, and Aztec
Land Time: 2010 GMT

MRI

1st Pass at 1839.25 GMT

Observation was taken at 16,000 ft. MSL (-3°C) heading 145. Cell was located at 040/30 BGS VOR. Updraft was recorded on south side of cell at 1200 ft/min. and lasted for 15 seconds. Good liquid water about 1/2 gm/m^3 was observed. Tops estimated to be 22,000 ft. MSL. Exited at 1840.21 GMT.

2nd Pass at 1843.45 GMT

Observations taken at 17,000 ft. MSL (-4.2°C) heading 340. Observed 1000 ft/min. updrafts and some supercooled liquid water at 1844.16 GMT. Exited at 1844.17 GMT.

3rd Pass at 1849.29 GMT

Observations taken at 18,900 ft. MSL (-4°C) heading 195. Observed no vertical motions. May have entered what could have been a 2nd turret. Some downdraft was recorded at 1852.11 GMT. No ice crystals observed.

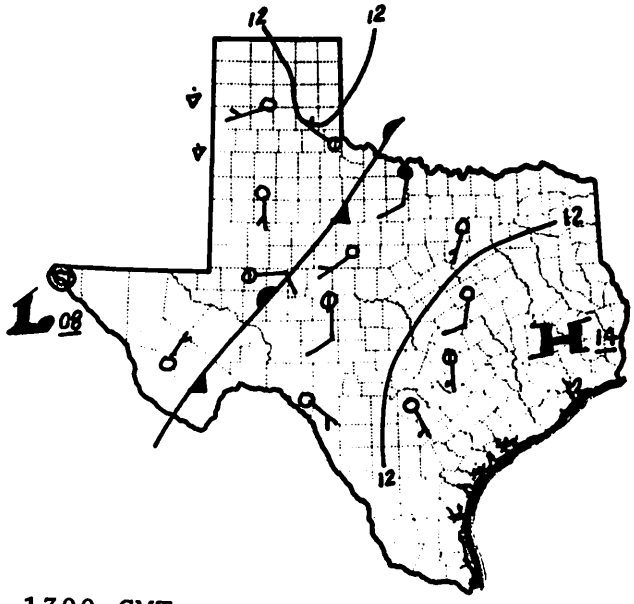
4th Pass at 1853.44 GMT

Observation taken at 16,800 ft. MSL heading 350 then chaged to 025 to go through more cloud. Cloud seemed to be dissipating. Exited at 1855.28 GMT.

P-Navajo

At 1847 GMT aircraft was in cloud for 5 seconds heading 270. Seeded 1 (30 gm flare) per second at 040/30 BGS VOR. Seeding aircraft had visual contact with MRI. Cloud seemed to have dissipated immediately after seeding.

Summary
2 July 1978



1300 GMT

AMS QUITE MOIST (PW = 1.37") AND SOMEWHAT UNSTBL (LI = -3.3). SOUNDING FAVORABLE FOR MINIMAL ACTIVITY, WITH A SLIGHT SUBSIDENCE INVERSION BETWEEN 700 AND 500 MB WHICH SHOULD REPRESS DEEP CONVECTION. LT RW ANTICIPATED DURING AFTERNOON DUE WK 700-500 MB TROUGH OVER OP AREA IN ASSOC. W/DIFFUST SFC FRONT.

FIRST CUMULUS OBSERVED AT NOON OBSERVATION, WITH T = 87°F. BY EARLY AFTERNOON, CONGESTUS AND TCU WITH LT RAINSHOWERS DEVELOPED. RW WERE VERY LT.

DAY CLASSIFIED A 5.

Weather Observation
2 July 1978

TIME (CDT)	
0800	ⓘ AC-AS; FEW LWR STTRA S-SW; FEW ACCAS SW; T = 73°F; WIND
0855	ⓘ AC-AS; FEW ACCAS SW; T = 76°F; WIND 16504
0950	ⓘ AC-AS; FEW ACCAS SW; T = 78°F; WIND 16509
1050	CLR; FEW AS S-SE-E; LN CU DSNT NW-NNW; T = 82°F; WIND 16507
1155	CLR FEW AC-AS SE-S; FEW SML CU ALQDS; CU CONG-TCU ENE-SE; T = 87°F; WIND 17007
1355	SCT CUMULUS; CU CONG-TCU ALQDS; RWU ALQDS; T = 90°F
1650	BKN CUMULUS; TCU-CB ALQDS; RWU E-NE AND W; T = 93°F; WIND 12005

FORECAST VERIFIED

TEXAS HIPLEX 1978 AIRCRAFT DATA

DATE 7/2/78 FLT. # _____ MISSION NO. _____

A/C CREW A. Roberts, E. Lobel, R. Hospelhorn

TAKE-OFF TIME (CDT) 1440 LAND TIME (CDT) _____

ADVISED POSITION _____

TEMP PROFILE (1000 Ft.)

	3	4	5	6	7	8	9	10	11	12	13.3	14	15.2	16.1	17	18	19	20
ASDG	29.8	25.3	23.1	20.8	17.9	15.1	12.7	10.3	8.3	6.0 P	3.2	1.3 IC	.8	-.9	-3.7			
DSDG		27.5	24.0	20.8	18.2		13.7	11	7.7	4.9	4.9	2.1	1.3	-2.9				

TIME TO -5°C (Min) _____ TIME TO -10°C (Min) _____

TIME TO ADVISED POSITION: _____ (Min)

MISSION DATA

TURRET #	PENT TIME (CDT)	GM AgI	ALT (Ft)	AMB TEMP (°C)	ACFT HDG	TURRET LOC (VOR/DME)	CLD PENT SPD (kts)	CRUISE SPEED (kts)	AgI DROP INT (sec)	UPD (Ft/min)	TURB
						/					
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MRI

HIPLEX NAVAJO LOG-1977

Date 7-2-78

Page No. 1

Site

Observer ESL

Tape No. 819

Take Off Time 1440 Land Time 1700?

BMS Time =Aircraft Time

Aircraft Time =Radar Time

Altitude (29.92) = Initial / Final

Time	Event #	Altitude (kft)	Temp (°C)	Cloud #	Pass#	Type of Pass	Comments (VOR, DME, HDG, Cl. Base HT., Foil)
							small droplets, light showers
							(event 2) from clouds above high
							humidity - low visibility
							event 5 for sounding
		9	12.7				bases
							downdraft east side
							good lwc, supercooled
							event 2 for updraft
153016							pict 29 ice blow off
153640		17.2	-2.9	1	1		090 hdg 120
							some precip, water
							downdraft -500

MRI

HIPLEX NAVAJO-1977

Observer

Tape No.

Time	Event #	Altitude (kft)	Temp (°C)	Cloud #	Pass #	Type of Pass	Comments (VOR, DME, HDG, Cl. Base Ht., Foil)
153718							+500
153730							end of updraft
							small graupel in the east
153828		out					
154057		17.2					100 hdg 125
							graupel and water
							event 3 for period
154130		out					
154259							pict 30
154409							pict 31 general idea
154550		17.7	4.3	2	1		125 220 hdg, precip, some
							graupel 195/41, no vert. motion
154639		out					
155107		17.5	-3.9	2	2		030 hdg 125, graupel
155155							-1000
155203		17.2	-2.5	out			
155435		17.5	-2.8	3	1		010 120 195/34 (rain) water
							small drops

MRI

HIPLEX NAVAJO-1977

Page No. 3 (cont.)

Observer _____

Tape No. _____

Time	Event #	Altitude (kft)	Temp (°C)	Cloud #	Pass #	Type of Pass	Comments (VOR, DME, HDG, Cl. Base Ht., Foil)
15 5530							+400 10 sec
15 5547							+800
15 5720		17.7	-4.5 out				difficult to ——— 020 hdg
15 5735?							pict 32 ice & shower over BGS
163000							formation with Aztec

AIRCRAFT CLOUD AND WEATHER OBSERVATIONS

TEXAS HIPLEX 1978

DATE 7-2-78 MISSION NO. _____ AIRCRAFT TYPE MRI Navajo

TIME (CDT)	OBSERVED PHENOMENA
	Clouds were very weak today. Little water and only up to
	800 ft/min updrafts. There was lots of sand around and were
	unable to find a "good" cloud to seed and sample.
	Did an intercomparison with the Aztec.

OBSERVER E. Lobl

TEXAS HIPLEX 1978 AIRCRAFT DATA

DATE 7/2/78 FLT. # 1 MISSION NO. _____

A/C CREW _____

TAKE-OFF TIME (CDT) 2:30 1264.7 Temp 31 LAND TIME (CDT) _____

ADVISED POSITION _____

TEMP PROFILE (1000 Ft.)

	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	22
ASDG	30	26	25	21	18	15	14	9			5	5	3	1	0	-2	-4	-5	-10
DSDG									10		5	5			0	-2		-10	-10

TIME TO -5°C (Min) _____ TIME TO -10°C (Min) _____

TIME TO ADVISED POSITION: _____ (Min)

MISSION DATA

TURRET #	PENT TIME (CDT)	GM AgI	ALT (Ft)	AMB TEMP (°C)	ACFT HDG	TURRET LOC (VOR/DME)	CLD PENT SPD (kts)	CRUISE SPEED (kts)	AgI DROP INT (sec)	UPD (Ft/min)	TURB
1	301		214	-12	030	235 / 31	120	Supercooled, lgt turb			
2	305		237	-15	220	235 / 27	130	Supercooled			
						/		LWC, better lgt turb			
3	308		235		270	235 / 34		Smooth fuzzy top			
4	325		240	-14	250	255 / 22	135	Solid			
5	335		241	-14	130	205 / 28		Graupel, 1200 ft. up			
6	347			-14	210	196 / 38.5	130	LWC, 500 + in precip.			500 up
7	350		240		060	196 / 46		Light precip, 500 up, 500 down on north			
8	353		140		360	200 / 34.9					
						/					
						/					
						/					
						/					
						/					
						/					
						/					

Aztec

AIRCRAFT CLOUD AND WEATHER OBSERVATIONS

TEXAS HIPLEX 1978

DATE _____ MISSION NO. _____ AIRCRAFT TYPE _____

TIME (CDT)	OBSERVED PHENOMENA
237	Light rain at 6.5K
241	Cloud base 8.5K
249	To 23K MSL 900 ft/min up aircraft performance

OBSERVER Riggio

Aztec

TEXAS HIPLEX 1978 AIRCRAFT DATA

TO TACH

DATE 7 / 2 / 78 FLT. # 1 MISSION NO. _____

2.75.2

A/C CREW Chuck, Bruce

77.3

TAKE-OFF TIME (CDT) 1447 LAND TIME (CDT) 1700

ADVISED POSITION Southwest HIPLEX Area

TEMP PROFILE (1000 Ft.)

Time		3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1448	ASDG	29	27	23	19	16	13	10											
1615	DSDG		27	24	21	18	15	12	7										

Clear Air Descent

TIME TO -5°C (Min) _____ TIME TO -10°C (Min) _____

TIME TO ADVISED POSITION: _____ (Min)

MISSION DATA

RAIN SHAFT TURRET #	PENT TIME (CDT)	GM AgI	ALT (Ft)	AMB TEMP (°C)	ACFT HDG	TURRET LOC (VOR/DME)	CLD PENT SPD (kts)	TYPE ~~CRUISE~~ SPEED (kts)	AgI DROP INT (sec)	DOWN ~~SPD~~ (Ft/min)	TURB
1	1510		8.9K	10	100	240/ 30				.2K	
2	1545		9K	9	120	215/ 35		L		.2	
3	1549		9K	9	020	205/ 37		M		.1	
4	1555		9K	10	050	215/ 33		L		.5	
5	1556		8.9K	10	040	205/ 32		M		.5	
6	1600		8K	13	030	205/ 28		L		.5	
7	1615		9.2	10	040	075/ 16		L		.2	
						/					
						/					
						/					
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						/					

AIRCRAFT CLOUD AND WEATHER OBSERVATIONS

TEXAS HIPLEX 1978

DATE July 2, 1978 MISSION NO. _____ AIRCRAFT TYPE Aztec

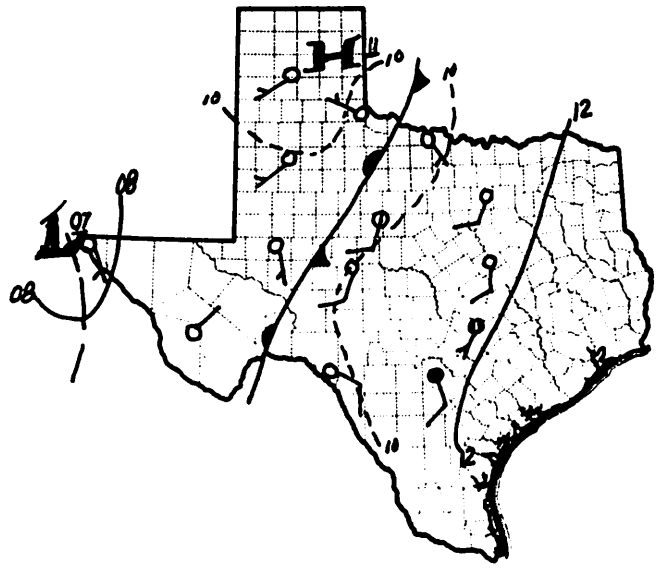
TIME (CDT)	OBSERVED PHENOMENA
1450	Small cu w/con and Hum
	Rain sighted SW of Webb
1455	Most development hard looking, esp tops
1457	Cu Hu and Med North of rain storm @ 245/23
1500	Cloud base 8.8k-9K very hazy below cloud, Temp 10°C at base
1504	265/34 light rain @ 9K/rain showers to the
	South
1530	255/24 base of cell patchy, several bases cloud pinched off
	~½ up on cloud
1533	255/26 temp. 10°C, 9K
1546	210/34 Cu med about 5-7 miles to East
1552	210/35 Heading 030 Rain showers 10 miles ahead
1600	205/28 temp. 13°C
1611	090/09 Cu hum and Med in area, 5 mil daimeter clouds
	hard, bases vary in height

OBSERVER Bruce

July 2, 1978 Debriefing Notes

Time (GMT)	
1830	Activity first observed in target area. Cells were isolated and of short duration.
1930	P-Navajo, Aztec and MRI were launched.
	P-Navajo
1437	Some light rain was observed on climb out.
1441	Cloud base was observed at 8,500 ft. MSL.
1449	Arrived on station at an altitude of 23,000 ft. MSL.
	MRI
2001	Penetrated first cell at 24,000 ft. MSL (-12°C) heading 030. Cell located at 235/31 BGS VOR. Observed supercooled water with light turbulence.
2005	Penetrated 2nd turret at 23,700 ft. MSL (-15°C) heading 220. Cell located at 235/27 BGS VOR. Observed better supercooled water with light turbulence.
2025	Penetrated 3rd turret at 24,000 MSL (-14°C) heading 250. Cell located at 255/22 BGS VOR. Tops were solid. Same observations as previous penetrations.
2035	Penetrated 4th turret at 24,000 ft. MSL (-14°C). Cell located at 205/28 BGS VOR. Observed some graupel and 1200 ft/min. updrafts.
2047	2nd penetration of same cell at 24,000 ft. MSL (-14°C) heading 210. Cell located at 196/38.5. Good liquid water observed, 500 ft/min. updraft then 500 ft/min downdraft in precipitation, then 500 ft/min. updraft before exit.
2050	3rd penetration of above cell at 24,000 ft. MSL heading 060. Cell located at 146/42 BGS VOR. Light precipitation observed. 500 ft/min. updraft then 500 ft/min. downdraft on north side.
	Turrets were narrow with good entrainment at mid-levels. Tops would ice out when they reached altitude of 24,000 ft. MSL.
	No seeding accomplished.

Summary
3 July 1978



1300 GMT

VERY MOIST AIRMASS REMAINED OVER OPERATIONAL AREA TODAY (PW = 1.30", LI = -2.7). IN ADDITION, NO CAPPING INVERSION EXISTS AT MID-LEVELS, AS WAS CASE 2 JULY. ADDITIONALLY, UPPER LEVEL TROUGH (700-500 MB) REMAINS IN IMMEDIATE VICINITY. WITH CONSIDERABLE SURFACE HEATING EXPECTED, ACTIVITY WILL DVLP DURING EARLY AFTERNOON.

SCT AC AND AS THROUGHOUT A.M. COMPUTER INDICATES CONV. T = 91°F. AT NOON OB, FIRST CU OBSERVED, T = 91°F. DVLPMNT WAS SLOW INITIALLY, BUT BY EARLY AFTERNOON ECHOES HAD APPEARED. ACTIVITY BECAME WIDESPREAD OVER OP AREA BY MID-AFTERNOON. AN UPPER LEVEL (500 MB) LOW FORMED OVER OP AREA DURING AFTERNOON, ACCENTUATING DVLPMNT. HVY TSTMS OCCURRED, WITH HAIL, OVER OP AREA LATE IN PERIOD.

DAY CLASSIFIED A 6.

Weather Observations
3 July 1978

TIME (CDT)	
0750	SCT AC-AS; FEW CS; T = 76°F; WIND 15506
0900	CLR. FEW AS SE-S AND NW-N; T = 80°F; WIND 18509
1000	CLR FEW AC-AS OVHD-S; T = 84°F; WIND 17505-11
1100	CLR FEW AC-AS ALQDS; ACCAS SW; T = 89°F; WIND 20008
1155	CLR FEW CU ALQDS; FEW AC ALQDS, ACCAS SW-WSW; T = 91°F; WIND 15505
1355	SCT CUMULUS; CU CONG-TCU ALQDS; FEW RW-W NE-E; T = 93°F; WIND 15008
1450	BKN CU; CU CONG-TCU ALQDS; CB NW; T = 93°F; WIND 13006
1600	BKN CU; TCU ALQDS; CB NW N NE-E; VIRGA OVHD; T = 96°F; WIND 12510
1650	SCT CUMULUS; CB NW-N-NE-E; TCU SE-S; T = 96°F; WIND

FORECAST VERIFIED

TEXAS HIPLEX 1978 AIRCRAFT DATA

DATE 7/3/78 FLT. # 1 MISSION NO. 7 & 9

A/C CREW A. Roberts, E. Lobel, and R. Hospehorn

TAKE-OFF TIME (CDT) 1545 LAND TIME (CDT) 1900

ADVISED POSITION E1 and E2

TEMP PROFILE (1000 Ft.)

	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
ASDG		26.5	25.3	22.4	19.4	16.1	13.3	10.4	8.2	6.7	4.2	2.4	.3	-1.2	-1.6			
DSDG																		

TIME TO -5°C (Min) _____ TIME TO -10°C (Min) _____

TIME TO ADVISED POSITION: _____ (Min)

MISSION DATA

TURRET #	PENT TIME (CDT)	GM AgI	ALT (Ft)	AMB TEMP (°C)	ACFT HDG	TURRET LOC (VOR/DME)	CLD PENT SPD (kts)	CRUISE SPEED (kts)	AgI DROP INT (sec)	UPD (Ft/min)	TURB
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MRI

HIPLEX NAVAJO LOG-1977

Date 7-3-78 Page No. 1

Site BGS Observer ESL

Tape No. 820

Take Off Time 1545 Land Time 1900

BMS Time _____ =Aircraft Time _____

Aircraft Time _____ =Radar Time _____

Altitude (29.92) = Initial _____ Final _____

Event 1 in cloud
Event 2 updraft
Event 3 precipitation

Time	Event #	Altitude (kft)	Temp (°C)	Cloud #	Pass#	Type of Pass	Comments (VOR, DME, HDG, Cl. Base HT., Foil)
							Light showers, Cu
160055							Underneath a cloud with an echo
							500 ft below
		9.0	13.3				Bases
160430							043/12 updraft, +1200
		10	10.4				Bases going into the cloud updrafts on the SW side of clouds. Some rain.
160811							+1100
161335					3		042/12 Third penetration. Water precipitation. Updrafts all along
							the line.
163710		17.6	-3.6	1	1		120, 285 hdg. Echo, lumpy down E side.
163729							+1500, +2000

New Development on the SW.

MRI

HIPLEX NAVAJO-1977

Page No. 2

Observer ESL

Tape No. 820

Time	Event #	Altitude (kft)	Temp (°C)	Cloud #	Pass #	Type of Pass	Comments (VOR, DME, HDG, Cl. Base Ht., Foil)
163741							+2500
163750		out 18.3	-4.9				supercooled water 332/33
163905		18.0	-4.1	1	2		120, 080 hdg., -800 333/33, 1wc, about 1 gm.
163930							+2000
163943							+2500
163949			out				
164331		18.0	-4.3	1	3		260 hdg.
Aztec found precipitation, light rain. Downdraft on east. -1000							
164340		+1500 small					-1300
164359							-1200
164420		17.4					240 hdg.
164428							+1000 small precipitation. JW about 1 gm.
164441							+500
164443							+1000 no more precipitation
164510							no updraft
164514			-5.8	out			
Seeded 1647 22K -12 07 hdg.							

MRI

HIPLEX NAVAJO-1977

Observer ESL

Tape No. 820

Time	Event #	Altitude (kft)	Temp (°C)	Cloud #	Pass #	Type of Pass	Comments (VOR, DME, HDG, Cl. Base Ht., Foil)
5040		17.6	-3.7	1	4		060 hdg., 110 knt graupel and water Event 3 for precipitation. -700.
							-1000 small hail
5129							+1500
5141			-2				+2000
5150		18.4					+2500
5157			-5.1				+2000, 050 hdg. small droplets
5215							+500 snow and water
5236		19	-7.4				+1000
5240							no updraft
5319		18.8	out				another cell
5626							penetration #35 tops
170824		18.3	-5.6	2	1		150 hdg. 130 knts.
170839							-700
170854							+1000 340/40
170903		18.4	out				
171903		17.9	-5.1	3	1		020 hdg. 120 knts. precipitation graupel downdraft 340/57 heavy.
171937							+1000
171947							+500 12 sec

1/sec
32 flares
30 gm

MRI

HIPLEX NAVAJO-1977

Page No. 4

Observer ESL

Tape No. 820

	Time	Event #	Altitude (kft)	Temp (°C)	Cloud #	Pass #	Type of Pass	Comments (VOR, DME, HDG, Cl. Base Ht., Foil)
17	2010							+2000 340/59
17	2024			-5.3				+2500
17	2030			-6.2				+1000
17	2045							No more up, 140 knts.
	P-Navajo 23K -10 070							
	No seed instrument in this Downdraft on the N side.							
Tops 35K 17	2128		18.5	-8.7	out			340/64 NE side
17	2540		17.6	-6.4	3	2		200 hdg. 135 knts, inflow shelf
17	2630			-6.0				graupel heavy and water
17	2710							+1500
17	2721							2000
17	2724							+2500 for 10 sec
17	2736							+1500
17	2744							+1000
17	2748		18.4	-7.1	out			125 SW side 340/59
								Aztec says raining hard at base.
17	3134		17.6	-5.4	3	3		downdraft 130 light precipitation
17	3153							water

MRI

HIPLEX NAVAJO-1977

Page No. 5

Observer ESL

Tape No. 820

	Time	Event #	Altitude (kft)	Temp (°C)	Cloud #	Pass #	Type of Pass	Comments (VOR, DME, HDG, Cl. Base Ht., Foil)
17	3205							graupel
17	3210							+500 030 hdg.
		End of tape. I think there were 3 more passes with heavy precipitation and high updrafts. Last 2 passes precipitation was mostly water and lighter. Updrafts in some of the coming up turrets still maintain up to +2000 ft/min.. Left the cloud at 1750. Flew thru the line to the S, SW.						
	181748		16.8	-3.1	4	1		110 hdg. 125 knts.
18	1825							+1500
18	1832							+2500
18	1840							+2700 for 5 sec.
18	1901							no more updraft
18	1912							-1500 232/11
18	1915		17.5	-5.4	out			supercooled water
18	2253		17.2	-3.4	5	1		195 hdg. 130 isolated lumpy, lwc.
18	2324		out					
18	3105		17.3	-3.8	5	2		280 hdg. 130 knts. 202/18 middle all water precipitation
18	3150							+700
18	3201							+1000 about 1 gm
18	3211			out				updrafts in the clear +800 NW side
18	3443		17	-3.8	5	3		110 hdg.

