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TERMINAL FORECAST REFERENCE NOTEBOOK (TFRN) FOR LUKE AFB, ARIZO--ETC(U)
JUN 80
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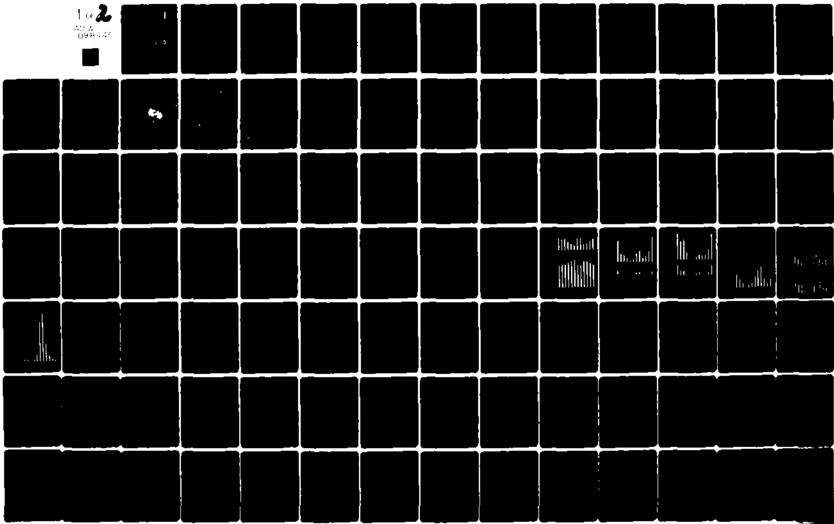

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TERMINAL FORCAST REFERENCE NOTEBOOK

FOR

LUKE AFB AZ

Detachment 15, 25 Weather Squadron (MAC)
Luke AFB, Arizona
2 June 1980

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FOR THE COMMANDER

Robert E Black

ROBERT E. BLACK, Lt Col, USAF
Operations Officer

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Forecast Studies

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This terminal forecast reference notebook is for Luke AFB Arizona. It describes the following topics concerning forecasting weather at Luke AFB: location, topography, and local effects; impact of weather on supported units; synoptic climatology; climatic aids; operationally significant forecast problems; approved forecast studies; rules-of-thumb; and special synoptic studies and references.

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5. PHYSIOLOGY
6. POLLUTION
7. PROPAGATION
8. RADAR (ALL SUBCATEGORIES)
9. WEATHER (ALL SUBCATEGORIES)

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CONTENTS

CHAPTER 1

LOCATION, TOPOGRAPHY AND LOCAL EFFECTS

1-1. Location: Luke Air Force Base is located in Maricopa County, Arizona approximately thirty miles west-northwest of the city of Phoenix (fig 1-1, 1-1a). Geographic coordinates are 112°-22'-57"W longitude and 33°-32'08"N latitude. The field elevation is 1,101 feet above mean sea level. The base's parallel runways are oriented 30°-210°. (fig 1-2).

1-2. General Discussion of Local Area and Topography.

a. Luke AFB is located on smooth, desert plain which slopes gently southward in the vicinity of the base at the rate of approximately 20 feet per mile. The base is surrounded by many square miles of similar terrain which slopes southward or southwestward. The base is three miles west of the Aqua Fria River, which flows southward into the Gila River about 9 miles south of the base. The Gila and Salt rivers join only 4 miles east and upstream of the confluence of the Aqua Fria and the Gila Rivers. The nearest highlands are; the White Tank Mountains, 4,083 feet, about 8 miles due west of the base; the Sierra Estrella, 4,512 feet, about 12 miles to the south; the Phoenix Mountains, 2,740 feet, about 20 miles to the east; and the Hieroglyphic Mountains, 4,565 feet, about 15 miles to the north. All surface and near surface geological deposits within several miles of the base consist of alluvium derived from either igneous or metamorphic rocks. The soils around the area are composed in lenticular layers of unconsolidated and semi-consolidated gravel, sand, silt, and clay which were transported from surrounding mountains by wind and water erosion. (figs 1-3, 1-4).

b. Most of the land immediately surrounding the base is irrigated and cultivated. Chief crops are cotton, alfalfa, lettuce, onions, and citrus. However, typical southwest desert vegetation lies within short distances to the south and west. The sparce vegetation in non-irrigated areas consist mainly of cresote bush on the desert floor, mesquite along the river bottoms, and palo verde and cacti on nearby desert hills. Only at elevations above 2,500 feet to the north and east may relatively thick growths of chaparral and oak be found.