MRI

HIPLEX NAVAJO-1977

Page No. 6

Observer ESL

Tape No. 820

	Time	Event #	Altitude (kft)	Temp (°C)	Cloud #	Pass #	Type of Pass	Comments (VOR, DME, HDG, Cl. Base Ht., Foil)
18	3508							some precipitation +1000
18	3514							+1500
18	3521							+1000 5 sec.
18	3534							-1000 10 sec.
18	3552		17	-3.8	out			snow and supercooled water
	Seeding 10K 45 sec at a line, 4 lines, 20 gm flare. Was not raining.							
18	3855		16.8	-2.7	5	4		300 hdg.
18	3910							-500
18	3925							gook graupel shower water and graupel and snow
18	3952							water about .8 gm
18	4012							+1500
18	4022							+1000
18	4026		17.1	-4.6	out			120 knts. 250 hdg.
18	4210		17.2	-3.7	5	5		110 hdg.
18	4222							+1000 new cell in front
18	4256		17.2					old cloud
18	4308							downdraft, heavy precipitation, water
18	4317							+1000
18	4325							+2000 no more precipitation

MRI

HIPLEX NAVAJO-1977

Page No. 7

Observer ESL

Tape No. 820

	Time	Event #	Altitude (kft)	Temp (°C)	Cloud #	Pass #	Type of Pass	Comments (VOR, DME, HDG, Cl. Base Ht., Foil)
K7	4345							no updraft
19	4353							-1000
19	4415		17.8	-6.2		out		110 hdg. 125 knts.
19	4647		17.1	-3.9	5	6		130 knts. 285 hdg.
19	4720							precipitation, small graupel, -600
19	4735							water & graupel
19	4743							+1000
19	4749							+2000
19	4800							+3000 5 sec.
19	4813							+1500
19	4819							+1000 graupel
19	4826							no updraft
			18.5	-7.4				turn out of cloud due to low fuel ad oxygen.

AIRCRAFT CLOUD AND WEATHER OBSERVATIONS

TEXAS HIPLEX 1978

DATE 7-3-78 MISSION NO. 7 & 9 AIRCRAFT TYPE MRI Navajo

TIME (CDT)	OBSERVED PHENOMENA
	Started out flying under some well organized bases with good updrafts. At first there were isolated showers and the overhead radar had contours for most of the clouds. The clouds getting to 40 kft were having fuzzy not well defined edges (not necessarily ice). We picked a cell that had hard well rounded edges for a first cloud-tops 30 to 35 kft. At first it was not connected into the line. Found good ups & precipitation in the later passes. The next two sampled system were isolated, away from any other activity 2 to 3 diameters away. Up to 3000 ft/min. updraft in one of the clouds. Up to more than 1 gm/m^3 water.

OBSERVER E.Lobel

P-Navajo

TEXAS HIPLEX 1978 AIRCRAFT DATA

DATE 7/ 3/ 78 FLT. # 1 MISSION NO. 9

A/C CREW Alan Bruce

TAKE-OFF TIME (CDT) 1548 LAND TIME (CDT) 1855

ADVISED POSITION NE of HIPLEX

TEMP PROFILE (1000 Ft.)

Time G		3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1551 34	ASDG	31	29	26	24	20	19	16	14	10	9	4	3	0	- 2	- 3	- 2	- 4	- 5	-9	-10	-11
1848	DSDG			25	22	20	18	15	12	10	3	5	4	0	-2	- 4	- 5	- 8	-10			

CLEAR AIR DESCENT at 220/28.

TIME TO -5°C (Min) 1618 TIME TO -10°C (Min) 1620

TIME TO ADVISED POSITION: _____ (Min)

MISSION DATA

Time in Cloud (sec)	TURRET #	PENT TIME (CDT)	GM AgI	ALT (Ft)	AMB TEMP (°C)	ACFT HDG	TURRET LOC (VOR/DME)	CLD PENT SPD (kts)	CRUISE SPEED (kts)	AgI DROP INT (sec)	UPD (Ft/min)	TURB
	1	1608		12.5	4	040	090 / 22.3	140	140		.5	L
45	2	1611		15	- 1	310	075 / 27.0				↑↓±2	L
35	3	1636		22.7	-10	250	350 / 23.6				-.7	L
50	4	1639		22.5	-11	335	335 / 26.9				.3	L
	5	1640		22.5	-11	335	330 / 34.0				.2	L
	Seed 1	1647	-48	22.0	-12	070	330 / 32.1		32 Flares	1sec	.2	M
135	6	1650		22.5	-10	270	340 / 33					M
40	7	1721		23.9	-10	070	340 / 55				.3-2	M
130	Seed 2	1727		21.9	-12	250	350 / 61.6		No Flares		Data Sheet	M
85	8	1809		22.8	-11	055	185 / 5.2				Data Sheet	
40	9	1818		22	-10	215	110 / 15.5				Data Sheet	M
45	10	1829		22	-13	280	195 / 18.1				Data Sheet	M
45	11	1835		21.5	--	325	205 / 17.8				Data Sheet	
							/					
							/					
							/					

AIRCRAFT CLOUD AND WEATHER OBSERVATIONS

TEXAS HIPLEX 1978

DATE 7-3-78 MISSION NO. 9 AIRCRAFT TYPE P-Navajo

TIME (CDT)	OBSERVED PHENOMENA
1552	Cu Med. Hum in Webb Area in all Quads.
1556	Very light rain at 160/8.2, several clouds in area hard.
1604	Cloud Base 9K.
1607	Small balls of moisture on windshield while in clear 090/19.4.
1608	T-1 rain on windshield.
1625	045/19.7 Tcu in circle formation 15m. dia.
1630	040/16.6 anvils forming on tallest Tcu.
1631	Anvils spreading out in all directions.
1636	T-3 All downdraft, water, ice, -12°C. T-4 fuzzy sides, T-5
	little moisture.
1647	Seed-1 inside cloud water, ice, graupel.
1650	T-6: 1-2K↑ for 25 sec; 1-2K↓ 15 sec; 2-3K↑ 15 sec. plenty
	of water, ice, graupel.
1727	Seed-2 1K↓ for 15 sec with light rain. 2K↓ for 60 sec with
heavy	graupel. Total 75 sec of updrafts; lightning and ice.
1809	T-8 1K↓ for 25 sec; .5K↓ for 15 sec; .3K↓ for 10 sec.
1818	T-9 .5K↓ with light rain .5K↑ with ice.
1823	5min. in cloud ↑↓ 1-1.5K ice, water.
1829	T-10 .8K↑ 30 sec .4K↓ 15 sec ice, water.
	T-11 2.5K↓ 10 sec, 2K↑ 15 sec, 1K↓ 10 sec small inversion at
	tops of small Cu; 15 miles removed from storm system.

OBSERVER Bruce

TEXAS HIPLEX 1978 AIRCRAFT DATA

DATE __/__/ 78 FLT. # _____ MISSION NO. _____

A/C CREW Aztec

TAKE-OFF TIME (CDT) _____ LAND TIME (CDT) _____

ADVISED POSITION _____

TEMP PROFILE (1000 Ft.)

	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
ASDG																		
DSDG																		

TIME TO -5°C (Min) _____ TIME TO -10°C (Min) _____

TIME TO ADVISED POSITION: _____ (Min)

MISSION DATA

TURRET #	PENT TIME (CDT)	GM AgI	ALT (Ft)	AMB TEMP (°C)	ACFT HDG	TURRET LOC (VOR/DME)	CLD PENT SPD (kts)	CRUISE SPEED (kts)	AgI DROP INT (sec)	UPD (Ft/min)	TURB
B	1836		10	9	230	225 / 18		125		500	
END	1839		10.5	9	140	/		120		1000	
						/					
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AIRCRAFT CLOUD AND WEATHER OBSERVATIONS

TEXAS HIPLEX 1978

DATE 7-3-78 MISSION NO. _____ AIRCRAFT TYPE Aztec

2177.3
2180.9

TIME (CDT) Take off	OBSERVED PHENOMENA
1548	
1611	Sample RW 040-14
1625	Sample RW 045-14
1643	Sanple RW 332-34 15 FPM
	Cloud base drop from 10,500 to 9600. Small hail at 1700
	335-36
1725	Sample RS

OBSERVER _____

July 3, 1978 Debriefing Notes

Mission No. 9-P

Take Off: 2048 GMT
Seed Mode: On Top
Amount: 960 gms (AgI)
Rate: 1 (30 gm flare) per second
Seed Time: 2147 GMT plus 32 seconds
Cloud Type: Isolated Growing Cumulus
Cloud Location: 330/32 BGS VOR
Mission Aircraft: Cloud Physics (MRI), P-Navajo, and Aztec

MRI

1st Pass at 2137.10 GMT

Observation taken at 17,600 ft. MSL (-3.6°C) heading 285. Cell located at 332/33 BGS VOR. Downdraft was recorded on east side of cell then 2500 ft/min. updraft for 25 seconds was recorded on south west side. Good supercooled water in cell. Exited at 2137.50 GMT at 18,300 ft. MSL (-4.9°C). Indicated air speed 120 kts.

2nd Pass at 2139.05 GMT

Observation taken at 18,000 ft. MSL (-4.1°C) heading 080. A 800 ft/min. downdraft was observed at 333/33 BGS VOR with 1 gm/m^3 of liquid water. A 2500 ft/min. updraft was observed for 25 seconds on east side. Exited at 2134.49 GMT.

3rd Pass at 2143.31 GMT

Observation taken at 18,000 ft. MSL (-4.3°C) heading 200. Cell located at 330/43 BGS VOR. First observed 1300 ft/min. downdraft at 2144.28 GMT then 1000 ft/min. updraft with small droplets in updraft. Estimated liquid water content to be 1 gm/m^3. No ice observed. Exited at 2145.14 GMT.

4th Pass at 2150.40 GMT

Observation taken at 17,600 ft. MSL (-3.7°C) heading 060. Graupel and

and water observed in 1000 ft/min. downdraft at 2151.24 GMT then at 2500 ft/min. updraft was observed with liquid water and snow at 2152.36 GMT. At 2153.14 GMT a 1000 ft/min. downdraft was observed prior to exit. Exited at 14,000 ft. MSL (-7.4°C).

P-Navajo

Aircraft seeded at 22,000 ft. MSL (-12) heading 070 at 330/32 BGS VOR. Cloud approximately 10 miles wide. Liquid water, ice and graupel was observed. No vertical motions observed in cloud. Fuzzy on sides, possibly due to entrainment.

Aztec

At 2143 GMT aircraft reported light rain at 332/34 BGS VOR with 1500 ft/min. updraft. Cloud base at 4600 ft. MSL to 10,500 ft. MSL. Small hail observed at 335/36 at 2200 GMT.

July 3, 1978 Debriefing Notes

Mission 9-C

Seed Mode: On Top
Amount: No Seed
Seed Time: 2227 GMT
Cloud Type: Complex
Cloud Location: 350/61.6 BGS VOR
Mission Aircraft: Cloud Physics (MRI), P-Navajo, and Aztec

MRI

1st Pass at 2219 GMT

Observation taken at 17,900 ft. MSL (-5.1℃) heading 020. Northeast side of cell located at 340/64 BGS VOR. Observed moderate to heavy precipitation and graupel. Downdraft observed at 340/57 BGS VOR at 2219.37 GMT, 1000 ft/min. updraft, then 500 ft/min. updraft, then 2000 ft/min. updraft, then 2500 ft/min. updraft. Some downdraft on north side. Exited at 2221.28 GMT at 18,500 ft. MSL (-8.7°C).

2nd Pass at 2225.40 GMT

Observation taken at 17,600 ft. MSL (-6.4°C) heading 200. Heavy graupel with good liquid water observed at 2227.10 GMT. At 2227.44 updrafts of 1500 ft/min. then 2500 ft/min. were recorded then 1000 ft/min. was observed. Exited at 2227.42 GMT at 18,400 ft. MSL (-7.1). Southwest side of cell located at 340/59 BGS VOR.

Aztec reported hard rain at base.

3rd Pass at 2231.34 GMT

Observation taken at 17,600 ft. MSL (-5.4) heading 030. Light precipitation water and graupel. 500 ft/min. updraft observed.

Precipitation was heavy with strong updrafts on 3rd and 4th pass. Activity weakening on 5th and 6th pass.

P-Navajo

1st Pass at 2221

Observation at 23,000 ft. MSL (-10) heading 070. Cell located at 340/55. Updrafts recorded at 300 to 2000 ft/min.

2nd Pass and seeding run at 2227 GMT

Observation at 23,000 ft. MSL (-10). Downdraft recorded at 1000 ft/min. for 15 seconds on northeast side with light rain. A 60 second 2000 ft/min. updraft with supercooled water was next recorded. Heavy graupel for 15 seconds was observed with light updrafts from 300 to 500 ft/min. prior to exit.

Aztec

Aircraft was sampling rain in target cloud. Observed 2000 ft/min. updraft then strong downdraft. Lots of lightning observed with some hail.

July 3, 1978 Debriefing Notes

Mission No. 7-P

Seed Mode: Cloud Base
Amount: 320 gms (AgI)
Rate: 4 (20 gm flares) per 45 seconds
Seed Time: 2336 GMT to 2339 GMT
Cloud Type: Isold growing cumulus
Cloud Location: 225/08 BGS VOR
Mission Aircraft: Cloud Physics and Aztec
Land Time: 0000 GMT

MRI

1st Pass at 2322.53 GMT

Observation taken at 17,200 ft. MSL (-3.4°C) heading 145. Good liquid water with no precipitation observed. Exited at 2323.24 GMT.

2nd Pass at 2331.05 GMT

Observation taken at 17,300 ft. MSL (-3.8°C) heading 280. Cell located at 220/18 BGS VOR. All water precipitation. 1 gm/m^3 of liquid water. Max updraft was 1000 ft/min. at 2332.01 GMT. Exited cloud 2332.11 GMT. 800 ft/min. recorded on northwest side of cell in clear air.

3rd Pass at 2334.43 GMT

Observation taken at 17,000 ft. MSL (-3.8°C) heading 110. Very high precipitation updraft at 1500 ft/min. At 2335.34 GMT a 1000 ft/min. downdraft for 10 seconds was recorded with snow and supercool water.

4th Pass at 2338.55 GMT

Observation taken at 17,800 ft MSL (-2.7 °C) heading 300. Encountered 500ft/min. downdraft at entry. Good graupel then mixed graupel and water then all water, about .8 gm/m^3. A 1500 ft/min. updraft was observed at exit at 2340.26 GMT at 17,100 ft. MSL (-4.6 °C).

5th Pass at 2324.10 GMT

Observation taken at 17,200 ft. MSL (-3.7°C) heading 110. A 1000 ft/min. updraft in possible new cell growth within old cell at 2343.08 GMT. Then downdraft with heavy precipitation, all water, at 2343.25 GMT, then 2000 ft/min. updraft at 2343.53 GMT, then 1000 ft/min. downdraft and exit at 2344.15 GMT at 17,800 ft. MSL (-6.2°C).

6th Pass at 2346.47 GMT

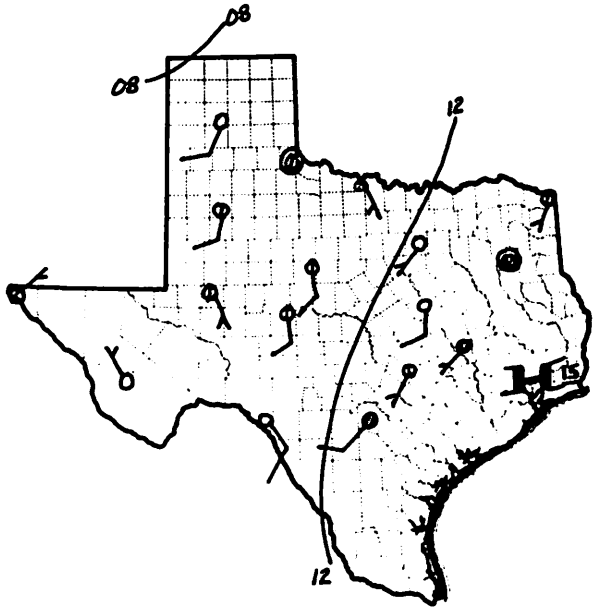
Observation taken at 17,100 ft. MSL (-3.9°C) heading 285. Observed small graupel then water and graupel mixed. At 2347.43 GMT encountered 3000 ft/min. updraft, then smooth ride to exit at 2348.26 GMT at 18,500 ft. MSL (-7.4°C).

Aztec

At 1836 GMT Aztec seeded at cloud base heading 230 in 500 ft/min. updraft. Cloud base was at 10,000 ft. MSL (9°C). Cell located at 225/08 BGS VOR. Seeding ended at 2339 GMT, aircraft was at 10,500 ft. MSL heading 140 with 1000 ft/min. updraft.

Aircraft sampled in rainshaft 10 to 15 minutes after seeding.

Summary
4 July 1978



1300 GMT

A SOMEWHAT DRIER SOUNDING THAN 3 JULY AND 500 MB SHT WV WHICH TRIGGERED HVY TSTMS OVER OP AREA LIES JUST N-E OF OP AREA. SUBSIDENCE IS NOW OVERRUNNING OP AREA AT 500 MB, AND ONLY SCT CU ARE EXPECTED.

EARLY A.M. CHARACTERIZED BY SCATTERED AC AND CI; THESE CLOUDS MOVING NE BY LATE MORNING, AND ACCAS SHOWING UP JUST E OF SNY BY 1600 GMT. FIRST CUMULUS OBSERVED ABOUT NOON, AND BY 1930 GMT CBS BEGAN DEVELOPING ALONG UPPER TROUGH JUST N-E OF AREA. ACTIVITY GREW RAPIDLY AND MOVED SLOWLY NE. SCATTERED CUMULUS OBSERVED OVER OP AREA THROUGHOUT FORECAST PERIOD.

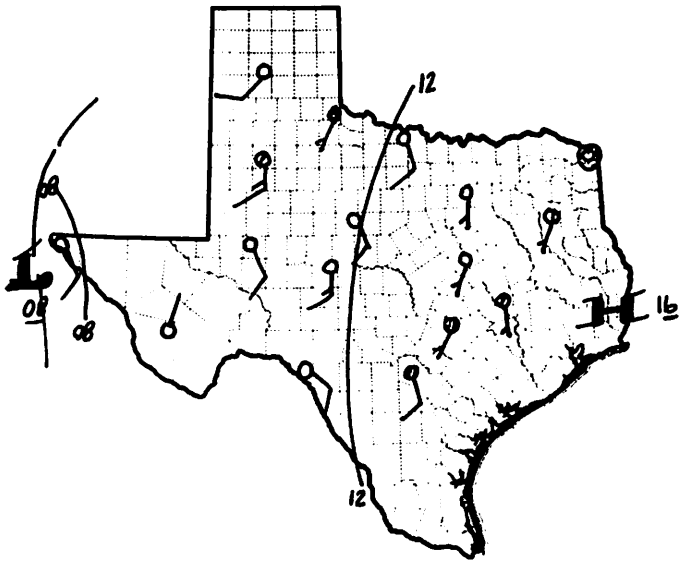
DAY CLASSIFIED A 3.

Weather Observations
4 July 1978

TIME (CDT)	
0750	SCT AC; BKN CI; T = 78°F; WIND 15009
0850	FEW AC E; SCT CI; T = 79°F; WIND 16511-19
0950	SCT CI: FEW AC E: T = 83°F; WIND 16510-17; FEW ACCAS ENE
1150	CLR FEW SML CU; T = 90°F; WIND 16014
1350	SCT CU; LG CB DSNT ENE, TCU DSNT N-NE; T = 94°F; WIND 17512G19
1555	SCT CU; LN CB DSNT N-NE AND ENE-E; CB TP WNW HRZN; T = 96°F; WIND 16010G16
1755	SCT CU; CBS DSNT NE E; T = 96°F; WIND 17010

FORECAST VERIFIED

Summary
5 July 1978



1300 GMT

500 MB RIDGING DOMINATES OPERATIONAL AREA. WEAK SFC FRONT LIES NEARLY STATIONARY FROM ERN COLORADO INTO CENTRAL N. MX. AMS OVER OP AREA MDTLY MOIST (1.09" PW). CONVECTIVE TEMP FCST BY GPCM TO BE 98°F.

SKIES CLEAR DURING A.M. HOURS, WITH ONLY A FEW CIRRUS ON THE N-E HROIZON. WINDS REMAINED SSE THROUGHOUT THE FORECAST PERIOD. FIRST CUMULUS OBSERVED AT 1650 GMT, T = 91°F. SCT CUMULUS PREVAILED REMAINDER FCST PERIOD, WITH CB BLOWOFF CIRROSTRATUS APPEARING EARLY EVENING FROM N. MX.

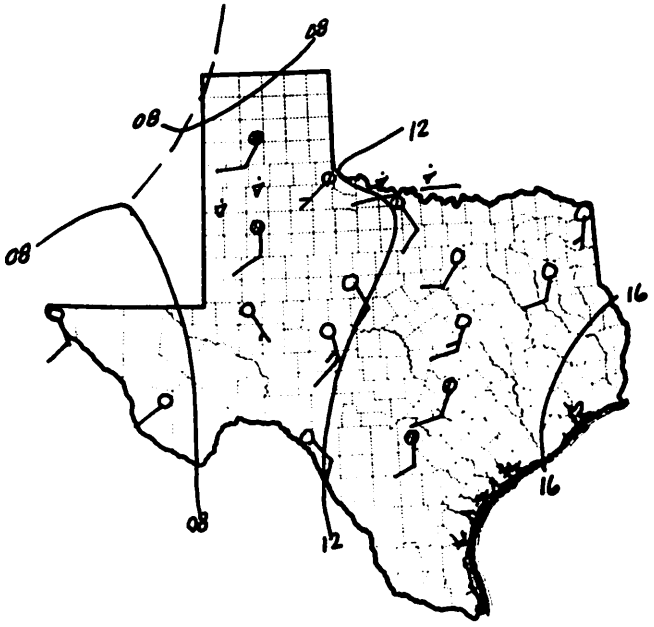
DAY CLASSIFIED A 3.

Weather Observations
5 July 1978

TIME (CDT)	
0800	CLR FEW CI N-E; T = 78°F; WIND 14009
0850	CLR FEW CI N-E HRZN; T = 79°F; WIND 16511
0950	CLR; T = 87°F; WIND 17008-15;CI NE HRZN
1150	FEW CU ALQDS; T = 91°F; WIND 16510-16
1255	SCT CU; T = 93°F; WIND 17512G19
1455	SCT CU; CB WSW HRZN; T = 97°F; WIND 15512G17
1655	SCT CUMULUS; CB DSNT SW; T = 98°F; WIND 17513
1850	FEW CU; SCT CS; CB TPS NW HRZN; T = 95°F; WIND 16010

FORECAST VERIFIED

Summary
6 July 1978



1300 GMT

PACIFIC SFC FRONT LIES STATIONARY FROM EASTERN COLORADO TO CENTRAL NEW MEXICO TO W OF ELP. A 500 MB SHORT WAVE LIES IN ERN N. MX. WITH ASSOCIATED MOIST COOL POOL WEST OF TROUGH. MOIST AMTS MDT (0.94" PW) AND AMS MDTLY STABLE (LI = -0.9).

SKIES REMAINED CLEAR THROUGHOUT THE FORECAST PERIOD, WIND AT SFC GENERALLY SE 10-15 KTS. A FEW CUMULUS FIRST NOTED AT 1850 GMT OBSERVATION, WITH SFC TEMP OF 91°F. A FEW CB WERE OBSERVED BY LATE AFTERNOON TO DSNT WNW-NW.

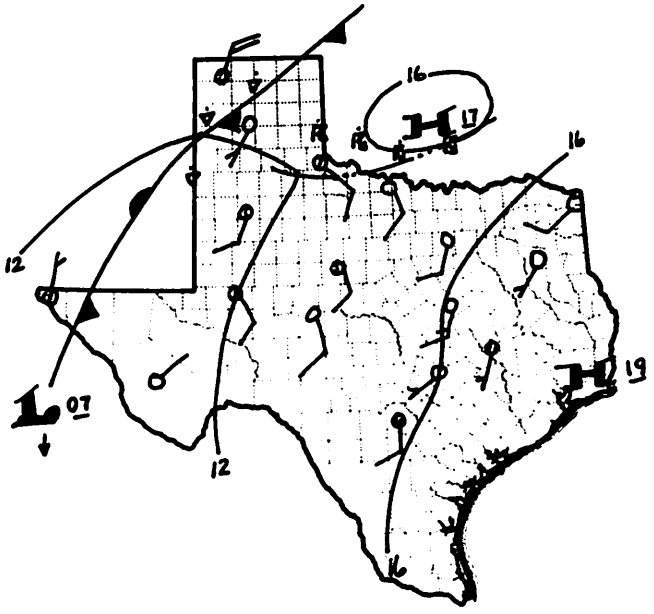
DAY CLASSIFIED A 1.

Weather Observations
6 July 1978

TIME (CDT)	
0800	CLR FEW CI N-NE HRZN; T = 78°F; WIND 15511
0900	CLR FEW CI-CS N-NE; T = 80°F; WIND 15012
0955	CLR FEW CI-CS N-E; T = 81°F; WIND 15012
1150	CLR FEW CI-CS NE-SE; T = 87°F; WIND 15013
1350	CLR FEW CU; T = 91°F; WIND 17012G17
1510	CLR FEW SML CU ALQDS; CB WNW HRZN; T = 96°F; WIND 13010
1600	CLR FEW SML CU ALQDS; CS SW W-NW HRZNS; T = 97°F; WIND 14014

FORECAST VERIFIED

Summary
7 July 1978



1300 GMT

A PACIFIC COOL FRONT IS MOVING SLOWLY ACROSS THE TEXAS PANHANDLE, AND BECOMES STATIONARY IN THE ROW AREA TO NR ELP. A MINOR SHT WV IS MOVING ACROSS WRN PANDL 500 MB RIDGE OVR OP AREA DOMINATES WEATHER PICTURE. FRONT NOT EXPTD TO EFFECT OP AREA. AMS DRY (.73" PW) AND STABLE (LI = -1.0). NO CUMULUS EXPTD TO DVLP.

A FEW SCT CIRRUS NOTED DURING A.M. IN OTHERWISE CLEAR SKIES. A FEW VERY SML CUMULUS NOTED MID-AFTERNOON AT SFC TEMPERATURE OF 96°F. A FEW CI-CS NOTED W-NW HORIZON AT DUSK.

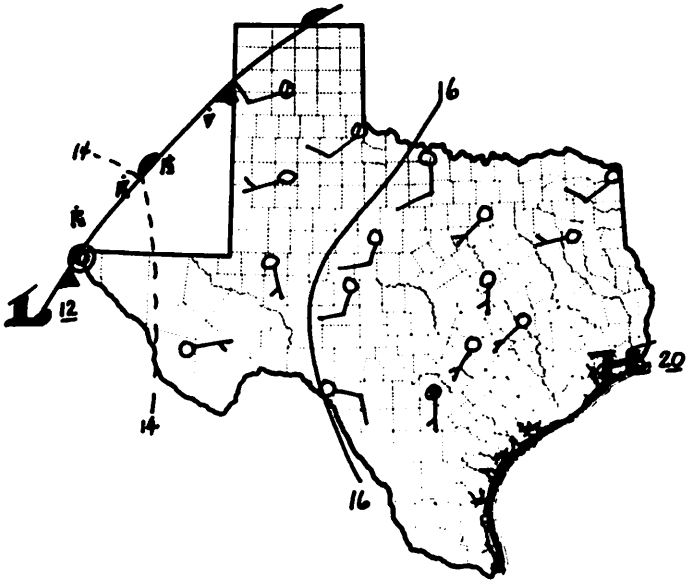
DAY CLASSIFIED A 1.

Weather Observations
7 July 1978

TIME (CDT)	
0755	SCT CI; T = 76°F; WIND 16011
0850	THN BKN CI; T = 79°F; WIND 17010G17
0950	SCT CI; T = 82°F; WIND 16510-16
1050	CLR FEW CI; T = 86°F; WIND 14007G17
1450	CLR FEW SML CU ALQDS; FEW CI N; T = 96°F; WIND 11005
1750	CLR FEW SML CU ALQDS; FEW CI-CS W-NW HRZN; T = 97°F; WIND 13010

FORECAST VERIFIED

Summary
8 July 1978



1300 GMT

AMS DRY AND STABLE TODAY, WITH 500 MB H CENTERED N OF MAF AND IN THE OP AREA. STG SUBSIDENCE OVER OP AREA, AND CONVECTIVE TEMP COMPUTED TO BE 103°F.

SKIES REMAINED CLEAR THROUGHOUT THE FORECAST PERIOD. NO CUMULUS OBSERVED, AND ONLY A FEW THN CIRRUS OBSERVED TO SOUTH AT DUSK.

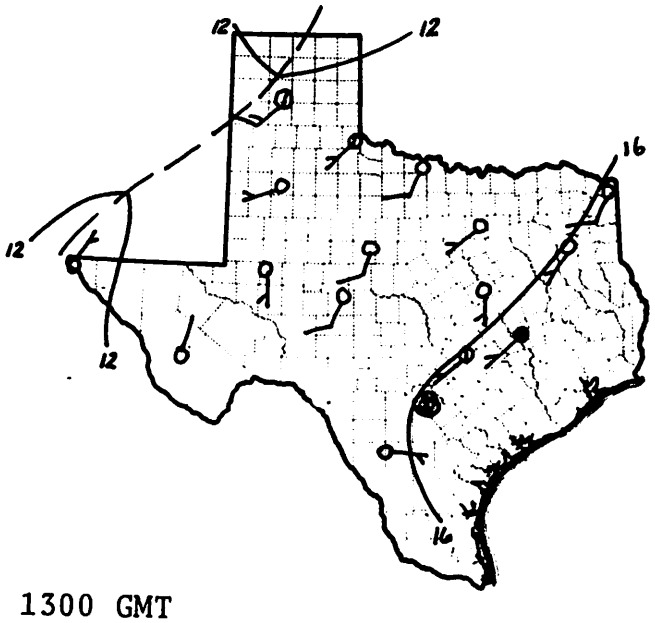
DAY CLASSIFIED A 1.

Weather Observations
8 July 1978

TIME (CDT)	
0800	CLR T = 76°F; WIND 15506
0855	CLR T = 79°F; WIND 16509
0950	CLR T = 82°F; WIND 19012
1050	CLR T = 85°F; WIND 16509
1355	CLR T = 93°F; WIND 18010
1550	CLR T = 99°F; WIND 16513G20

FORECAST VERIFIED

Summary
9 July 1978



1300 GMT

AMS MOST STABLE OF SEASON (LI = +5.0) AND ALSO DRIEST (0.50 IN PW). A CP FRONT IS DROPPING SSE FROM LOW IN CENTRAL KANSAS TO NR ACK TO PUB. 500 MB RIDGE EXTENDS FROM HIGH IN SE OKLAHOMA TO NEAR MAF.

SKIES REMAINED CLEAR THROUGHOUT FORECAST PERIOD, WITH EXCEPTION OF A VERY FEW SML AC BY EARLY EVENING, AND A FEW THIN CIRRUS.

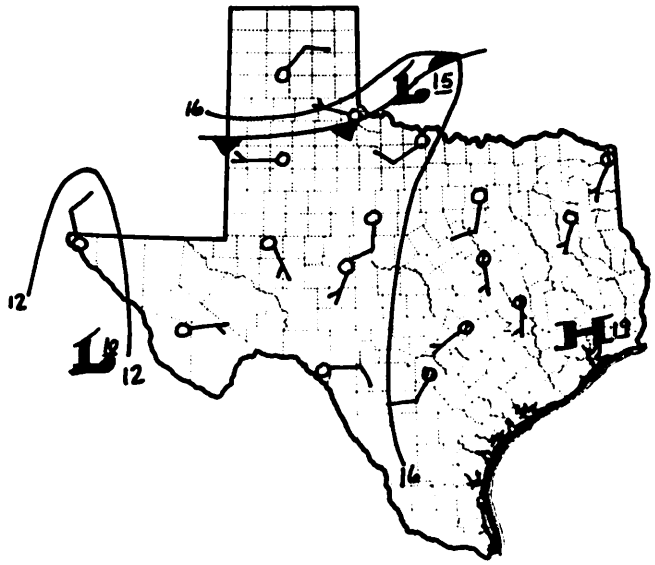
DAY CLASSIFIED A 1.

Weather Observations
9 July 1978

TIME (CDT)	
0800	CLR T = 76°F; WIND 15005
0900	CLR T = 79°F; WIND 18007
0950	CLR T = 82°F; WIND 19011
1055	CLR T = 87°F; WIND 18009
1150	CLR T = 91°F; WIND 15010
1455	CLR T = 96°F; WIND 18012G19
1755	CLR T = 98°F; WIND 16511; FEW THN CI S-SW
1955	CLR FEW SML AC; T = 98°F; WIND 17013; FEW THN CI

FORECAST VERIFIED

Summary
10 July 1978



1300 GMT

ANOTHER DAY CHARACTERIZED BY LIGHT WINDS ALOFT, DRY, STABLE AMS AND STRONG SUBSIDENCE. NO CONVECTION EXPECTED TO BE PRODUCED IN UPPER AIR RIDGE.

SKIES REMAINED CLEAR UNTIL NOON OBSERVATION, WHEN FIRST CUMULUS WAS OBSERVED (T = 89°F). SKIES WERE SCATTERED WITH CU THROUGHOUT REMAINEDER OF FORECAST PERIOD. A VERY FEW THIN CIRRUS LATE IN FORECAST PERIOD.

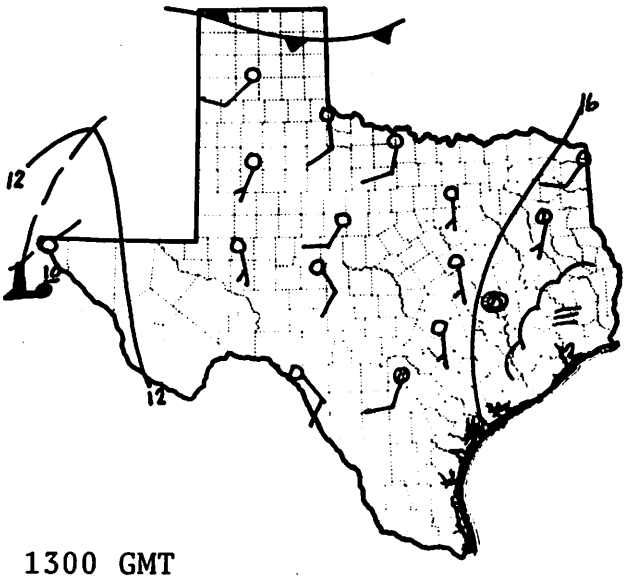
DAY CLASSIFIED A 3.

Weather Observations
10 July 1978

TIME (CDT)	
0750	CLR T = 76°F; WIND 14008
0900	CLR T = 79°F; WIND 16010
0955	CLR T = 83°F; WIND 17010
1055	CLR T = 86°F; WIND 15007
1150	CLR FEW SML CU; T = 89°F; WIND 16004
1450	SCT CUMULUS; T = 95°F; WIND 09003; FEW CI ABV; WIND DIR VRBL
1750	SCT CUMULUS; T = 97°F; WIND 11004; FEW CI

FORECAST VERIFIED

Summary
11 July 1978



1300 GMT

DRY, STBL AMS OVER OP AREA, WITH LARGE 500 MB HIGH OVER N. CENTRAL TEXAS. LIMITED MOISTURE (.8" PW) WILL HENDER SCT CU.

FIRST CUMULUS OBSERVED AT NOON OBSERVATION, WITH T = 93°F. SCT CUMULUS PREVAILED THE BALANCE OF THE FORECAST PERIOD.

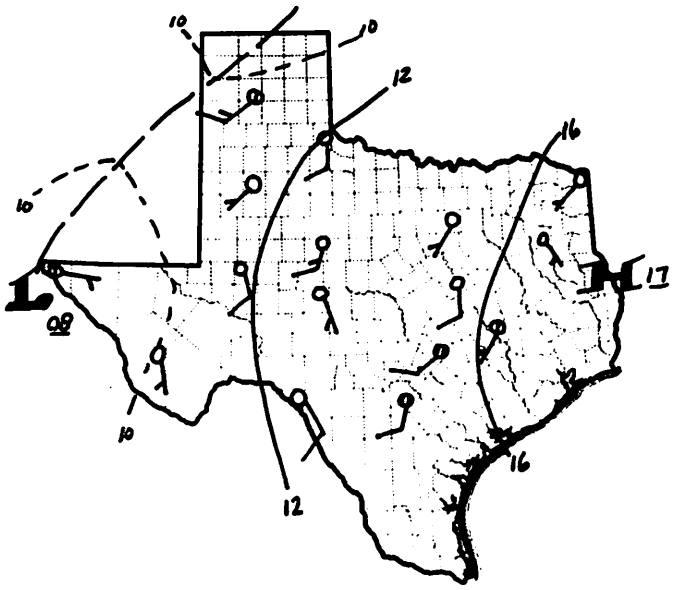
DAY CLASSIFIED A 3.

Weather Observations
11 July 1978

TIME (CDT)	
0800	CLR T = 78°F; WIND 16503
0855	CLR T = 79°F; WIND 19012
0955	CLR T = 83°F; WIND 19010
1150	FEW SML CUMULUS; CLR T = 89°F; WIND 18012
1355	SCT CUMULUS; T = 93°F; WIND 17510
1550	SCT CUMULUS; T = 95°F; WIND 16010
1755	SCT CUMULUS; T = 97°F; WIND 17013

FORECAST VERIFIED

Summary
12 July 1978



1400 GMT

DAY CHARACTERIZED BY A STABLE AMS WITH NEARLY NORMAL MOISTURE AND NO TRIGGER MECHANISM PRESENT. 500 MB RIDGING CONTINUES OVER OP AREA, WITH WEAK SURFACE TROUGH OVER CENTRAL NEW MEXICO.

MORNING WAS CLEAR, WITH FIRST CUMULUS NOTED AT NOON OBSERVATION ($T = 90^{o}F$). SCATTERED CUMULUS PREVAILED BALANCE OF FORECAST PERIOD, BECOMING CLEAR AGAIN BEFORE DUSK.

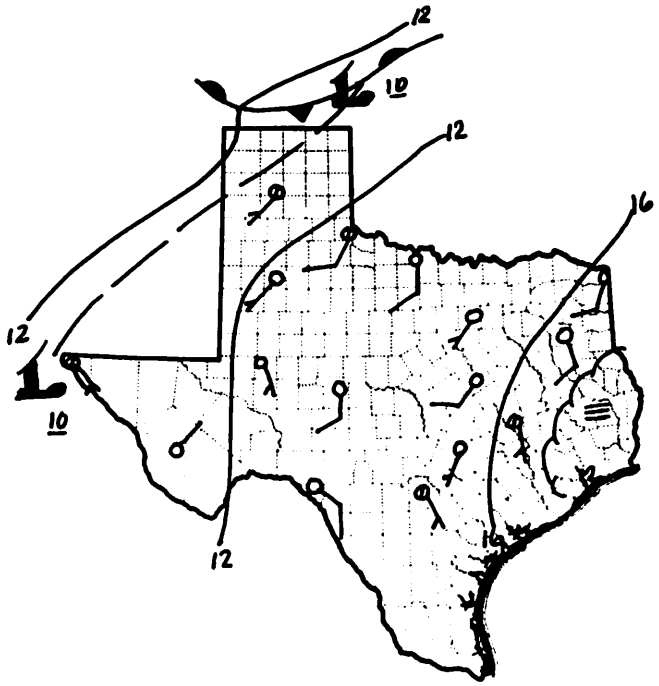
DAY CLASSIFIED A 3.

Weather Observations
12 July 1978

TIME (CDT)	
0800	CLR T = 76°F; WIND 16010
0950	CLR T = 82°F; WIND 17013
1050	CLR FEW AC NNW; T = 86°F; WIND 16513
1150	SCT CUMULUS; T = 90°F; WIND 16513
1500	SCT CUMULUS; T = 96°F; WIND 16510G20
1655	FEW CU ALQDS; T = 93°F; WIND 15012

FORECAST VERIFIED

Summary
13 July 1978



1300 GMT

OPERATIONAL AREA WEATHER DOMINATED ONCE AGAIN BY 500 MB RIDGE. AVERAGE LLM (10.36 GM/KG). SCATTERED CUMULUS EXPECTED OVER OP AREA. FRONT LIES ACROSS KANSAS AND SRN COLORADO.

FIRST CUMULUS OBSERVED AT 1100 OBSERVATION, AND SCATTERED CUMULUS WERE OBSERVED THE REMAINDER OF THE AFTERNOON. NO SIGN OF DEEP CONVECTION.

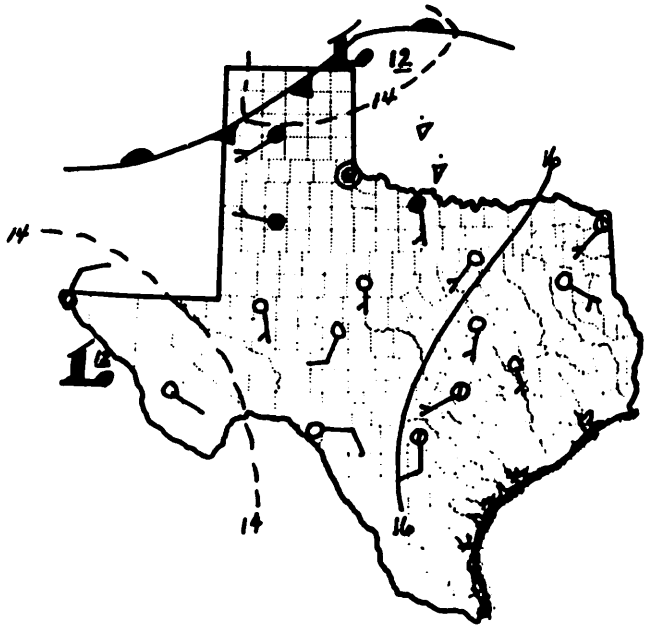
DAY CLASSIFIED A 3.

Weather Observations
13 July 1978

TIME (CDT)	
0755	CLR T = 78°F; WIND 16009
0900	CLR T = 81°F; WIND 17009G14
0950	CLR T = 83°F; WIND 18015
1055	CLR T = 87°F; WIND 17515
	CLR FEW SML CU; T = 90°F; WIND 18015
1550	SCT CUMULUS; T = 91°F; WIND LV

FORECAST VERIFIED

Summary
14 July 1978



1300 GMT

STNRY FRONT LIES IN NRN OKLAHOMA, TEXAS PANHANDLE, AND INTO CENTRAL NEW MEXICO. AMS IS ABOVE NORMAL IN MOISTURE (PW = 1.18") BUT RIDGING IS - IF ANYTHING - INCREASING OVER OPERATIONAL AREA.

SCATTERED CUMULUS FIRST NOTED AT NOON SOUNDING, AND SCATTERED CUMULUS - APPARENTLY CAPPED BY SUBSIDENCE - PREVAILED BALANCE OF FORECAST PERIOD.

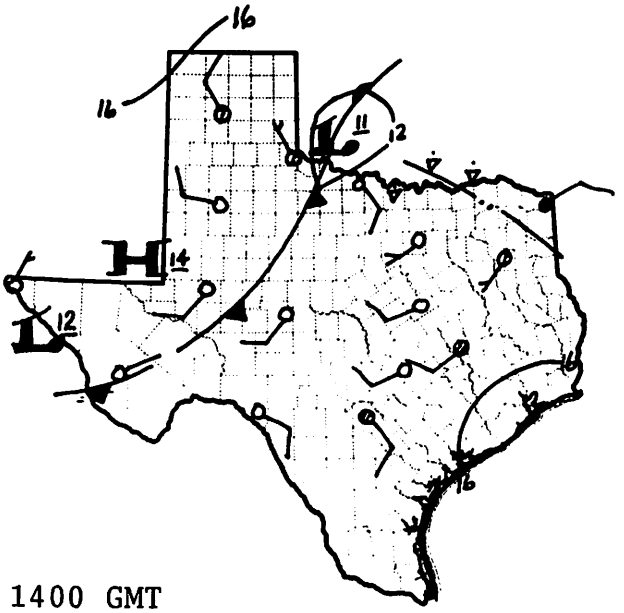
DAY CLASSIFIED A 3.

Weather Observations
14 July 1978

TIME (CDT)	
0755	SCT CI; CI NW-NNE; T = 77°F; WIND 16007
0950	SCT CI; CI NW-NE: T = 84°F; WIND 21011
1150	THN SCT CU; CI NW-NE: T = 88°F; WIND 17511
1350	SCT CUMULUS; SCT CIRRUS; T = 92°F; WIND 215V06; WNDDIR 190V240
1500	SCT CU; BKN CI; T = 96°F; WIND 14007
1655	SCT CU; SCT CI; T = 98°F; WIND 13008

FORECAST VERIFIED

Summary
15 July 1978



1400 GMT

DAY CHARACTERIZED BY 500 MB RIDGE UNDERRIDDEN BY 700 MB SHT WV. WITHIN A MODERATELY MOIST (PW = 1.11") AND STABLE (LI = +1.0) MAS. NO COMPUTER PRODUCTS AND NO RAWINSONDE DATA WERE AVAILABLE THEREFORE NO RELIABLE VERTICAL MOISTURE PROFILES WERE AVAILABLE. A VERY WEAK AND DIFFUSE SURFACE FRONT LIES FROM A LOW IN SW OK TO CDS, W OF ABI AND SVT AND NEAR BAS.

SKIES CLEAR THROUGHOUT A.M. HOURS. AT NOON OBSERVATION, A LINE OF SML ACCAS, ASSOCIATED APPARENTLY WITH THE MID-LEVEL SHT WV, WERE VSBL N-NE OF STATION. ALSO, A FEW SML CUMULUS WERE OBSERVED TO SOUTH-SE, WITH T = 92°F. BY MID-AFTERNOON, SCT CUMULUS W/CU CONG N-NE; T = 103°F OBSERVED. 500 MB RIDGE PRODUCING EXTREME SURFACE HTG. LATE AFTERNOON COMBINATION OF EXTM HTG AND MID-LEVEL SHT WV SET OFF A BROKEN LINE OF TSTMS

FM NE OF SNYDER TO S OF LBB. MVMT SW. THIS IS JUST ALG THE HIPLEX BORDER. ACTIVITY INCREASED IN INTENSITY AND COVERAGE ALG LINE. CLOUD BASES, SINCE ACTIVITY GREW OUT OF ACCAS, WERE AT 13000'. EARLIER, CUMULUS WERE OBSERVED: THESE CELLS BEING CAPPED BY ACSL. SFC HTG BROKE THROUGH INVERSION LATER IN AFTN. ACTIVITY DSPTD AT DUSK N OF MIDLAND.

DAY CLASSIFIED A 6.*

* NON-HIPLEX CRITERIA ACTIVITY, IE. CLD BASE > 12000'

Weather Observations
15 July 1978

TIME (CDT)	
0805	CLR T = 77°F; WIND 18004
0900	CLR FEW CI N-NE; T = 81°F; WIND 24004; WSHFTG GRDLY
0955	CLR T = 85°F; WIND 22013
1155	CLR LN SML ACCAS NNW-NE; SML CU S-SE; T = 92°F; WIND 28006
1400	SCT CUMULUS; FEW ACCAS-ACSL ALQDS; T = 100°F; WIND 02005; WNDDIR 000 VBL 07005G11 KTS.
1500	SCT CU; FEW CU CONGESTUS N-NE; T = 103°F; WIND 02009
1555	SCT CU; SML CB DSNT NE; CU CONG N-NE; T = 105°F; WIND 05006
1755	SCT CUMULUS; LN CB BLDG NW-N-NE MVG SW; RWU NE; T = 104°F; WIND 02003
1900	SCT CU-AC; BKN CS; CB DSPTG NW-NE; RWU NW; VIRGA N; WIND 01005

FORECAST BUSTED*

* ACTIVITY NOT HIPLEX CRITERIA

TEXAS HIPLEX 1978 AIRCRAFT DATA

DATE 7 /15 / 78 FLT. # 1 MISSION NO. _____

A/C CREW A. Roberts, E. Lobl, D. Suder

TAKE-OFF TIME (CDT) 1805 LAND TIME (CDT) 1945

ADVISED POSITION _____

TEMP PROFILE (1000 Ft.)

	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
ASDG					24.6	21.3	18.4	15.6	11.0	9.1	7.0		1.2	-1.0				
DSDG																		

TIME TO -5°C (Min) _____ TIME TO -10°C (Min) _____

TIME TO ADVISED POSITION: _____ (Min)

MISSION DATA

TURRET #	PENT TIME (CDT)	GM AgI	ALT (Ft)	AMB TEMP (°C)	ACFT HDG	TURRET LOC (VOR/DME)	CLD PENT SPD (kts)	CRUISE SPEED (kts)	AgI DROP INT (sec)	UPD (Ft/min)	TURB
pass 3	190113		16	-1.9	030	/		good lwc		+500	
along line	190223 190500	out	16	-1.4	120	/		grpl, small		+500	
						/				+600 at	260/30
	15 min in cloud					/		5 sec +	1000 +1000	238/30	
Intercomparison	193500					/					
						/					
There were quite a few precip coves. At our altitude we had graupel and small											
water drops. Nothing vigorous. We must have gone out too late and clouds were											
dissipating. Many times ground could be seen from 16k ft even though we were in											
cloud. It seems that with the heating diminishing, the clouds were dissipating.											
some rain did reach ground.						/					
All equipment functioned.						/					
						/					
						/					
						/					
						/					

P-Navajo

TEXAS HIPLEX 1978 AIRCRAFT DATA

DATE 7/15/78 FLT. # _____ MISSION NO. _____

A/C CREW Alan, Bruce

TAKE-OFF TIME (CDT) 1810 LAND TIME (CDT) _____

ADVISED POSITION NE of Big Spring

TEMP PROFILE (1000 Ft.)

	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
ASDG	37	31	29							8								
DSDG							17		9	8								

TIME TO -5°C (Min) _____ TIME TO -10°C (Min) _____

TIME TO ADVISED POSITION: _____ (Min)

MISSION DATA

TURRET #	PENT TIME (CDT)	GM AgI	ALT (Ft)	AMB TEMP (°C)	ACFT HDG	TURRET LOC (VOR/DME)	CLD PENT SPD (kts)	CRUISE SPEED (kts)	AgI DROP INT (sec)	UPD (Ft/min)	TURB
1	1825		7.2	21	310	295/ 18			Mod rain	-1 to -1.5	
2	1828					290/ 25				+1 K	
3	1833				300	305/ 27				+1 K	
4	1839					295/ 27				+1.5	
5	1854					270/ 30				+1 K	
6	1911					270/ 37			Light rain	-.5K	
						/					
						/					
						/					
						/					
						/					
						/					
						/					
						/					
						/					
						/					

AIRCRAFT CLOUD AND WEATHER OBSERVATIONS

TEXAS HIPLEX 1978

DATE 7-15-78 MISSION NO. _____ AIRCRAFT TYPE _____

TIME (CDT)	OBSERVED PHENOMENA
1812	Strong updraft NE of Webb
1815	230/4 light rain observed w/dust and hazy to North
1827	Rain shaft in shape of a horse shoe; blowing dust ahead of
	rain shaft in similar shape. Rain shaft made up of Mod.
	to large rain drop sizes w/small graupel. Cloud to ground
	lightning present but not frequent.
1833	Rain shaft had milky white appearance. Content of shaft
	was large droplets w/graupel.
1834	Heavy graupel encountered
1834	Alt. 12.5-13K cloud bases were smooth, Temp. 8°C

OBSERVER Bruce

July 15, 1978 Debriefing Notes

MRI cloud physics aircraft and the Aztec took off at 2305 GMT Cloud development was very isolated and short lived.

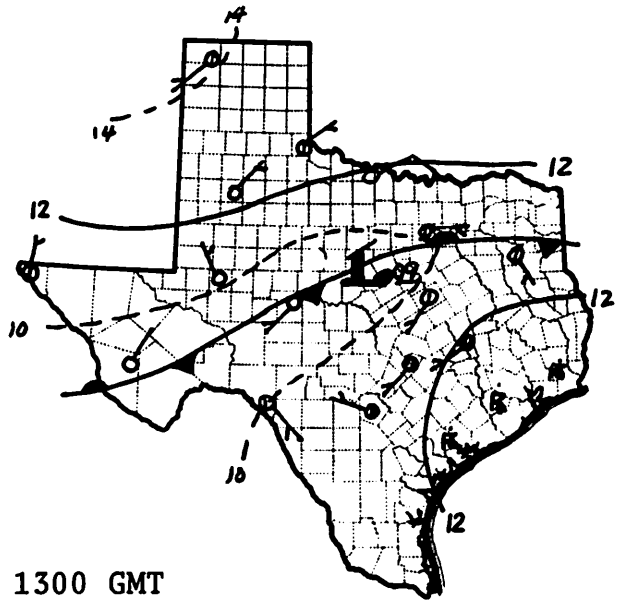
MRI made a few passes through cells located in the Lemesa, Texas area. At0001.13 GMT MRI made a penetration at 16,000 ft. MSL (-1.9°C) heading 030. Good liquid water (∿1 gm/m^3) with 500 ft/min. updraft. Exited cloud at 0002.23 GMT.

At 0005 GMT MRI aircraft penetrated a series of cells along a line. Aircraft was in cloud for 15 minutes, however, the line was spotty and the ground could be seen at times. Some graupel was observed with updrafts ranging from 500 ft/min., then to 600 ft/min. and then 1000 ft/min. at 238/30 BGS VOR. Cells were short lived and a mission was not declared.

The Aztec followed the MRI aircraft on climb out and attempted to maintain visual. At 2327 GMT the Aztec penetrated a heavy rainshaft located at 290/25 BGS VOR. Rain shaft was shaped like a horseshoe and rain was reported within the entire horseshoe area. Aircraft encountered heavy graupel. Strong updrafts were recorded from 1000 to 1500 ft/min. away from the cell.

Both aircraft joined up for an intercomparison of instruments.

Summary
16 July 1978



1300 GMT

DAY CHARACTERIZED BY LACK OF LLM IS OVERALL DRY (PW = 0.78") AMS; AMS ALSO QUITE STABLE (LI = +2.0). 500 MB HIGH REMAINS NW OF OPERATIONAL AREA, RIDGING BACK OVER AREA. SFC FRONT LIES ACROSS E TX TO A LOW IN CENT TX SW TO N OF DRT. A FEW ACCAS ARE BEING OBSERVED OVER OP AREA.

EARLY IN FORECAST PERIOD HIGH BASED CU (OR LOW AC) WERE OBSERVED, WITH T = 100°F. BY LATE AFTERNOON, SKIES REMAINED BASICALLY CLEAR, WITH ACCAS THINLY DISPERSED, SOME WITH MDT DEPTH. NO VIRGA OBSERVED.

DAY CLASSIFIED A 3.*

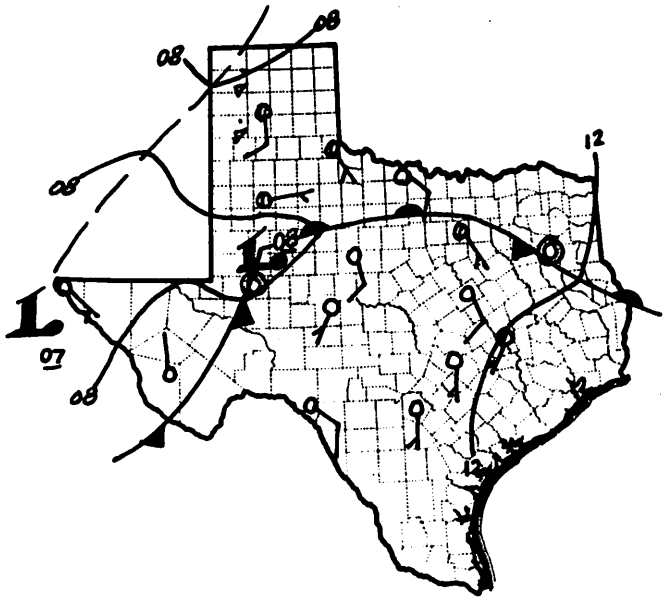
* CLOUD BASES IN EXCESS OF 12000' AGL

Weather Observations
16 July 1978

TIME (CDT)	
0755	SCT CIRRUS; HAZE LYR SW-W-NW; T = 78°F; WIND 36009
0855	THN SCT CIRRUS; T = 82°F; WIND 02012
0950	SCT CI; AC N-NE; T = 87°F; WIND 03510G20
1150	SCT AC; FEW CI; T = 94°F; WIND 06010
1400	FEW CU-AC; FEW ACCAS ALQDS; T = 100°F; WIND 07009G15
1700	FEW CU-AC; ACCAS ALQDS; FEW SML ACSL; T = 104°F; WIND 08013
1755	CLR FEW AC-ACCAS, SW-W; T = 102°F; WIND 04011

FORECAST VERIFIED

Summary
17 July 1978



1300 GMT

AIRMASS QUITE DRY IN LOW LEVELS, AND MDTLY STABLE. A WK WM FRONT LIES FROM SE TEXAS TO OPERATIONAL AREA. FRONT IS PRODUCING MID-LEVEL CLOUDINESS (AC AND ACCAS), BUT VERY LITTLE LLM EXISTS. FRONT EXPTD TO MV N OF OP AREA BY EARLY FORECAST PERIOD - UPPER LEVEL RIDGING CONTINUES OVER OP AREA.

SCATTERED ALTOCUMULUS WITH SOME ACCAS OBSERVED THROUGHOUT FORECAST PERIOD. 500 MB RIDGING DOMINATED AMS, WITH ACCAS BEING CAPPED DURING LATE AFTERNOON, PRODUCING ACSL.

AFTERNOON T MAX = 106^{o}F, AND A FEW SML LOWER CUMULUS APPEARED. NO DEEP CONVECTION OBSERVED.

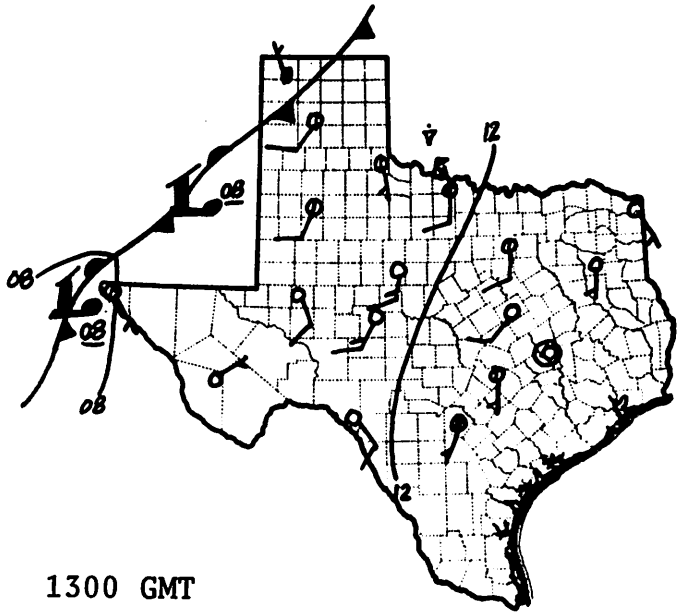
DAY CLASSIFIED A 3.

Weather Observations
17 July 1978

TIME (CDT)	
0755	CLR FEW AC NW NE; ACCAS NE; FEW CI ALQDS; T = 80°F; WIND 15006
0850	SCT AC; FEW CI NE-E; T = 83°F; WIND 16505
0950	SCT AC; FEW ACCAS ALQDS; FEW CI E-S HRZN; T = 87°F; WIND 18509
1055	SCT AC; FEW ACCAS SW-OVHD-NE; CC OVHD; T = 93°F; WIND 21007
1200	SCT AC; FEW CI; ACCAS ALQDS; T = 97°F; WIND 20004
1350	SCT AC; FEW CC-CI OVHD; ACCAS ALQDS; T = 101°F; WIND 13001
1455	SCT AC; FEW LWR CU; FEW ACCAS ALQDS; FEW ACSL W-N; T = 104°F; FEW CI-CC; WIND LV
1550	SCT AC-HIGH CU; FEW ACSL-ACCAS ALQDS; CB NW DSNT; T = 102°F; WIND 16505
1650	SCT CU-AC; ACSL TPG AC-CU; T = 104°F; WIND 04504; FEW ACCAS DSNT N

FORECAST VERIFIED

Summary
18 July 1978



1300 GMT

AIRMASS AGAIN WARM AND QUITE DRY IN LOW LEVELS. MID-LEVEL, AS DURING 17 JULY, QUITE MOIST. ACCAS AND AC COMMON OVER OP AREA, AS A WEAK SFC FRONT LIES STNRY FROM CENT KS TO TX PNDL AND INTO N. MX. W OF ROW AND ELP. 500 MB RIDGE REMAINS OVER OP AREA BUT HAS WEAKENED SOMEWHAT.

SCATTERED AC AND CU WITH SOME ACCAS SUMMARIZE THE AFTERNOON OBSERVATION. NO VIRGA OBSERVED FROM ACCAS. A FEW CIRRUS OBSERVED NEAR NW PCTNS AT DUSK. NO SIGNIFICANT CONVECTION OVER OP AREA.

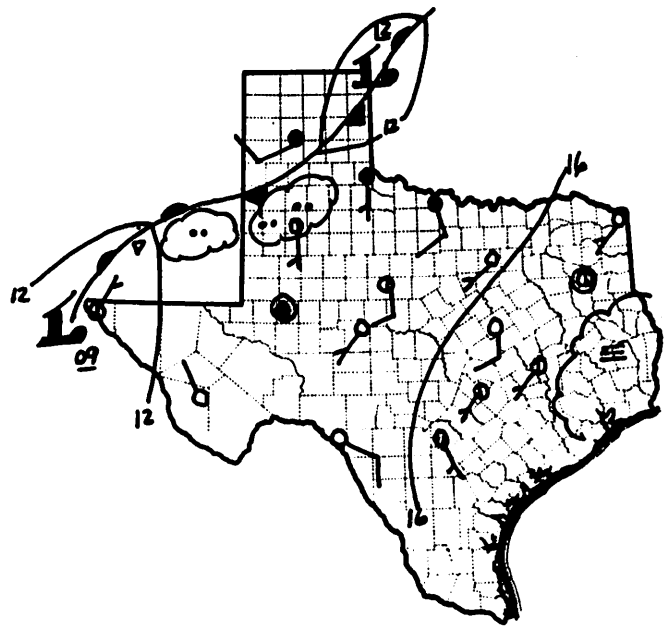
DAY CLASSIFIED A 3.

Weather Observations
18 July 1978

TIME (CDT)	
0755	SCT CI; AC-AS NW NE; SML ACCAS NW NE; T = 79°F; WIND 17009
0900	CLR FEW CI WNW-NE; ACCAS DSNT N; T = 82°F; WIND 17015
0955	SCT CC; FEW AC-ACCAS N-NE; LN ACCAS N-E; T = 85°F; WIND 18008-18
1055	SCT CC; AC-ACCAS NW-NE; T = 89°F; WIND 17514
1155	CLR ACCAS NW-NE; T = 93°F; WIND 18015
1350	FEW SML CU AC-ACCAS W-N; T = 98°F; WIND 15012; FEW CI E-SE
1450	SCT CU; FEW AC-ACCAS DSPTG NW-NE; FEW CI S DSNT NW; T = 100°F; WIND 13008

FORECAST VERIFIED

Summary
19 July 1978



1300 GMT

A PACIFIC FRONT LIES FROM A LOW IN THE CENTRAL PLAINS TO A LOW IN THE GAGE AREA TO N OF PVW TO CVS AND HMN. A FEW RW AND TRW OCCURRING ALONG FRONT. AMS HAS AVG MOISTURE AND IS STABLE. RIDGE CONTINUES OVER AREA. WK SHT WV IN WRN OK.

BROKEN CIRRO FORM CHARACTERIZED MOST OF THE MORNINGS OBSERVATIONS, AND FIRST CUMULUS NOTED AT 1600 GMT SOUNDING. SCT CUMULUS NOTED BY 1900 GMT.

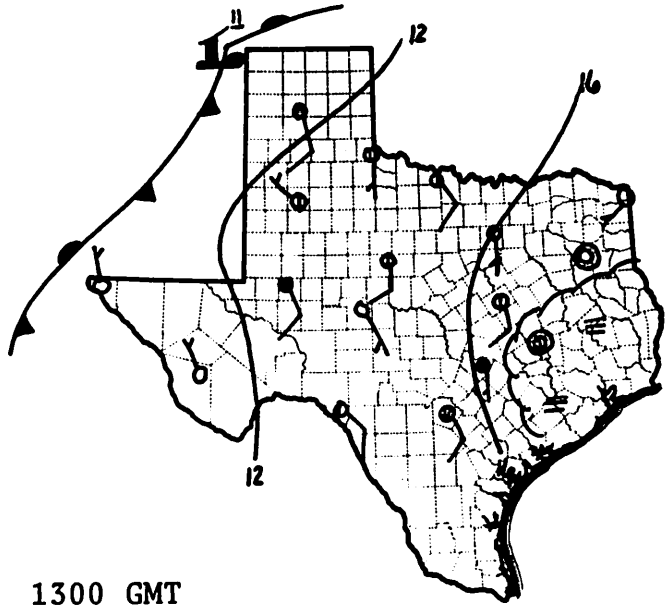
DAY CLASSIFIED A 3.

Weather Observations
19 July 1978

TIME (CDT)	
0755	BKN CI-CS; T = 73°F; WIND CALM
0905	OVC CI-CS; BINOVD ALQDS; T = 76°F; WIND 15012
1000	BKN CI-CS; T = 81°F; WIND 17010
1105	FEW CU SE-SW; THN AS W; ⓓ CI-CS; T = 85°F; WIND 18012
1200	CU SE-SW; ⓓ CI-CS; T = 90°F; WIND 19010
1400	SCT CU; SCT CI-CS; FEW ACCAS DSNT NW-N; T = 94°F; WIND 13013
1450	FEW SML CU ALQDS; SCT CI-CS; T = 95°F; WIND 14012
1605	FEW SML CU; SCT CI; T = 96°F; WIND 13006

FORECAST VERIFIED

Summary
20 July 1978



1300 GMT

FRONT LIES FROM CENTRAL KANSAS TO NE N. MX. TO W OF ELP. 500 MB SHT WV IN TEXAS PANHANDLE MOVING NE. INVERTED TROUGH IS SE TEXAS MOVING SLOWLY W. 500 MB RIDGE BREAKING DOWN, AND MOISTURE AMNTS HIGH OVER OP AREA. AMS QUITE UNSTBL, AND LARGE POSITIVE AREA EXISTS ABV STG MID-LEVEL INVERSION. INVERSION NOT EXPTD TO BREAK.

FIRST CUMULUS NOTED AT ABOUT 1615 GMT;AT A TEMP OF 89°F .EARLY A.M., HOWEVER, THICK CS REMAINS FROM PREVIOUS DAY WERE PRODUCING VIRGA AROUND AREA. THESE CLOUDS MOVED NE BEFORE LATE MORNING. CUMULUS CONGESTUS NOTED BY 1800 GMT, AND WITH HIGH LIQUID WATER IN-CLOUD, A VERY FEW RW--WERE SPOTTED OVER OP AREA (CLOUD DEPTH ABOUT 6-7 K') UNDER CAPPING INVERSION. BY LATE AFTERNOON A FEW CBS DEVELOPED, BREAKING THE INVERSION, BUT WERE NORTH OF OP AREA.

DAY CLASSIFIED A 5.

Weather Observations
20 July 1978

TIME (CDT)	
0755	SCT AS-AC; BKN CC-CS; VIRGA WNW-N; T = 78°F; WIND 17011
0955	SCT AS-AC; SCT CI-CS-CC; FEW VIRGA N; T = 82°F; WIND 19013
1100	SCT AS; FEW AC NW; FEW CS; T = 88°F; WIND 16014
1150	CU ALQDS; FEW AS S-SW-NW; T = 90°F; WIND 18508
1315	SCT CUMULUS; FEW CU CONG S N; T = 92°F; WIND 16010; FEW AS S N
1350	SCT V BKN CUMULUS; SCT AS; CU CONG ALQDS; T = 93°F; WIND 12016G21
1415	BKN CUMULUS; FEW AS; FEW TCU/RW--S DSNT NNE; T = 93°F; WIND 12009G17
1455	SCT CU; SCT AS; FEW CU CONG-SML TCU ALQDS; RW--NW; T = 94°F; WIND 13514
1655	SCT CU; ⓫ AC-AS; FEW CU CONG ALQDS; TCU W-NW; CB DSNT SSE AND NNW-NNE; VIRGA SW; RWU DSNT NW; T = 94°F; WIND 18509

FORECAST BUSTED

TEXAS HIPLEX 1978 AIRCRAFT DATA

DATE 7/20/78 FLT. # 1 MISSION NO. 10

A/C CREW A. Roberts, E. Lobel, D. Suder

TAKE-OFF TIME (CDT) 1500 LAND TIME (CDT) 1715

ADVISED POSITION _____

TEMP PROFILE (1000 Ft.)

	3	4	5	6	7	8	9	10	11.1	12	13	14	15	16	17	18	19	20
ASDG	33.7	30.3	27.1	23.5	20.2	17.5	14.4	10.9	7.9	6.8	4.1	2.8	.5	-1.2	-3.7	-4.5		
DSDG																		

TIME TO -5°C (Min) 40 TIME TO -10°C (Min) _____

TIME TO ADVISED POSITION: _____ (Min)

MISSION DATA

TURRET #	PENT TIME (CDT)	GM AgI	ALT (Ft)	AMB TEMP (°C)	ACFT HDG	TURRET LOC (VOR/DME)	CLD PENT SPD (kts)	CRUISE SPEED (kts)	AgI DROP INT (sec)	UPD (Ft/min)	TURB
			9.7	11.2	bases	/					
1.1	155354		17.8	-4.0	015	302 / 29	115	snow	307/34		
	155530		17.9	-5.0		out /					
2.1	160002		18	-4.7	130	324 / 26		supercooled precip.		water +1000	
	160053		out			/					
2.2	160358		17.9	-4.6	300	325 / 25					
	160507		17.7	-4.8		out /					
			moderate shower with lightning at the base								
2.3	160732		17	-3.0	120	/		graupel			
	160 08 ?					out /					
2.4	161213		17	-1.8	310	/		light snow		+500	
	161317		17	-3.2		out /					
2.5	1616 ?		17	-2.5	150	/	110				
	161745					out /					
summary	160800	to	160840			/					
	ground	dew	point	14.1,	temp.	16.3 /					

AIRCRAFT CLOUD AND WEATHER OBSERVATIONS

TEXAS HIPLEX 1978

DATE 7-20-78 MISSION NO. 10 AIRCRAFT TYPE MRI Navajo

TIME (CDT)	OBSERVED PHENOMENA
	Penetrated some clouds on the way up. A few had updrafts of
	1000 ft/min. Chose the test cloud because it was isolated
	and good looking. Found the updraft on the first pass.
	After that it was mostly downdraft and light precip.
	Clouds in general were developing and dissipating fast.

OBSERVER Lobel

AIRCRAFT CLOUD AND WEATHER OBSERVATIONS

TEXAS HIPLEX 1978

DATE 7-20-78 MISSION NO. 10 AIRCRAFT TYPE Aztec

TIME (CDT)	OBSERVED PHENOMENA
1500	T/O
1516	Sampled Rw with MRI Navajo at position 250/15
1611	Sampled target cloud Rw with cloud to ground lightning
1614	Cloud to ground lightning
1615	Cloud to ground lightning except intensity decreased and no
	other lightning noted
1617	No other lightning noted
1618:30	No other lightning noted
RTB	1730

OBSERVER _____

TEXAS HIPLEX 1978 AIRCRAFT DATA

DATE 7/20/78 FLT. # _____ MISSION NO. _____

A/C CREW Chuck, Henry

TAKE-OFF TIME (CDT) 1500 LAND TIME (CDT) 1730

ADVISED POSITION _____

TEMP PROFILE (1000 Ft.)

	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
ASDG																		
DSDG																		

TIME TO -5°C (Min) _____ TIME TO -10°C (Min) _____

TIME TO ADVISED POSITION: _____ (Min)

MISSION DATA

TURRET #	PENT TIME (CDT)	GM AgI	ALT (Ft)	AMB TEMP (°C)	ACFT HDG	TURRET LOC (VOR/DME)	CLD PENT SPD (kts)	CRUISE SPEED (kts)	AgI DROP INT (sec)	UPD (Ft/min)	TURB
						/					
						/					
						/					
						/					
						/					
						/					
						/					
						/					
						/					
						/					
						/					
						/					
						/					
						/					
						/					
						/					

P-Navajo

TEXAS HIPLEX 1978 AIRCRAFT DATA

DATE 7/20/78 FLT. # 1 MISSION NO. 10

A/C CREW Alan Bruce

TAKE-OFF TIME (CDT) 1455 LAND TIME (CDT) _____

ADVISED POSITION _____

TEMP PROFILE (1000 Ft.)

Time	G		3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1455	33	ASDG	30	29	26	24	21	19	16	12	10	9	4	5	0	0	-3	-4	-4	-5	-10
1640	31	DSDG		27				15	14/11	10	8	6/6	5	4	2	0	-1	-1	-3	-5	-6

TIME TO -5°C (Min) 1533 TIME TO -10°C (Min) 1536

TIME TO ADVISED POSITION: _____ (Min) Position 090/25

MISSION DATA

TURRET #	PENT TIME (CDT)	GM AgI	ALT (Ft)	AMB TEMP (°C)	ACFT HDG	TURRET LOC (VOR/DME)	CLD PENT SPD (kts)	CRUISE SPEED (kts)	AgI DROP INT (sec)	UPD (Ft/min)	TURB
P1	1534		20.3	-5	190	290 / 20.4					
P2	1543		21.4	-10	145	280 / 24.4					
P3	1546		21.8	-10	030	285 / 24.8					
P4	1550		22.3	-9	010	305 / 28.1					
P5	1554		20.0	-9	150	315 / 30					
P6	1558		20.0	-10	120	305 / 28.8					
P7	1603		23.0	-14	085	320 / 21.1					
P8	1606		23.0	-13	090	325/ 25.4					
P7-S	1609	-10	23.6	-13	190	330 / 29.6	Turret seeded				
P9	1614		23.0	-11	245	315 / 20					
P9-II	1616		23.0	-11	65	315 / 20					
P10	1620		23.5		090	330 / 30.1					
P11	1629		22.5	-10	250	290 / 38.8					
P12	1630		22.0	-9	160	280 / 38.5					
P13	1632		22.0	-9	180	270 / 36.3					
P14	1638		21.6	-9	090	270 / 22.4					

AIRCRAFT CLOUD AND WEATHER OBSERVATIONS

TEXAS HIPLEX 1978

DATE 7-20-78 MISSION NO. 10 AIRCRAFT TYPE P-Navajo

TIME (CDT)	OBSERVED PHENOMENA
1455	Cu in all quads; obstructing sky 90%
1506	090/5 Cu Med surrounded by small Cu
1508	030/6.7 Cloud base 10.3 K, Temp 12°C
1510	010/9.9 Light Verga with small drops some Cu in area with good development about 6-7K of growth
1512	015/15.7 Verga
1515	0°C Altitude reached
1517	Clouds in Area pushing 19-20K development well defined.
1520	330/12.7 Graupel shaft in cloud for 7 sec.
1522	270/12.3 Sleet, rain @17.3K Temp-3°C 80 sec.
1534	P1 ↑1K, ↓1K ice on Windshield, slight turbulence
1543	P2 ↓.5K for 10 sec.,↑.5K for 5 sec. with ice
1546	P3 no updrafts or downdrafts for 10 sec with ice
1548	Cirrus layer now in area 300/26.0, 22.2K
1550	P4 will be in new growth of old cell P4 No drafts with ice
	and snow
1554	P5 ↓.5K for 20 sec. Supercool H_2O and ice 5 sec. no drafts
1558	P6 ↓.5K for 20 sec. ice, graupel 5 sec. no drafts
1603	P7 ↓.2K for 10 sec ↑.2K for 10 sec with ice
	↓.2K for 10 sec ↑.2K with ice for 20 sec.
1606	P8 ↓.5K for 15 sec with ice ↑.3 for 20 sec with ice
1614	P9 ↓.2K for 15 sec with little ice 2no turret of P9 25sec ice
1616	P9-II ↑1.5K for 15 sec 2no turret in cloud for 10 sec

OBSERVER Bruce

AIRCRAFT CLOUD AND WEATHER OBSERVATIONS

TEXAS HIPLEX 1978

DATE 7-20-78 MISSION NO. 10 AIRCRAFT TYPE P-Navajo

TIME (CDT)	OBSERVED PHENOMENA
1620	P-10 20 Sec in cloud with no shafts ↓↓
1629	P-11 25 sec in cloud ↓.2K no moisture
1630	P-12 ↓.5K for 10 sec ↑.5K for 20 sec. ↓.5K for 10 sec.
1632	P-13 ↑1K for 15 sec
1638	P-14 ↑.5K for 15 sec

OBSERVER Bruce

July 20, 1978 Debriefing Notes

Mission No. 10

Take Off: 1955 GMT
Seed Mode: On Top
Amount: 300 gms (AgI)
Rate: 1 (30 gm flares) per second
Seed Time: 2109 GMT plus 10 seconds
Cloud Type: Isold Growing Cumulus
Cloud Location: 330/29.6 BGS VOR
Land Time: 2215 GMT Mission Aircraft: Cloud Physics (MRI), P-Navajo and Aztec

MRI

During climb out, isolated rainshowers were observed to the northwest. Penetrated rainshaft, located at 250/15 BGS VOR, with Aztec at 2016 GMT. Aircraft were in rainshaft for two minutes and observed 1000 ft/min. downdraft. Cloud bases were observed at 4,700 ft. MSL.

Sampled two cells on climb, observed 1000 ft/min. updrafts with good supercooled water at 17,000 ft. MSL.

Sampled another cloud at 17,000 ft. MSL. Observed no updraft and little water. Tops would grow to 27,000 ft. MSL then would ice out or become fuzzy due to dry air entrainment.

Observed test case.

1st Pass at 2100 GMT

Observation was taken at 18,000 ft. MSL ($-4.7^{o}C$) heading 130. Cell was located at 324/26 BGS VOR. Top was hard and good supercooled water observed, with 1000 ft/min. updraft. Exited at 2100.53 GMT.

2nd Pass at 2103.88 GMT

Observation was taken at 17,900 ft. MSL($-4.6^{o}C$) heading 300. Observed small graupel and no updrafts, only downdrafts observed. Exited at 2105.07 GMT.

Aztec reported moderate rain at cloud base and good lightning.

3rd Pass at 2107.32 GMT

Observation taken at 17,000 ft, MSL (-3) heading 120. Observed all downdraft with some graupel. Exited at 2108 GMT.

4th Pass at 2112.13 GMT

Observation taken at 17,000 ft. MSL heading 310. Cell located at 325/25 BGS VOR. Observed 500 ft/min. updraft with light snow and graupel. Exited 2113.17 GMT.

5th Pass

Cloud was diffused. Aircraft heading 150 at 17,000 ft. MSL. Exited at 2117.45 GMT.

P-Navajo

1st Pass at 2103 GMT

Observation at 23,000 ft. MSL heading 085. Cell located at 320/21 BGS VOR.

Observed 200 ft/min. downdraft for 10 seconds, then 200 ft/min. updraft with ice for 10 seconds, then 200 ft/min. downdraft, then 200 ft/min. updraft with ice for 10 seconds.

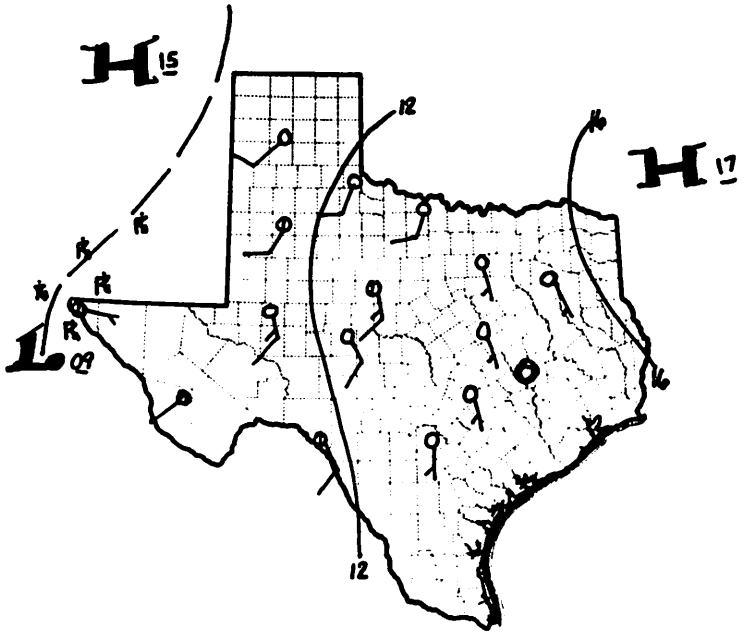
2nd Pass at 2109 GMT

Seeding pass at 23,000 ft. MSL (-13°C) heading 190. Cell located at 330/29.6 BGS VOR. In cloud for 10 seconds and released 10 flares. Top was fuzzy.

Aztec

At 2111 GMT aircraft sampled test case located at 320/25 BGS VOR. Aircraft sampled in rain shaft. Rainshaft intensity decreased.

Summary
21 July 1978



1400 GMT

WELL ABOVE AVERAGE MOISTURE NOTED OVER OP AREA (1.28" PW) WITH NORMAL STABILITY (LI = -0.6). 500 MB SHORT WV LIES ACROSS CENTRAL N. MX., AND A SURFACE FRONT LIES ACROSS THE CENTRAL PLAINS TO EASTERN COLORADO, WITH A SFC TROUGH DROPPING FROM THE FRONT TO EASTERN N. MX. SOUNDING BOUYANCY ABOUT NEUTRAL.

CIRRUS WAS SCATTERED THROUGHOUT THE FORECAST PERIOD,AND FIRST CUMULUS WAS SEEN AT NOON OBSERVATION. TSTMS DEVELOPED IN THE TRANS-PECOS AND ERN N. MX. BY EARLY AFTERNOON. BY LATE AFTERNOON (2200 GMT) A FEW RW DEVELOPED NEAR BROWNFIELD, BARELY MISSING THE FORECAST AREA. ACTIVITY DIED NEAR DUSK, BUT TSTMS ALONG SFC TROUGH CONTINUED THROUGHOUT THE NIGHT.

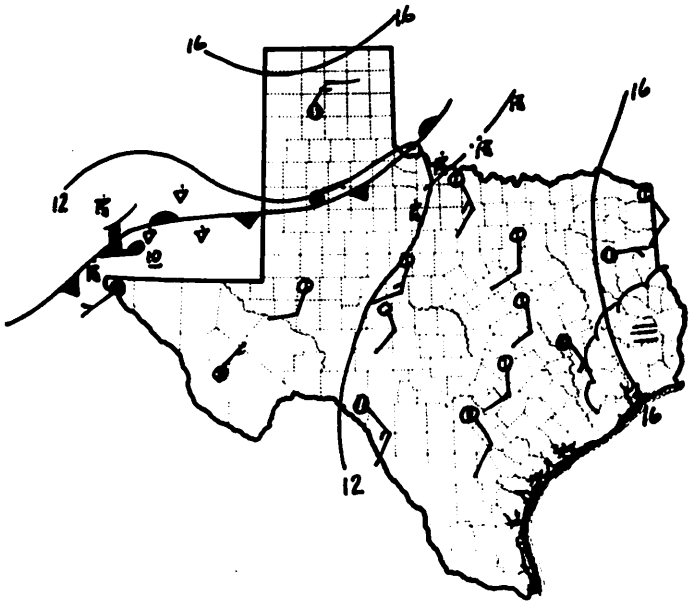
DAY CLASSIFIED A 3.

Weather Observations
21 July 1978

TIME (CDT)	
0805	SCT AS-AC; CI W-W; T = 76°F; WIND 15512
0855	SCT AS-AC; CI S-W; T = 80°F; WIND 16516
0955	CLR CI S-W; T = 84°F; WIND 17515
1055	SCT CI; T = 86°F; WIND 16012
1155	FEW CU ALQDS; SCT CI; T = 90°F; WIND 15512
1355	SCT CUMULUS; T = 93°F; SCT CIRRUS; WIND 16508-14
1450	SCT CU; SCT CI; MDT CU NE-E; T = 95°F; WIND 15503
1655	SCT CU; SCT CI; CS BNK S-W; MDT CU NE-SE; T = 96°F; WIND 15006

FORECAST BUSTED

Summary
22 July 1978



1400 GMT

SFC FRONT LIES NORTH OF OP AREA FROM LBB TO SE N. MX. AMS MDTLY MOIST BUT STBL. SKIES BROKEN CS OVER OP AREA IN A.M. WK 500 MB RIDGE REMAINS OVER OP AREA. FIRST CUMULUS NOTED AT NOON OBSERVATION (T = 90°F). BY 1800 GMT CUMULUS CONGESTUS WERE OBSERVED, AND A FEW TCU-RWU APPEARED BY 1900 GMT ACTIVITY INTENSIFIED BY LATE AFTERNOON, AND A FEW MODERATE TSTMS OCCURRED IN OP AREA.

FRONT PASSED STATION LATE AFTERNOON, DROPPING TEMPS FROM 96°F TO 85°F.

DAY CLASSIFIED A 6.

Weather Observations
22 July 1978

TIME (CDT)	
0810	FEW AC W; SCT CI; HAZY; T = 78°F; WIND 17007
0850	SCT CI; FEW AC W-NW; CI MAINLY N HALF; T = 81°F; WIND 19011
0955	BKN CI; T = 84°F; WIND 20010
1100	THN BKN CI; T = 88°F; WIND 22008
1200	SCT V BKN THN CI; SML CU NE; T = 90°F; WIND 21003
1400	BKN CUMULUS; CU CONG ALQDS FEW TCU NE-SE; APRNT RW-SE; HAZY; T = 94°F; WIND 09008; WSHFTG GRDLY
1450	BKN CU; TCU-CB ALQDS; RWU NE-SE-S AND SW; T = 85°F; WIND 11023; WSHET FROPA 1420; LTGCG S; RW-AT STN
1750	⓪ CU; ⊕ CS; RWU NE-SE-S AND W; OCNL LTGCG S-SE; T = 86°F; WIND 04010G16

FORECAST VERIFIED

TEXAS HIPLEX 1978 AIRCRAFT DATA

DATE 7/22/78 FLT. # 1 MISSION NO. _____

A/C CREW A. Roberts, E. Lobl, D. Suder

TAKE-OFF TIME (CDT) 1435 LAND TIME (CDT) 1615

ADVISED POSITION _____

TEMP PROFILE (1000 Ft.)

	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
ASDG	32	31.6	27.0	23.6	20.4	17.6	14.4	11.1	9.5	6.1		1.3	-.4	-2.6	-5.0	-6.2	-8.2	
DSDG																		

TIME TO -5°C (Min) 37 TIME TO -10°C (Min) _____

TIME TO ADVISED POSITION: _____ (Min)

MISSION DATA

TURRET #	PENT TIME (CDT)	GM AgI	ALT K(Ft)	AMB TEMP (°C)	ACFT HDG	TURRET LOC (VOR/DME)	CLD PENT SPD (kts)	CRUISE SPEED (kts)	AgI DROP INT (sec)	UPD (Ft/min)	TURB
	10.5k ft.			9.4	bases, precip						
	penetrations thru clouds				+ 1000 ft/min		305/7				
	most updrafts in the clear on the SW / side										
151133			16	-2.9		/				+1000	outside
151210			out			/					
151357			17	-5		245/ 18				+1000	bumpy
151429			out			/					
152750			19	-8.2		187/25			grp1	+1200	
153151			18.3	-5.6	090	167/30				+500 at 170/30	
153242			out			/					
H3 says tops at 24k ft						/					
						/					
Returned to base due to a broken seat belt						/					
						/					
						/					
						/					

3.1

3.2

TEXAS HIPLEX 1978 AIRCRAFT DATA

DATE 7 / 22/ 78 FLT. # 1 MISSION NO. No mission

A/C CREW Alan, Bruce

TAKE-OFF TIME (CDT) 1446 LAND TIME (CDT) 1705

ADVISED POSITION

TEMP PROFILE (1000 Ft.)

	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
ASDG	27	26	25	23	20	17	15	10	5	4	3	2	2	-2	-3	-4	-5	-4	-10	-12
DSDG	28	25	23	15*	19	18	8*	11	9	7	5	5	2	0	-3	-4	-5	-5	-8	-10

Time G
14:47
29
16:40
Clear Air Descent
*Temp. of Rainshaft

TIME TO -5°C (Min) 1512 TIME TO -10°C (Min) 1515

TIME TO ADVISED POSITION: (Min)

MISSION DATA

TURRET #	PENT TIME (CDT)	GM AgI	ALT (Ft)	AMB TEMP (°C)	ACFT HDG	TURRET LOC (VOR/DME)	CLD PENT SPD (kts)	CRUISE SPEED (kts)	AgI DROP INT (sec)	UPD (Ft/min)	TURB
P1	1513		21.5	-10	310	265 / 12.6					
P2	1517		22	-12	190	260/ 18.3					
P3	1534		22	-10	090	170/ 30.4					
P4	1537		22.1	-10	055	160/ 30.9					
P5	1538		22.1	-10	055	160/ 31.1					
P6	1541		21.8	-10	290	150/ 27.7					
						/					
In SEED	1621		23.4	-14	270	360/ 26.3			91 flares fired		
Out	1625		23.9			330/ 30					
						/					
In SEED III	1635		23.3	-12	230	295/ 36.6			5 flares fired		
Out	1637		23.6			295/ 38.2					
						/					
						/					
						/					
						/					

AIRCRAFT CLOUD AND WEATHER OBSERVATIONS

TEXAS HIPLEX 1978

DATE 7-22-78 MISSION NO. No mission AIRCRAFT TYPE Navajo

TIME (CDT)	OBSERVED PHENOMENA
1448	Rain shafts on Big Spring extending South of Webb.
1452	Dark rain shaft SE of Big Spring
1459	060/18.2 Light to Med rain shower
1502	Good moisture in clouds on ascent
1507	120/18.9, 16K ↑2K ice and water
	120/18.6 ↓5K ice, water
	140/17.3 18.6K ↑2K
1513	P1 ↑ .6K 40 sec
1517	P2 ↓ .2K 20 sec
1529	200/23.4 heading 140, cloud tops in area smooth w/a few
	turrets
1534	P3 ↑ .5K w/graupel 15 sec ↓.5K w/heavier grpl. 20 sec
1536	P4 ↑ .8K 15 sec ↓ .2K 10 sec in cloud 30 sec
1538	P5 ↑ .3K 15 sec ↑ .4K 10 sec ↓ 1.5K 20 sec
1541	P6 no drafts 15 sec then ↓ .5K 10 sec.
1609	055/27.0 alt. 22.8 temp. -10
1610	055/20.6 80 sec ice, snow Mod. turbulence
1612	010/29.4 dark rain shafts CG lightning
1645	cloud base on descent at 13K

OBSERVER Bruce

Aztec

TEXAS HIPLEX 1978 AIRCRAFT DATA

DATE 22/ Jul/ 78 FLT. # _____ MISSION NO. _____

A/C CREW Charles E. Henry

TAKE-OFF TIME (CDT) 1435 LAND TIME (CDT) 1735

ADVISED POSITION _____

TEMP PROFILE (1000 Ft.)

	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
ASDG																		
DSDG																		

TIME TO -5°C (Min) _____ TIME TO -10°C (Min) _____

TIME TO ADVISED POSITION: _____ (Min)

MISSION DATA

TURRET #	PENT TIME (CDT)	GM AgI	ALT (Ft)	AMB TEMP (°C)	ACFT HDG	TURRET LOC (VOR/DME)	CLD PENT SPD (kts)	CRUISE SPEED (kts)	AgI DROP INT (sec)	UPD (Ft/min)	TURB
						/					
						/					
						/					
						/					
						/					
						/					
						/					
						/					
						/					
						/					
						/					
						/					
						/					
						/					
						/					
						/					

AIRCRAFT CLOUD AND WEATHER OBSERVATIONS

TEXAS HIPLEX 1978

DATE July 22, 1978 MISSION NO. _____ AIRCRAFT TYPE N13816 Pa-23 Aztec

TIME (CDT)	OBSERVED PHENOMENA
1435	T/O
1452	Sampled Rw 320/5
1605	Sampled Rw 150/25
1607	Sampled Rw 150/28
1631	Sampled Rw 360/26 Target Area seeded by 7335L P-Nav.
1634 to 1651	Sampled line of turrets seeded by P-Nav. on an East-West and N.E. to S.W. oriented line. Positions ranged from 360/26 to 340 at 25 on an east-west heading. Rainshowers were light to moderate with moderate downdrafts up to 1500 fpm. No lightning observed at any time during period, check that I did see one or two bolts cloud to ground. Terminated sampling at 1653.
1735	RTB to land.

OBSERVER _____

July 22, 1978 Debriefing Notes

Sample and Seed Flight

The MRI cloud physics aircraft, P-Navajo and Aztec took off at 1935 GMT. Bases were reported at 10,500 ft. MSL (9.4°C) on climb out. Updrafts were reported on southwest side of the cells. One updraft, located at 305/07 BGS VOR, was observed to be 1000 ft/min. Some updrafts were reported to be out from underneath the visible cloud.

MRI made two passes on cell located at 245/18 BGS VOR.

1st Pass at 2011.33

Observation was taken at 16,000 ft. MSL (-2.9°C). No precipitation was observed.

2nd Pass

Observation was taken at 17,000 ft. MSL (-5°C). No precipitation was observed.

At 2027.50 GMT a pass was made on a cell located at 187/25 BGS VOR. The observation was taken at 19,000 ft. MSL (-8.2). A 1200 ft/min. updraft with graupel was observed.

At 2031.51 GMT a pass was made on cell located at 167/30 BGS VOR. Observation was made at 18,300 ft. MSL (-5.6). A 500 ft/min. updraft with precipitation was reported.

At 2115 GMT MRI aircraft returned to base due to aircraft problems. Pilot's seat belt broke.

P-Navajo

Crew commented that clouds had more moisture at start of flight than at the end of the period working with the MRI aircraft. P-Navajo recorded updraft to be 2000 ft/min. at 120/18.9 BGS VOR at 16,000 ft. MSL.

Aztec

Aztec observed only light virga at base during MRI portion of flight.

P-Navajo

At 23,400 ft (-14°C) aircraft observed a line of turrets about 1/2 diameter apart connected at their base. Seeded cells along the line at a rate of 1 (30 gm) flare per second using a total of 88 flares. Seeding was accomplished, in cloud only heading 270. Line was approximately 5 miles long seeding was from 360/26 to 330/30 BGS VOR. Seed time was from 2121 GMT thru 2125 GMT.

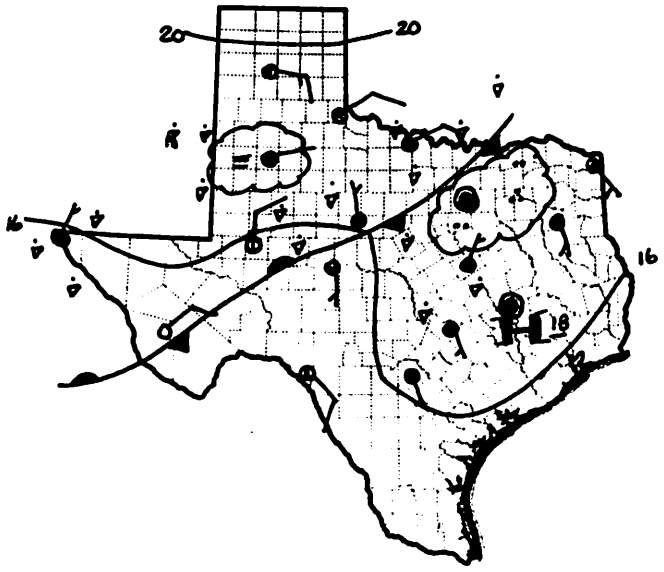
Aztec

Sampled RW at 2131 GMT thru 2151 GMT at 360/25 BGS VOR. RW seemed to become heavier with most intense at 2151 GMT with large drops. No ice observed. Sampled at 8,500 ft. MSL at start of observation.

P-Navajo

Seeded at 2135 GMT at 23,300 ft. MSL (-12) heading 230. Cell located at 245/36.6 BGS VOR. Seeded one turret with 5 flares.

Summary
23 July 1978



1300 GMT

A SURFACE FRONT LIES FROM SW MISSOURI TO N CEN TX S OF ABILENE AND TO MARFA. CONVECTIVE ACTIVITY IS WIDESPREAD OVER THE STATE. LOCAL AIRMASS IS QUITE MOIST AND COOL, BUT NOT VERY UNSTABLE CONVECTIVELY. AN EASTERLY WV IS INITIATING CONVECTION OVER ERN PORTION OF STATE. ACTIVITY EXPECTED OVER OP AREA DUE TO SFC FRONT IN VICINITY.

EARLY MORNING CHARACTERIZED BY MULTIPLE CLOUD LAYERS, HAZE AND RAINSHOWERS. BY LATE MORNING THE NOCTURNAL ACTIVITY HAD CEASED, BUT HEATING HAD BEGUN TO PRODUCE LOWER CUMULUS. BY EARLY AFTERNOON THESE CUMULUS HAD DEVELOPED INTO TCU AND CBS. RAINSHOWERS AND THUNDERSTORMS CONTINUED THROUGHOUT THE AFTERNOON, WEAKENING WITH EARLY EVENING.

DAY CLASSIFIED A 6.

Weather Observations
23 July 1978

TIME (CDT)	
0755	◐ CU; CI ABV; STFRA ALQDS; HAZY; T = 72°F; WIND 03012; TCU- RWU SE S AND NW
0900	SCT V BKN SC; BKN AC-AS; CI ABV; TCU S; TWU NE-E; HAZY; T = 73°F; WIND 05012G18; SCUD NE-E
0955	◐ CUMULUS; ◐ AC; RWU NE-E; T = 74°F; WIND 04512
1100	SCT CU; BKN AC; FEW CI VSBL ABV; T = 78°F; WIND 07009
1150	◐ CU-AC; ◐ V ⊕ AC-CI; FEW CS ABV; LWR CU FRMG NW; T = 81°F; WIND 06011
1305	◐ AC-AS; ◐ CS; FEW LWR CU ALQDS; LN TCU-CB W-NW NE-E E-SE AND DSNT SW; OCNL SPRKL; T = 82°F; WIND 05010
1500	◐ CUMULUS; ◐ AC; ◐ CS; TCU E-SE W AND NE; RWU SE; T = 85°F; WIND 06013
1655	◐ V ⊕ CU-CB; TCU-CB-RWU ALQDS STNRY; T = 88°F; WIND 04511

FORECAST VERIFIED

TEXAS HIPLEX 1978 AIRCRAFT DATA

DATE 7/23/78 FLT. # 1 MISSION NO. 11

A/C CREW A. Roberts, E. Lobel, D. Suder

TAKE-OFF TIME (CDT) 1400 LAND TIME (CDT) 1620

ADVISED POSITION E2 & E4

TEMP PROFILE (1000 Ft.)

	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
ASDG			19.9	17.5	15.9	12.7	11.8	9.5	8.0	4.9	3.2	1.1	-.7	-2.3				
DSDG																		

TIME TO -5°C (Min) 35 TIME TO -10°C (Min) _____

TIME TO ADVISED POSITION: _____ (Min)

MISSION DATA

TURRET #	PENT TIME (CDT)	GM AgI	ALT (Ft)	AMB TEMP (°C)	ACFT HDG	TURRET LOC (VOR/DME)	CLD PENT SPD (kts)	CRUISE SPEED (kts)	AgI DROP INT (sec)	UPD (Ft/min)	TURB
1.1	143252		16	-2.3	055	/		good liqu. water			
	143323			-3.5		/					
2.1	143704		17.1	-3.4	030	307 / 27				+1200	15 sec
	143758		17.5	-5.6		out /					
2.2	144035		17.5	-3.5	220	/ cell					
	144103		17.5	-5.3	250	309 / 26.5	cell 2				
	144152		17.2	-4.2	out	/					
2.3	144445		17	-4.4	090	/	110			-1000	at 4520
	144536		17			out /					
3.1	145657		16.9	-4.5	360	/	supercooled water			+300	at 2750
	145756		17	-4.9		out /					
	150051		17	-3.6	100	360 / 42	snow on the W side graupel			-1000	at 0207
	another cell at					005 / 42					
	150357					/		heavy graupel			
	150411					/				+1500	
	150418					/				+2000	20 sec
	150450									-500	

TEXAS HIPLEX 1978 AIRCRAFT DATA

DATE 7/23/78 FLT. # 1 MISSION NO. 11

A/C CREW A. Roberts, E. Lobel, D. Suder

TAKE-OFF TIME (CDT) _____ LAND TIME (CDT) _____

ADVISED POSITION _____

TEMP PROFILE (1000 Ft.)

	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
ASDG																		
DSDG																		

TIME TO -5°C (Min) _____ TIME TO -10°C (Min) _____

TIME TO ADVISED POSITION: _____ (Min)

MISSION DATA

TURRET #	PENT TIME (CDT)	GM AgI	ALT (Ft)	AMB TEMP (°C)	ACFT HDG	TURRET LOC (VOR/DME)	CLD PENT SPD (kts)	CRUISE SPEED (kts)	AgI DROP INT (sec)	UPD (Ft/min)	TURB
/	0539		18.4	-6.8		020 / 45	out				
	base observed moderate to heavy showers/										
3.2 /	151002		18.2	-5.7	260	/					
/	1116					014 / 42	graupel			+1000	
/	1258					/	supercooled water			+1000	
/	1423		19	-2.9*		/ out					
3.3 /	1719		18.4	-2.3	090	/		graupel			
/	1924					005 / 42				+1500	25 sec
/	2131		turning		out	/					
3.4 /	2213		18.6	-2.1	270	008 / 38				+1000 +2000	2340 25 sec
/	2415		19.2	-2.2	out	/					
3.5 /	3005 3104		17.9	-2.3	070	040 / 23 /	graupel & water			+1500	
/	3234		18.5	-2.4	out	/				+2000	
4.1 /	5310		17	-3	220	065 / 25					
/	5414		16.9		out	/					
4.2 /	5728		16	-2	050	/	good water			+1000	5756
	5805		16.3			out					

*temperature might be off

AIRCRAFT CLOUD AND WEATHER OBSERVATIONS

TEXAS HIPLEX 1978

DATE 7-23-78 MISSION NO. 11 AIRCRAFT TYPE MRI Navajo

TIME (CDT)	OBSERVED PHENOMENA
	Cirrus Stratus was covering most of the sky. Convection
	was visible in all quads. Good isolated Cu. Cong. in the
	west, 40 min. from BGS. Going towards it icing was
	observed. Vectored towards the east. All penetrated clouds
	had good liquid water and updrafts in excess of 1000 ft/min.
	Penetrated some new turrets on the north end of the line
	east of BGS. Made penetrations east-west thru the line -
	good precip. and updraft (graupel and supercooled water).
	Cloud was becoming "smoother" with time. Not as much
	turbulence and precip. Found another good cell on the
	east side of the line. Were unable to work a coordinated
	mission with the Aztec due to the scud all around.
	In the evening (1900) MRI Navajo sampled the precip out
	of the same system, for a ZR mission.

OBSERVER E. Lobel

P-Navajo

TEXAS HIPLEX 1978 AIRCRAFT DATA

DATE 7 / 23 / 78 FLT. # 1 MISSION NO. 11

A/C CREW Alan, Bruce

TAKE-OFF TIME (CDT) 1359 LAND TIME (CDT) 1625

ADVISED POSITION _____

TEMP PROFILE (1000 Ft.)

Time	G		3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1353	26	ASDG	25	20	16	17	16	13	10	10	11	6	4	3	1	1	0	-5	-6	-5	-7	-10
1553		DSDG	25	21	20	18	16	14	12	10	11	6	4	3	1	0	1	-2	-4	-5	-5	-10

TIME TO -5°C (Min) _____ TIME TO -10°C (Min) _____

TIME TO ADVISED POSITION: _____ (Min)

MISSION DATA

TURRET #	PENT TIME (CDT)	GM AgI	ALT (Ft)	AMB TEMP (°C)	ACFT HDG	TURRET LOC (VOR/DME)	CLD PENT SPD (kts)	CRUISE SPEED (kts)	AgI DROP INT (sec)	UPD (Ft/min)	TURB
P1	1412		11.9	6	010	320 / 20.7					
P2	1418		17.4	0	280	300 / 27.7					
P3	1429		22.0	-10	210	255 / 33.4					
P4	1430		22.1	10	210	250 / 36.6					
P5	1456		22.1	-10	010	355 / 38.8					
P5-II	1459		22.1	-10	150	355 / 39.7					
P6	1504		23.0	-10	080	010 / 40.4					
SEED I	1511		22.9	-10	120	035 / 38.8	IN CLOUD 3 MIN.		80	flares	
	1514		22.5	-10	090	040 / 44.7			12	flares	
						/					
P7	1524		22.4	-10	210	030 / 33.2					
P7 out	1527		22.7		180	030 / 24.3					
P8	1528		22.7	-10	180	060 / 21.4					
P9	1551		23.1	-10	255	040 / 28.9					
						/					
						/					

AIRCRAFT CLOUD AND WEATHER OBSERVATIONS

TEXAS HIPLEX 1978

DATE 7-23-78 MISSION NO. 11 AIRCRAFT TYPE P-Navajo

TIME (CDT)	OBSERVED PHENOMENA
1354	CB on horizon, heading 220
	Cu Con. 260/40 Visual
1405	Cloud base 5.9 to 6K
1410	320/15.7 Moisture in and around cloud @ 11K
1411	Temp. inversion near top of lower cloud layer
1412	P1 ↑ .7K for 15 S
1414	Stratus layer @ 13.4K, another layer above
1416	Pealius cloud over TCU @ 17K
1417	2nd stratus layer 16.2K
	16.2K tops of Cu in area
1420	P2 ↑ .5K for 20 sec some moisture, clear ice on wings
1429	P3 ↓ .2K for 15 sec water, ice
1430	P4 ↑ .3K 13 sec water, ice
1450	330/26.6 Temp -10 Alt. 22.0
1454	Some Cu has pushed into stratus layer
1456	P5 ↑ .3K for 20 sec water, ice good quantity
1459	P5-II ↑.2K for 15 sec water, ice
1504	P6 ↓.5K for 10 sec ↓.7K for 25 sec w/ice, snow
	↑.6K for 20 sec ↑.5K for 15 sec
	↓.5K for 25 sec Total Time in cloud - 140 sec

OBSERVER _____

AIRCRAFT CLOUD AND WEATHER OBSERVATIONS

TEXAS HIPLEX 1978

DATE 7-23-78 MISSION NO. 11 AIRCRAFT TYPE P-Navajo

TIME (CDT)	OBSERVED PHENOMENA
1524	P7 ↑.5K for 10 sec ↑1.7K for 15 sec
	↓1.8K for 20 sec ↑1K for 15 sec
	↑.7K for 15 sec ↓1K through end of cloud
	Good ice, water, turbulence
1528	P8 ↑.5K for 15 sec
1531	P9 ↓.7K for 20 sec ↓.8K for 15 w/ice

OBSERVER _____

Aztec

TEXAS HIPLEX 1978 AIRCRAFT DATA

DATE 7/23/78 FLT. # 1 MISSION NO. 11

A/C CREW Charles E. Henry

TAKE-OFF TIME (CDT) 1345 LAND TIME (CDT) 1615

ADVISED POSITION _____

TEMP PROFILE (1000 Ft.)

	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
ASDG																		
DSDG																		

TIME TO -5°C (Min) _____ TIME TO -10°C (Min) _____

TIME TO ADVISED POSITION: _____ (Min)

MISSION DATA

TURRET #	PENT TIME (CDT)	GM AgI	ALT (Ft)	AMB TEMP (°C)	ACFT HDG	TURRET LOC (VOR/DME)	CLD PENT SPD (kts)	CRUISE SPEED (kts)	AgI DROP INT (sec)	UPD (Ft/min)	TURB
						/					
						/					
						/					
						/					
						/					
						/					
						/					
						/					
						/					
						/					
						/					
						/					
						/					
						/					
						/					
						/					
						/					

AIRCRAFT CLOUD AND WEATHER OBSERVATIONS

TEXAS HIPLEX 1978

DATE 7-23-78 MISSION NO. 11 AIRCRAFT TYPE N13816 Pa-23 Aztec

TIME (CDT)	OBSERVED PHENOMENA
1345	9/0
	Bases at 6000 16°C (West of Airport)
015/43 1514	Seeded complex sampled at altitudes ranging from 700 Down
	to 3500
025/45 1518	Sampling accomplished from 015° Radial
020/45 1519	Clockwise to 030° Radial 36 to 48 DME. Some
020/45 1525	Cloud to ground lightning was observed. Rain
015/45 1528	intensified midway through sampling period.
015/48 1530	Bases dropped rapidly, at one point down to
030/45 1532	4000
030/36 1546	
	Heaviest activity was noted over Lake Thomas at about 1550
RTB 1615	Landing
	*NOTE Temp/Dw pt Hose was disconnected throughout flight

OBSERVER _____

July 23, 1978 Debriefing Notes

Mission No. 11

Take Off: 1900 GMT
Seed Mode: On Top
Amount: 2790 gm (AgI)
Rate: 2(30 gm flares) per second
Seed Time: 2011 to 2015 GMT
Cloud Type: Complex
Cloud Location: 035/388 BGS VOR
Mission Aircraft: Cloud Physics (MRI), P-Navajo and Aztec
Land Time: 2120 GMT

MRI

At 1932.52 GMT aircraft headed northeast where good new turrets were developing. Aircraft made a penetration at 16,000 ft. MSL. Max updraft was 1000 ft/min. with good liquid water content.

At 1437.04 GMT aircraft penetrated a cell located at 307/21 BGS VOR at 17,100 ft. MSL (-3.4°C) heading 030. Observed 1200 ft/min. for 15 seconds and good liquid water.

At 1940.35 GMT aircraft penetrated same cell heading 220 at 17,500 ft. MSL (-3.5 °C) Observed good liquid water with no precipitation and no updraft. Tops estimated at 22,000 ft. MSL. Exited at 1941.55 GMT.

At 1444.45 GMT aircraft again penetrated cell heading 040 at 17,000 ft. MSL. Observed 1000 ft/min. downdraft and no precipitation. Cell seemed to be icing out.

Aircraft next observed a line of cells to the east and traveled to the new development on the north end of the line, located approximately 360/42 BGS VOR.

At 2000.5 GMT MRI began sampling the test case.

1st Pass at 2000.51 GMT

Observation made at 17,000 ft. MSL (-4.5) heading 100. Cell located at 360/43 BGS VOR. Observed 1000 ft/min. updraft with snow.

Aircraft passed through a second cell on same heading. This cell located at 005/42 BGS VOR. Observed heavy graupel for 20 seconds and 2000 ft/min. updraft. Exited at 2005.34 GMT at 18,400 ft. MSL (-6.8°C) at 020/45 BGS VOR.

2nd Pass at 2010 GMT

Observation taken heading 260. Observed graupel at 014/42 BGS VOR and 1000 ft/min. updraft before encountering graupel. Exited at 2014.23 GMT at 19,000 ft. MSL.

3rd Pass at 2017.19 GMT

Observation taken at 18,400 ft. MSL heading 090. Cell located at 005/42 BGS VOR. Some graupel with 1500 ft/min. updraft for 25 seconds was observed. Turned out of cloud at 2021.31 GMT.

4th Pass at 2022.12 GMT

Observation made at 18,600 ft. MSL heading 270. Observed 2000 ft/min. updraft at 008/38 BGS VOR for 25 seconds. Crew believes they were in new turret. Exited at 2024.15 GMT. Precipitation seemed to have become less intense.

5th Pass at 2030.05 GMT

Observation was taken at 17,900 ft. MSL heading 070. Observed 2000 ft/min. updraft with some graupel and smooth rid through cloud. Less precipitation noted. Exited on east side at 2032.34 GMT.

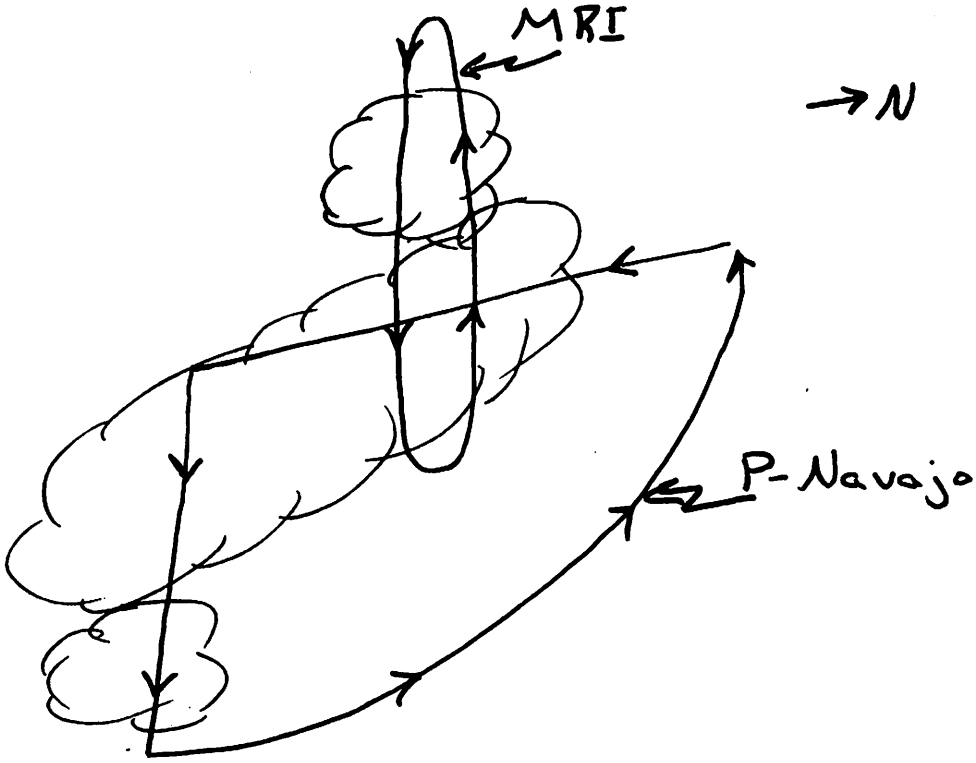
P-Navajo

At 2011 GMT P-Navajo made seeding run at 22,900 ft. MSL (-10) heading 120.

Cell seeded was located at 035/38.8 through 040/44.7 BGS VOR. Aircraft was heading 120 at start of seeding run and continued on that heading for 3 minutes then changed heading to 090 in order to go back into cloud. Used 80 flares before turn and 12 flares after turn. Exited at approximately 2015 GMT.

Crew observed hard top on southeast side. Cell was fuzzy at entry. Not much moisture was observed in cloud with only light turbulence. Light rime icing was encountered during first half of seeding run. The second half had better moisture with light turbulence and light rime icing. A 2000 ft/min. updraft was observed at exit.

Note: Below is a diagram showing the flight paths of the MRI cloud physics aircraft and the P-Navajo as described by the pilots of both aircraft.



From this description it seems likely that only the eastern half of the MRI track was the seeded area.

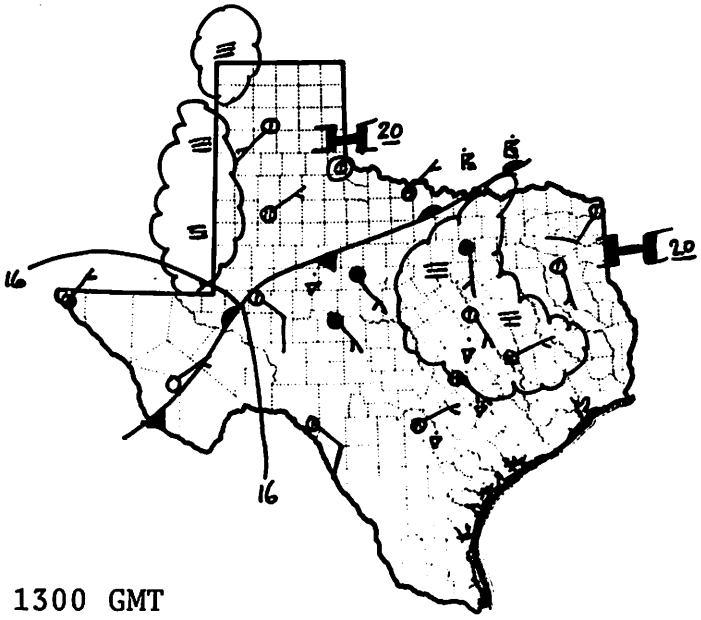
Aztec

The Aztec sampled in rainshaft from 015/36 to 030/40 BGS VOR from 3500 ft. MSL to 7000 ft. MSL.

From 2014 to 2047 GMT precipitation was observed to be light to moderate becoming moderate. No hail or graupel was observed.

At 2050 GMT possible hail was observed over Lake J.B. Thomas. Some dust was observed on northwest side were MRI aircraft was working.

Summary
24 July 1978



1300 GMT

WARM FRONT LIES NEARLY STATIONARY ACROSS OP AREA. NE-SW AT BIG SPRING, AND MOIST, UNSTABLE AMS REMAINS UNSEASONABLY COOL. A 500 MB H RESIDES OVER AREA, BUT IS RATHER WEAK. WINDS ALOFT VERY LIGHT (<10 KTS). RAINSHOWERS AND A FEW THUNDERSTORMS EXPECTED OVER OP AREA DURING AFTERNOON.

HAZY, FOGGY CONDITONS OVER MUCH OF THE REGION DURING THE MORNING, WITH CONSIDERABLE CLOUDINESS ABOVE. FIRST CONVECTIVE CUMULUS NOTED AT 1500 GMT. BY NOON, CUMULUS CONGESTUS HAD DEVELOPED, WITH FIRST RAINSHOWER OBSERVED OVER OP AREA AT 1800 GMT. RAIN-SHOWERS AND SOME THUNDERSTORMS CONTINUED INTO EARLY EVENING HOURS. HIGH PRESSURE ALOFT SEEMED TO REPRESS DEEP ACTIVITY, WITH MOST SHOWERS TO 20 K, A FEW TO 28K, AND ONE OR TWO TSTMS TO 42K.

DAY CLASSIFIED A 6.

Weather Observations
24 July 1978

TIME (CDT)	
0700	SCT AC-AS; THN BKN CI; F-HAZE LYR W-N; T = 68°F; WIND 09003
0755	FEW ST; SCT AC-AS; THN BKN CI; F-HZE LYR W-N; T = 71°F; WIND 11505; TCU DSNT SE-S
0850	SCT AC; SCT CI; ST E-SE; HAZE LYR W-NW; T = 73°F; WIND 15005; FEW TCU DSNT ENE; WSHET GRDL
1000	FEW CU ALQDS; SCT AC; SCT CI; T = 76°F; WIND 15505
1100	SCT CUMULUS; FEW AC-AS; SCT CI; CU CONG N SE-SW; CONG GLDG RPDLY; T = 79°F; WIND 13004; TCU S
1150	SCT CUMULUS; CU CONG ALQDS; SCT CI; T = 82°F; WIND 16001
1350	BKN CU; BKN AC; TCU-CB RWU N-NE-E-SE-S; CU CONG ALQDS; T = 83°F; WIND 11007
1455	ⓓ CU; ⓓ AC-CC; TCU-CB RWU ALQDS; RW - AT STN; T = 77°F; WIND 12513
1550	BKN CU-CB; RWU ALQDS; R--AT STN; T = 78°F; WIND 11005; TRWU NE
1650	ⓓ AC-AS; ⓓ CS; CB DSNT ALQDS DSPTG; RWU ALQDS; FEW TCU ALQDS; T = 81°F; WIND 14010

FORECAST VERIFIED

TEXAS HIPLEX 1978 AIRCRAFT DATA

DATE 7 / 24/ 78 FLT. # 1 MISSION NO. _____

A/C CREW A. Roberts, E. Lobl, D. Suder

TAKE-OFF TIME (CDT) 1450 LAND TIME (CDT) 1630

ADVISED POSITION _____

TEMP PROFILE (1000 Ft.)

	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
ASDG			21	18	15.3	12.3	10.9	9.4	6.8	5.5		1	-1.1	-2.8	-4	-5.5		
DSDG																		

TIME TO -5°C (Min) 40 TIME TO -10°C (Min) _____

TIME TO ADVISED POSITION: _____ (Min)

MISSION DATA

TURRET #	PENT TIME (CDT)	GM AgI	ALT (Ft)	AMB TEMP (°C)	ACFT HDG	TURRET LOC (VOR/DME)	CLD PENT SPD (kts)	CRUISE SPEED (kts)	AgI DROP INT (sec)	UPD (Ft/min)	TURB
1.1	150850		10.5		210	325/ 3.5		good lwc		+1000 at 0920 +1500 at 0930	
	150939		11.5	out		/					
1.2	151230		12	5.5	360	312/ 4				+1500 at 1330	
	151420			out		/					
1.3	151726		14	1	220	/				+1000 at 1805	
	151830		14.4	0	out	/					10 sec
2.1	153423		18.5	-6.2		/		snow grpl	075/?	+800 at	3515
	153523		18.4	-6.7	out on the E side						
2.2	153840		18.3	-5	250	076/ 23.5				+600 -600	3920 3944
	154029		18	out		/					
						/					
Clouds were icing out fast.						/					
Very little precipitation encountered or seen./											
						/					
						/					
						/					

P-Navajo

TEXAS HIPLEX 1978 AIRCRAFT DATA

DATE 7 / 24 / 78 FLT. # _____ MISSION NO. _____

A/C CREW Alan, Bruce

TAKE-OFF TIME (CDT) 1412 LAND TIME (CDT) 1635

ADVISED POSITION _____

TEMP PROFILE (1000 Ft.)

G

	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
ASDG	25	20	20	15	15	12	9	9	9	7	5	4	1	-2	-3	-3	-4	-5	-6	-9	-10
DSDG				16	15	10	9	9	9	7	5	3	1	0	-2	-4	-4	-5	-6	-10	-10

Time

1412
1600

TIME TO -5°C (Min) 1437 TIME TO -10°C (Min) 1440

TIME TO ADVISED POSITION: _____ (Min)

MISSION DATA

TURRET #	PENT TIME (CDT)	GM AgI	ALT (Ft)	AMB TEMP (°C)	ACFT HDG	TURRET LOC (VOR/DME)	CLD PENT SPD (kts)	CRUISE SPEED (kts)	AgI DROP INT (sec)	UPD (Ft/min)	TURB
P1	1439		20.9	-6	240	060 / 15.6					
P2	1442		22.2	-9	045	070 / 13.2					
P3	1504		23.2	-10	080	080 / 4.8					
P3-II	1507		24.2	-14	240	065 / 14.3					
P4	1526		23.2	-10	050	030 / 6.3					
P5	1540		23.1	-10	100	080 / 24.2					
P5-II	1544		23.2	-10	280	080 / 25.1					
						/					
						/					
						/					
						/					
						/					
						/					
						/					
						/					
						/					

AIRCRAFT CLOUD AND WEATHER OBSERVATIONS

TEXAS HIPLEX 1978

DATE 7-24-78 MISSION NO. _____ AIRCRAFT TYPE P-Navajo

TIME (CDT)	OBSERVED PHENOMENA
1412	Rain showers Southeast of Big Spring
1414	165/11.3 light moisture on Windshield
1419	110/6.3 light rain
1419	Cloud bases @ 6.5K
1424	060/15.2 light rain
1428	Stratus layer from 15.6 to 16.4
	Most clouds in area stopping growth at this stratus layer
1440	P1 ↓.5K for 10 sec ↑.7K for 20 sec. In cloud 40 sec
1442	P2 ↑.5K for 25 sec
1445	Few turrets at or above -10 level, 23.1 K
1504	P3 ↑.5K for 5 sec ↓.2K for 7 sec ↑.8K for 15 sec
	↑.2K for 5 sec ↓.7K for 5 sec ↑1K for 10 sec
	Exited P3 at 060/15.4 w/Super Cooled H_2O
1507	P3-II ↓2K for 15 sec ↑.7K for 10 sec ↓.3K for 15 sec
	↑1.5K for 20 sec w/ice, small graupel
	Exited P3-II at 065/6.8 Time 1511
1526	P4 ↑.2K for 120 sec ↓.2K for 25 sec
1540	P5 light turbulence w/some ice
1544	P5-II ↑.5K for 10 sec In cloud 20 sec

OBSERVER Bruce

July 24, 1978 Debriefing Notes

MRI

At 2008.50 GMT a penetration was made on climb at 10,500 ft. MSL heading 210. Cell was located at 325/3.5 BGS VOR. Good liquid water with 1000 ft/min. updraft for 10 seconds then 1500 ft/min. for 10 seconds was observed. Exited at 2005.39 at 11,500 ft. MSL.

At 2012.30 GMT a second penetration was made at 12,000 ft. MSL (+5.5) heading 360. Cell located at 312/04 BGS VOR. Observed 1500 ft/min. updraft in middle of cloud. Exited at 2014.20 GMT.

At 2117.26 GMT a third penetration was made at 14,000 ft. MSL (+1°C) heading 220. A 1000 ft/min. updraft for 10 seconds was observed. Exited at 2018.30 GMT at 14,400 ft. MSL (0°C). Cloud was observed to be icing out. Aircraft penetrated a second cloud.

At 2034.23 GMT a penetration was made at 18,500 ft. MSL (-6.2°C). Snow and graupel were observed. A 800 ft/min. updraft was observed on east side of cell. Exited at 2035.23 GMT.

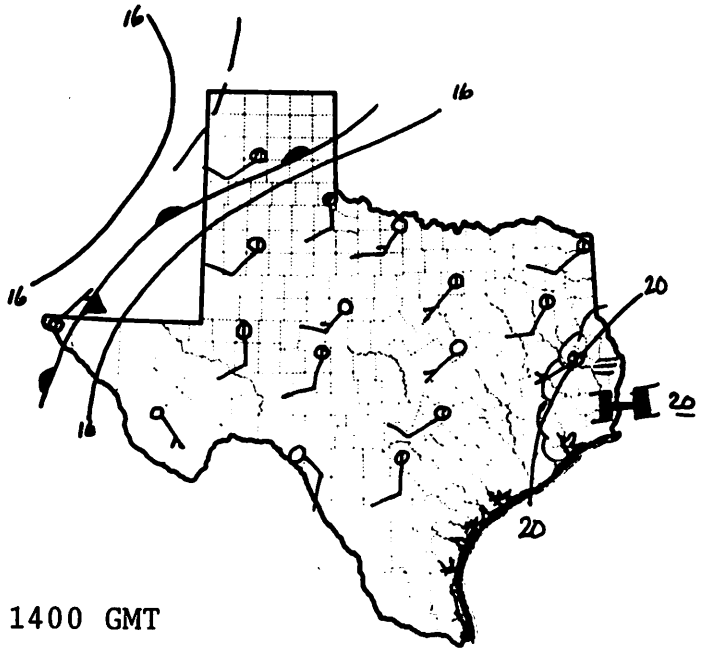
At 2038.40 GMT a second penetration was made at 18,300 ft. MSL (-5°C) heading 250. Cell was located at 076/23.5 BGS VOR. A 600 ft/min. updraft on the east side and a 600 ft/min. downdraft on the west side. Exited at 2040.29 GMT.

Cell was icing out rapidly, little precipitation observed.

Tops were estimated at 25,000 ft. MSL. They would ice out quickly after they had reached altitude.

Bases were at 6,500 ft. MSL. No precipitation observed.

Summary
25 July 1978



1400 GMT

AMPLE LLM WITH 500 MB HIGH OVER AREA AND NO FORCING MECHANISM CHARACTERIZE DAY'S MORNING SOUNDING. AIRMASS QUITE MOIST (PW = 1.39") BUT STABLE (LI = +0.7). SURFACE FRONT RETREATED NORTH OF OP AREA, LYING FROM KS TO NW OK TO NEAR AMA, ROW AND ELP. A WK 500 MB LOW IS CENTERED OVER AMA. SCT CIRRUS OVER OP AREA.

FIRST CUMULUS NOTED AT NOON OBSERVATION (T = 85°F) UNDER SCT CIRRUS. SCT CU AND CI DOMINATED OBSERVATIONS BALANCE OF FORECAST PERIOD. TSTMS DEVELOPED ALONG REMAINS OF FRONT LATE IN DAY IN NEW MEXICO.

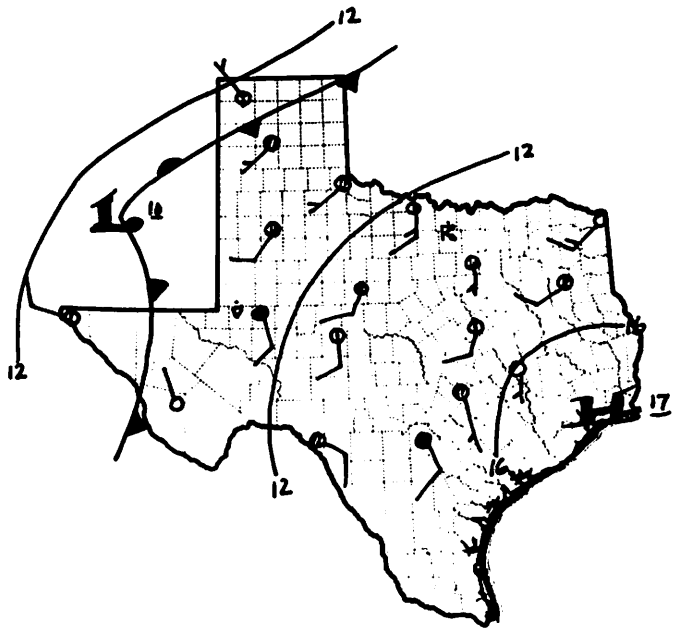
DAY CLASSIFIED A 3.

Weather Observations
25 July 1978

TIME (CDT)	
0755	SCT CI; FEW WHISP AS NW; T = 72°F; WIND 15508
0850	SCT CI; T = 75°F; WIND 17510
0955	SCT CI; T = 79°F; WIND 19011
1055	THN SC CI; T = 82°F; WIND 20010
1150	FEW SML CU ALQDS; T = 85°F; WIND 15007; SCT CI
1350	SCT CU; FEW THN CI; T = 90°F; WIND 16008G17
1455	SCT CU; CU MDRCRS ALQDS; SCT THN CI; T = 91°F; WIND 16005
1550	SCT CUMULUS; SCT CI-CS; FEW MDRCS N-E-S; T = 93°F; WIND 28012

FORECAST VERIFIED

Summary
26 July 1978



1300 GMT

VERY MOIST AIRMASS WITH SHT WV AT 500 MB, AND IS MDTLY UNSTBL (LI = -1.4). MP COLD FRONT LIES FROM NE KS TO TEXAS PANHANDLE TO TCC AND A LOW NEAR HMN, CONTINUING EAST OF GDR TO MRF. 700-500 MB SHORT WAVE LIES E-W FROM NRN LA TO TX S PLAINS. CONVECTION ANTICIPATED ALG SHT WV IN NE PCTN OF OP AREA DURING AFN, AND ALSO DURING LATE EVENING ALONG SURFACE FRONT.

SCT ACCAS OBSERVED THROUGHOUT MORNING. FIRST CUMULUS OBSERVED 1715 GMT, WITH TEMP =90^{o}F.CUMULUS CONGESTUS NOTED BY MID-AFTERNOON, WITH TCU-RWU IN ERN PCTN OF OP AREA. TSTMS BECAME STRONG LATE AFTERNOON IN OP AREA.

DAY CLASSIFIED A 6.

Weather Observations
26 July 1978

TIME (CDT)	
0755	SCT AC-ACCAS; OVC CS: BINOVC WSW-S-SE; LN CU-TCU W-NW; T = 75°F; WIND 17510
0855	FEW AC-AS NW-NE-SE; LWR CU E; LN CU-TCU WSW-NW; BKN CS; T = 77°F; WIND 19013
1000	BKN CS; ACCAS NW NE-E; T = 83°F; WIND 18506-11
1100	ⓓ CS; ACCAS NE SW-W NW-N; T = 86°F; WIND 19508
1155	ⓓ CS; SML CU SE; AC-ACCAS NE-SE; AS NW-N; T = 89°F; ACCAS-VIRGA S; WIND 19510
1350	SCT CUMULUS; CU CONGESTUS ALQDS; BKN CS; CB SW HRZN; T = 94°F; WIND 16508
1450	BKN CUMULUS; CU CONG ALQDS; ⓓ V ⊕ CS; TCU-RWU NE; CB DSNT SW; T = 94°F; WIND 20007; VIRGA S-SW
1550	SCT CUMULUS; BKN CI-CS; TCU DSNT ALQDS; LN CB BLDG RPDLY NE-E MVG SW; T = 94°F; WIND LV
1655	SCT CU; LN TCU-CB NE-SE MVG SW; ⓓ CS; T = 95°F; WIND 15003

FORECAST VERIFIED

TEXAS HIPLEX 1978 AIRCRAFT DATA

DATE 7 / 26 / 78 FLT. # 1 MISSION NO. 12

A/C CREW A. Roberts, E. Lobl, D. Suder

TAKE-OFF TIME (CDT) 1520 LAND TIME (CDT) 1705

ADVISED POSITION E2 & E4

TEMP PROFILE (1000 Ft.)

	3	4	5	6	7	8	9.1	10	11.1	12	13	14	15	16	17	18	19	20
ASDG	33.8	30.4	27.1				13.7	IC 10.5	8.9	5.8	5.3	2.2	0		-4.4			
DSDG			28.9	26.2	23.2	22.0	17.4			7.8	6.4		IC 1.6					

IC = In Cloud

TIME TO -5°C (Min) _____ TIME TO -10°C (Min) _____

TIME TO ADVISED POSITION: _____ (Min)

MISSION DATA

TURRET #	PENT TIME (CDT)	GM AgI	ALT (Ft)	AMB TEMP (°C)	ACFT HDG	TURRET LOC (VOR/DME)	CLD PENT SPD (kts)	CRUISE SPEED (kts)	AgI DROP INT (sec)	UPD (Ft/min)	TURB
154105-	154135					070 / 27		good lwc		+1500	
154350-	154413					060 / 29				+2500	
1.1	155410					062 / 24	supercooled			+1000	30 sec
1.2	160319	out	17.3	-4.7	045	069 / 21	graupel	water		+1500	15 sec turb
	160438					/	snow				
	160448					/				+800	20 sec
	160638		17	-4.4	out	065 / 29		graupel grpl from over		-500 hang	
1.3	160918		17	-3.7	240	064 / 24				+1500 at 20 sec	1355
	161009		17	-4.3	out	/					
1.4	161321		16.5	-3.7	050	/		graupel		-1000 at	1355
	161401		16.3	-2.9	out	/					
1.5	161701					/		graupel from overhang			
1.6	162116		cloud dissipated, little/precip, still graupel out of overhang'								
2.1	162521		17.6	-5.2	260	/ updraft on the east side,				suppercooled water	
	162601		17.8	-5.8	out	/					
						/					

MRI Navajo

TEXAS HIPLEX 1978 AIRCRAFT DATA

DATE 7 / 26 / 78 FLT. # 1 MISSION NO. 12

A/C CREW _____

TAKE-OFF TIME (CDT) _____ LAND TIME (CDT) _____

ADVISED POSITION _____

TEMP PROFILE (1000 Ft.)

	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
ASDG																		
DSDG																		

TIME TO -5°C (Min) _____ TIME TO -10°C (Min) _____

TIME TO ADVISED POSITION: _____ (Min)

MISSION DATA

TURRET #	PENT TIME (CDT)	GM AgI	ALT (Ft)	AMB TEMP (°C)	ACFT HDG	TURRET LOC (VOR/DME)	CLD PENT SPD (kts)	CRUISE SPEED (kts)	AgI DROP INT (sec)	UPD (Ft/min)	TURB
3.1	162958		18	-4.2	140	85 / 19				+1000 at 3014	
	/C3036		18.2	out of 1st line		090/ 21			Supercooled water		
	/C3142		18.4	-6.5	another turret						
	/C3212		out			/					
3.2	/C3611		17	-4.2	020	/			Water	+1000 at 3715	
	/C3731		out			/					
3.3	/C4145		16.5		180	090 / 18				+1500 at 4225	
	/C4301		17	-4.9	out	/					
3.4	/C4533		17			/	Precip, water & grpl			+1000	
	/C4648		out			/					
3.5	/C4927		17	-4.2		092 / 17				+500 at 30 sec	5010
	/C5047		out			/					
						/					
						/					
						/					
						/					

AIRCRAFT CLOUD AND WEATHER OBSERVATIONS

TEXAS HIPLEX 1978

DATE 7-26-78 MISSION NO. 12 AIRCRAFT TYPE MRI Navajo

TIME (CDT)	OBSERVED PHENOMENA
	Clouds were vigorous and growing fast. Texas cloud was
	a turret growing around a mother cloud that was nature (iced
	out and precipitating thru the base) In approximately 25
	minutes the test cloud went thru its stages and dissipated
	at mid levels. The upper deck was still precipitating
	very lightly (graupel). I believe this turret did never
	have any precip thru the base.
	We studied another turret coming up in the vicinity.
	Similarly, good updrafts and liquid water in the beginning.
	dissipating in 20 to 25 min.
	Clouds had higher turbulence today than usually.

OBSERVER Elena Lobel

Aztec

TEXAS HIPLEX 1978 AIRCRAFT DATA

DATE 7/26/78 FLT. # 1 MISSION NO. 12

A/C CREW Chuck, Bruce

TAKE-OFF TIME (CDT) 1530 LAND TIME (CDT) 1705

ADVISED POSITION _____

TEMP PROFILE (1000 Ft.)

Time		3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1531	ASDG	31	29	25	21	16	15	10											
	DSDG		29	26	21	17	13	10											

TIME TO -5°C (Min) _____ TIME TO -10°C (Min) _____

TIME TO ADVISED POSITION: _____ (Min)

MISSION DATA

TURRET #	PENT TIME (CDT)	GM AgI	ALT (Ft)	AMB TEMP (°C)	ACFT HDG	TURRET LOC (VOR/DME)	CLD PENT SPD (kts)	CRUISE SPEED (kts)	AgI DROP INT (sec)	UPD (Ft/min)	TURB
Rn. Shwr	1544		9.7	9		070 / 26			Verga		
	1548		9.4	9		070 / 30			Scud clouds in area		
			9.2	10		070 / 33			Moderate Rain		
						/					
						/					
						/					
						/					
						/					
						/					
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						/					

AIRCRAFT CLOUD AND WEATHER OBSERVATIONS

TEXAS HIPLEX 1978

DATE 7-26-78 MISSION NO. 12 AIRCRAFT TYPE Aztec

TIME (CDT)	OBSERVED PHENOMENA
1536	light rain showers to SE
1605	9.5 cloud base

OBSERVER Bruce

July 26, 1978

Mission No. 12

Take Off: 2020 GMT
Seed Mode: On Top
Amount: No Seed
Seed Time: 2104 GMT
Cloud Type: Complex
Cloud Location: 072/20 to 072/8 BGS VOR
Mission Aircraft: Cloud Physics (MRI), P-Navajo and Aztec

During this mission a number of individual turrets were sampled by the MRI aircraft. This Debriefing only concerned itself with the test case cell. Information concerning the other turrets sampled may be found in the aircraft forms.

1st Pass at approximately 2054 GMT

Observed growing turret on northwest side of complex. Turret was located at 062/24 BGS VOR. Observed 1000 ft/min updraft for 30 seconds then an increase to 1500 ft/min updraft for 15 seconds. Observed good supercooled water.

2nd Pass at 2103.19 GMT

Observation taken at 17,300 ft. MSL (-4.7^{o} C) heading 045. Cell located at 069/21 BGS VOR. Observed graupel and snow then 800 ft/min updraft for 20 seconds. Exited 2106.38 GMT. Observed graupel in clear air possibly from over hang. Altitude at exit was 17,000 ft. MSL (-4.4^{o}C) at 065/29 BGS VOR.

3rd Pass at 2109.18

Observation taken at 17,000 ft MSL (-3.7^{o}C) heading 240. Cell located at 064/24. Observed 1500 ft/min. updraft for 20 seconds and encountered graupel from over hang. Exited at 2110.09 GMT.

4th Pass at 2113.21 GMT

Observation taken at 16,500 ft MSL (-3.7^{o}C) heading 050. Graupel

observed in 1000 ft/min. downdraft. No updraft. Again graupel was observed in clear air possibly from over hang.

5th Pass at 2117.01 GMT and 6th Pass at 2121.16 GMT

Cloud seemed to "puff" out. Suspended ice crystals only.

P-NAVAJO

1st penetration, at 2104 GMT, was at 21,800 ft MSL (-15). Aircraft had visual with MRI. Cloud-base on climb out was 9,800 ft. MSL (12.6).

Cell located at 072/20-8, aircraft heading 055. Observed some supercooled water and light turbulence with 700 ft/min updraft for a few seconds then 700 ft/min downdraft. Max updraft recorded at 1000 ft/min. Cloud top approximately 30,000 ft. MSL and was well rounded in growth stage. No entrainment.

2nd Pass at 2122 GMT

Observation taken at 21,300 ft. MSL ($-12^{o}C$) heading 150. Cell located at 065/25 BGS VOR. Observed moderate graupel then 1500 ft/min. updraft for 5 seconds. Light rime ice and snow observed at exit. Exited at 2112 GMT. Aircraft believed to have travelled through turret and then mother cloud.

3rd Pass at 2128 GMT

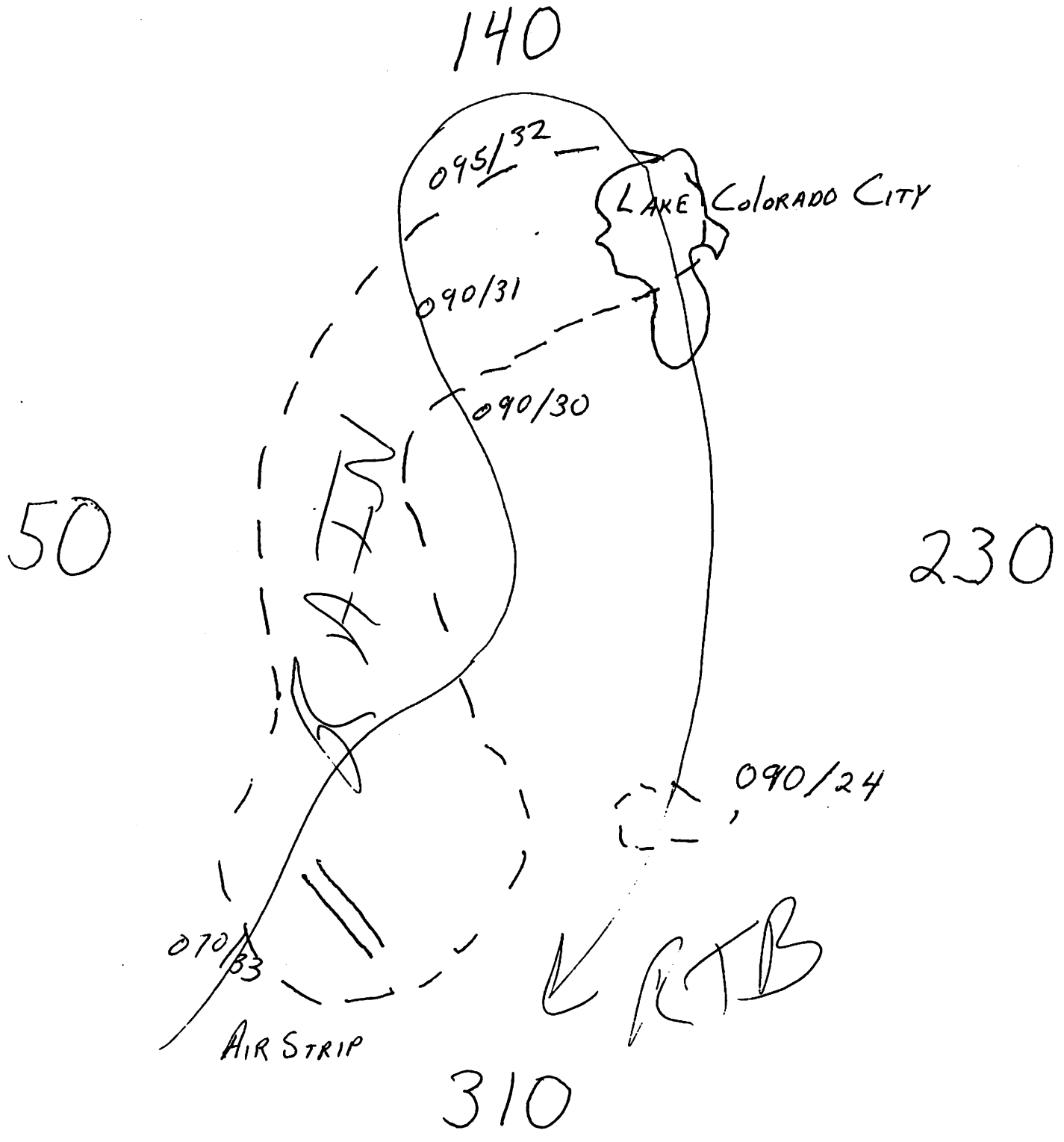
Observation taken at 21,900 ft. MSL ($-12^{o}C$) heading 340. Cell located at 090/40 BGS VOR. Light to moderate turbulence experienced at entrance, 1200 ft/min. updraft in cloud with lightning, graupel and turbulence.

Observed light turbulence and snow before exit.

Below is a diagram of the on-top seeding and sampling tracks

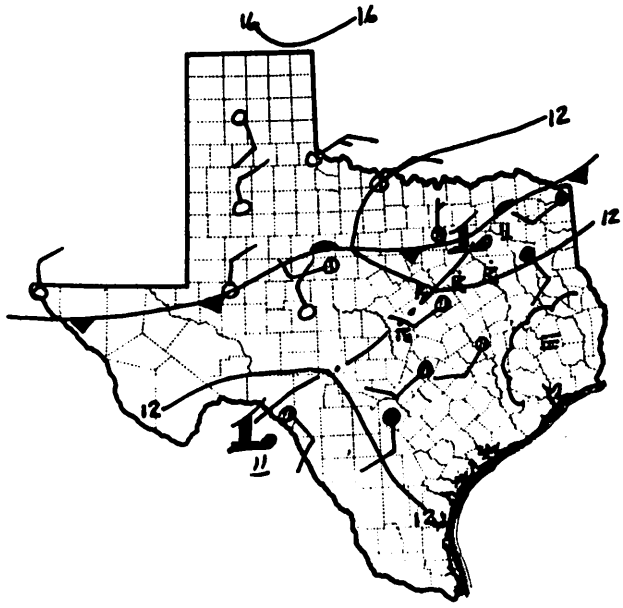
AZTEC:

Aztec sampled at cloud base in rain shaft.



Mostly moderate Rain

Summary
27 July 1978



1400 GMT

COOL FRONT LIES JUST S OF OP AREA FROM SJT TO MRF. AMS MDTLY MOIST AND QUITE UNSTBL. ENE FLOW AT 500 MB PROVIDING QUITE COLD (-10.5°C) AND MOIST (0.2°C DEPRESSION) AIR. CONVECTION ANTICIPATED BY MID-AFTERNOON IN OP AREA, AS SHALLOW FRONT WILL BECOME STATIONARY.

ACCAS OBSERVED OVER OP AREA THROUGHOUT MORNING HOURS, WITH CIRRUS ABOVE. SFC FRONT CONTINUED SLOWLY SE. CUMULUS FIRST OBSERVED AT 1900 GMT, OBSERVED T = 96°F. DEEP CONVECTION BUILT RPDLY ALONG SFC FRONT WELL S OF OP AREA, AND A LINE OF STRONG (TOPS > 50K) TSTMS DEVELOPED.

SCT CUMULUS REMAINED OVER OP AREA THROUGHOUT AFTERNOON, AND TCU-SML DEVELOPED BETWEEN STERLING CITY AND GARDEN CITY FROM 2300-0100 GMT, MAX TOPS TO 37K.

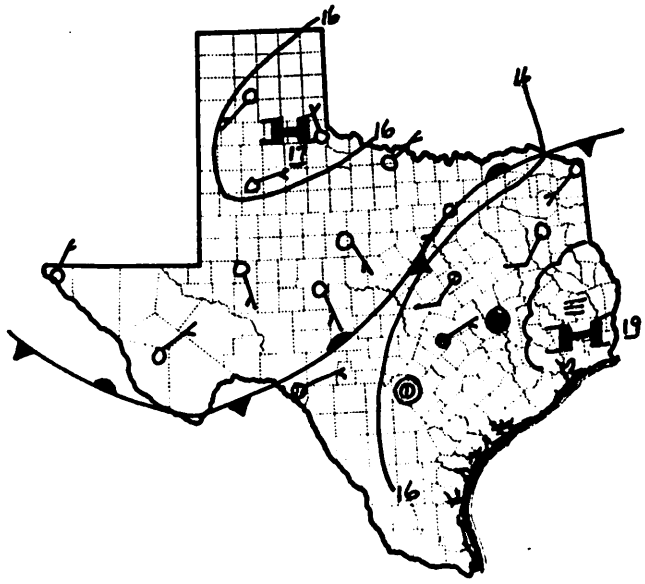
DAY CLASSIFIED A 6.

Weather Observations
27 July 1978

TIME (CDT)	
0850	SCT CIRRUS; ACCAS N-E-S-SSW; T = 74°F; WIND CALM
1000	SCT CIRRUS; ACCAS NNW-N; T = 79°F; WIND 35003
1055	SCT AC-ACCAS; SCT CIRRUS; T = 84°F; WIND 36003; ACCAS LNS NW-NE
1150	SCT CIRRUS; ACCAS NW-NE AND SW; T = 89°F; WIND 01007
1305	SCT AC-ACCAS; ACSL N-NW; CIRRUS SE-SW; LN CB BLDG RPDLY DSNT S-SW; T = 94°F; WIND 36008G18
1355	SCT CUMULUS; SCT AC; FEW ACCAS; FEW CI S-SW; LN CB DSNT S-SW; T = 96°F; WIND 02515G21
1455	SCT CUMULUS; LN TCU-CB DSNT SSE-S-SW; T = 97°F; WIND 02013; CS DSNT S-SSW
1555	SCT CUMULUS; CU MDRCS S-SW; TCU-CB DSNT SE-SW; CS S-SW; T = 98°F; WIND 05015
1755	FEW CU ALQDS; TCU LN DVLP SE-S; CS DSNT SE-S-SW; T = 93°F; WIND 06508
1855	FEW SML CU; LN SML CB SE-S-SSW; CS DSNT SE-S; T = 92°F; WIND 08507G15

FORECAST VERIFIED

Summary
28 July 1978



1300 GMT

HIGH MOISTURE IN LOW-LEVELS IN OTHERWISE STABLE AND DRY AIRMASS TO PRODUCE SCT CUMULUS. TEMPS WARM (-5.1°C) AT 500 MB. A SFC FRONT LIES STNRY FROM NE TX TO JCT AND DRT. FRONT EXPTD TO DRIFT VERY SLOWLY N DURING PERIOD AND NOT ENTER AREA.

SCT CUMULUS NOTED THROUGHOUT FORECAST PERIOD, AFTER FIRST CUMULUS OBSERVED AT NOON OB (T = 88°F). A FEW CU CONG AND SML TCU NOTED BEFORE DUSK TO S.

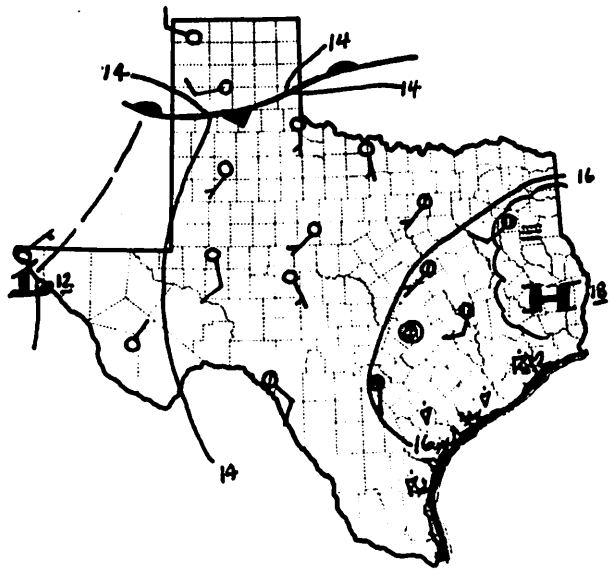
DAY CLASSIFIED A 4.

Weather Observations
28 July 1978

TIME (CDT)	
0755	CLR HAZE LYRS W-NW; T = 73°F; WIND 16003
0855	CLR CLM K NW; T = 76°F; WIND 19006
1105	CLR CI ON HRZN SSW; T = 85°F; WIND CALM
1150	CLR FEW SML CUMULUS W-N AND S; CB SSW HRZN; K 4R W-NW; T = 88°F; WIND 20002
1300	SCT CUMULUS; T = 90°F; WIND 17005
1555	SCT CUMULUS; T = 95°F; WIND 18009
1850	SCT CUMULUS; FEW CU CONG - SML TCU; T = 97°F; WIND 19006; CB DSNT S-SE

FORECAST VERIFIED

Summary
29 July 1978



DAY CHARACTERIZED BY INCREASING MOISTURE ASSOCIATED WITH INVERTED TROUGH AT MID LEVELS SLOWLY MOVING WNW FROM NEAR DRT. AMS ONLY MARGINALLY UNSTABLE, AND SOMEWHAT MOIST IN LOW LEVELS, ALTHOUGH MOISTURE WILL INCREASE SIGNIFICANTLY DURING FORECAST PERIOD.

FIRST CUMULUS OBSERVED AT 1500 GMT OBSERVATION. SCT TO THIN SCT CUMULUS PERSISTED BALANCE OF FORECAST PERIOD, WITH MID AND UPPER LEVEL CLOUDINESS OVERRUNNING SKY BY EARLY AFTERNOON. CUMULUS MEDIOCRIS OBSERVED MID-AFTERNOON, AND SOME CONGESTUS TO THE SOUTHEAST, WITH A FEW TCU-RWU PUSHING THROUGH THE CS DECK LATE AFTERNOON.

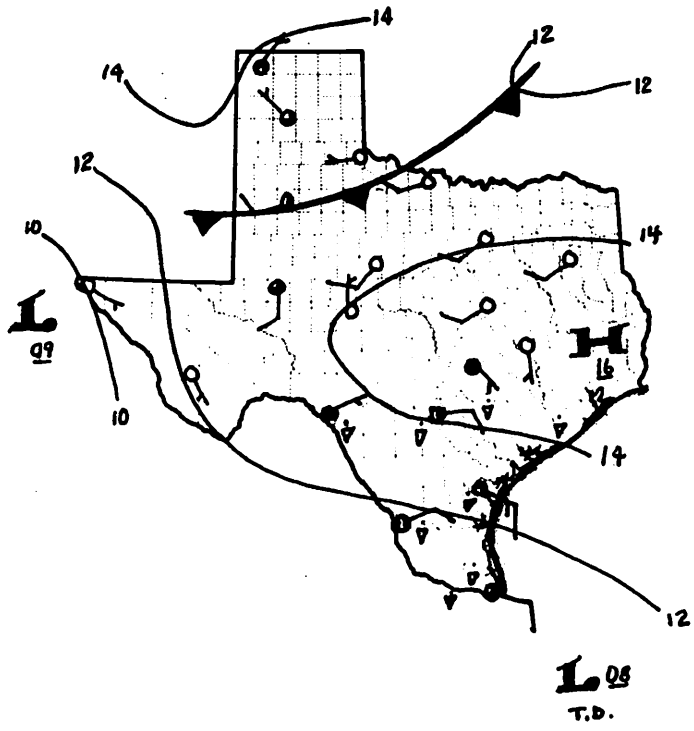
DAY CLASSIFIED A 5.

Weather Observations
29 July 1978

TIME (CDT)	
1000	CLR SML CU SE-S; CB DSNT SE-S AS-AC SE-S; CI-CS-SW; T = 79°F; WIND 17014G20
1105	THN SCT CUMULUS; SCT CI; FEW ACCAS-SML CB DSNT SE-S; T = 83°F; WIND 19014G20
1355	SCT CUMULUS; BKN CS; FEW AS; T = 94°F; WIND 17015
1555	SCT CUMULUS; SCT AC-AS; BKN CS; FEW TCU-TWU SE; T = 97°F; WIND 17516G23

FORECAST VERIFIED

Summary
30 July 1978



VERY HIGH MOISTURE CONTENT (PW = 1.62") OVER OP AREA PROVIDED BY SE FLOW SFC 500 MB. EASTERLY WAVE SE OF AREA SUPPLYING GULF MOISTURE. AMS QUITE COOL AND SOMEWHAT UNSTABLE (LI = -1.4). AN AIRMASS CONVECTION DAY (CLASS 6) ANTICIPATED.

CONSIDERABLE MID AND UPPER LEVEL CLOUDINESS OBSERVED DURING A.M. HOURS, WITH FIRST CUMULUS NOTED AT 1600 GMT OBSERVATION. CUMULUS INCREASED THROUGHOUT FORECAST PERIOD, AND BY MID-AFTERNOON CU WAS BKN W/OVC CS ABV. RAINSHOWERS WERE OCCURRING IN OP AREA BY MID-AFTERNOON, AND A FEW TSTMS (42000') OCCURRED BY LATE AFTERNOON.

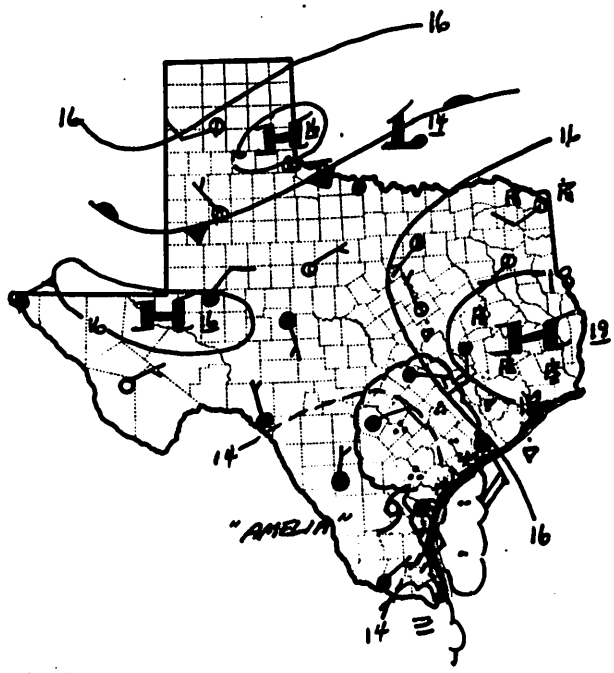
DAY CLASSIFIED A 6.

Weather Observations
30 July 1978

TIME (CDT)	
1100	BKN AC-AS; BKN CS; FEW CU W NW-N; T = 77°F; WIND 16513
1355	BKN CUMULUS; ⊕ CS; CS DNS; T = 82°F; WIND 15010
1455	BKN CUMULUS; ⊕ CS; T = 84°F; RWU SE; WIND 13009
1655	RWU E-SE N; BKN VOVC CUMULUS; ⊕ CS; T = 86°F; WIND 15013; TRWU E

FORECAST VERIFIED

Summary
31 July 1978



1300 GMT

MOISTURE FROM EASTERLY WAVE REMAINS OVER OP AREA, AND IS CONTINUING SLOWLY WNW. AMS REMAINS SOMEWHAT MOIST (PW = 1.29") AND ONLY MDTLY UNSTBL (LI = -0.8). TEMPERATURES ARE COLD AT 500 MB (-7.9°C) BUT STRONG CAPPING INVERSION ($^{\Delta T}/_{\Delta Z}$ = +1.8°C) exists above (500-495 MB). A FEW RAINSHOWERS EXPECTED TO DEVELOP UNDER INVERSION, WITH NO HEAVY ACTIVITY ANTICIPATED.

MID AND UPPER LEVEL CLOUDINESS DOMINATED THE EARLY PORTION OF THE FORECAST PERIOD, BUT DECREASED THROUGHOUT THE DAY. FIRST CUMULUS NOTED AT 1600 GMT OBSERVATION. BY NOON, CUMULUS WAS SCATTERED. ACTIVITY RESTRICTED TO CUMULUS CONGESTUS - CAPPED BY INVERSION (ABOVE) UNTIL 2100 GMT WHEN STRONG SFC HTG (95°F) WAS ABLE TO PRODUCE ENOUGH BOUYANT STRENGTH TO BREAK INVERSION. RAINSHOWERS AND SML CB (35000') OCCURRED NW AND SE PORTIONS. ACTIVITY DISSIPATED AFTER DARK.

DAY CLASSIFIED A 6.

Weather Observations
31 July 1978

TIME (CDT)	
0755	OVC AC-AS; BINOVC NW-E; FEW LWR SC, ST SW-W; T = 69°F; WIND 05004
0855	SCT AS; OVC AC-CC; ACCAS S-SW-W; FEW LWR ST SW-N; BINOVC NW-E; T = 73°F; WIND LV
0955	FEW ACCAS SW-W; OVC CS-CC; RWU DSNT SE-S; T = 73°F; WIND LV
1100	FEW CUMULUS S-SW; OVC CS-CC; BINOVE NW-E; T = 76°F; WIND CALM
1350	SCT CU; FEW AS; BKN CC-CS; T = 88°F; FEW CU CONG NW-N; WIND 05006
1510	SCT CU; SCT AC-AS; SCT V BKN CI-CS; CU CONG ALQDS YCP W; T = 92°F; WIND 01009
1600	SCT CU; SCT AC; BKN CC-CS; CU CONG ALQDS; TCU-RWU NW-N; T = 93°F; WIND 07008
1650	SCT CUMULUS; CU CONG ALQDS; TCU-RWU SE-S; TCU-SML CB NW-N; TRWU NW; T = 95°F; SCT AC; SCT CI; WIND 04012

FORECAST VERIFIED