c. The Phoenix Metropolitan Area begins only 13 miles east-southeast of Luke AFB. This dense urban population boast of containing 55 per cent of Arizona's total population. The primary city is Phoenix which is the state capital. Its size was 583,217 in the 1970 census but has experienced rapid growth during the last decade.

d. No large bodies of water are near Luke AFB. However, several normally dry riverbeds converge near the base and can temporarily influence local flying weather during extended periods of rain. Dams in the watershed are designed for water storage and have only limited flood control ability. Between 1978 and 1980, four 100 year floods occurred along the Aqua Fria and Salt Rivers. In February 1980, as much as 75,000 cfs flowed through the Aqua Fria River and nearly 200,000 cfs, through the Salt River (fig 1-3).

e. On a synoptic scale, the Pacific Ocean is Luke AFB's primary moisture source. Its nearest point is approximately 290 miles west. The Gulf of California serves as the primary source of low level moisture from July through early September. It lies 160 miles to the southwest. Some mid and high level moisture is advected from the Gulf of Mexico, 975 miles to the southeast, during the summer (fig 1-5).

f. Mountain ranges limit moisture advection into southern Arizona from any direction except the southwest. The coastal ranges and the Sierra Nevada of California extend from the west through the northwest. There are also additional ranges to the northwest in Nevada. Northern Arizona has the Colorado Plateau, average heights above 5,000 feet, and the Mogollon Rim, average heights over 7,000 feet with several peaks exceeding 10,000 feet. The Rockies extend from the northeast through western New Mexico into central Mexico (fig 1-3, 1-5).

1-3. Topographic Effects on Local Weather.

a. Fronts: The mountains through Southern California and Nevada tend to block frontal systems moving from the Pacific Ocean. The stronger fronts that do reach southern Arizona usually produce little precipitation or low level clouds. Likewise, the Southern Rockies to the east protect Arizona from the winter Artic outbreaks that plague the central U.S. Upper air lows that form southwest of San Diego, California and travel east give southern Arizona its lowest ceilings and most of the winter rains. This occurs because of the lack of significant mountain ranges southwest of Luke to block the advection of moisture. Such sytems are produced only occasionally each winter.

b. Thunderstorms: Although thunderstorms may occur during any month at Luke AFB, the greatest frequency is from July through early September during the Arizona monsoon season.

(1) The Sierra San Pedro Matir, the Sierra de la Giganta of Baja California, and the foothills of the Sierra Madre Occidental of central Mexico confine low level moisture over the Gulf of California to a rather natural channel about 200 miles across. The width of the gulf is between 60 and 100 miles. By late June, a strong heat low develops over the high deserts of southern Nevada. In early July, thick cloud canopies with embedded showers or thunderstorms move across the mouth of the gulf as tropical disturbances develop along Mexico's central Pacific coast or as easterly waves move from the mainland over the gulf itself. Surges of low level moisture travel northward between the ranges into Southwest Arizona. Probable dynamics for the moisture pump are higher pressure under clouds associated with convective activity, evaporational cooling from precipitation, and differential heating in and outside the cloud area. The net effect is an increased slope of the tropical air mass boundary to the extent that the air mass becomes unstable and moves up the progressively hotter gulf toward the heat low in Nevada. Steep lapse rates caused by average afternoon temperature in excess of 100 degrees and mountains above 4,000 feet clockwise from the northwest through the south combine to produce spectacular afternoon and evening thunderstorms in southern Arizona. (fig 1-3, 1-5).

(2) Depending upon the direction of the steering wind and its strength, there are three favored origins for thunderstorms that eventually move over the base. They are the Santan Mountains to the southeast; the Sauceda, Gila Bend, and Maricopa Mountains to the southwest; and the Bradshaw Mountains to the north-northeast. Thunderstorms from the first two directions, guided by prevailing SE or SW flow aloft, will usually hit the base about 1900L. Storms from the third direction, which are guided by late evening mountain drainage winds, usually strike the air field around 2200L. Cells traveling toward the base from any other direction will usually miss the base by more than 5 nautical miles because of the steering effect of the Sierra Estrella and the White Tank Mountains (fig 1-6).

c. Air Pollution: The growth of the Phoenix area has made air pollution a factor of increasing interest. Pollution in the form of haze or smoke usually originates over Phoenix under an inversion and is moved over Luke AFB by nocturnal easterly drainage winds in the Phoenix area. The White Tanks help create a local eddy which keeps the pollutants in the area until the inversion is broken. Range and forest fires during the spring and fall in Arizona may cause temporary smoke problems but visibilities usually remain VFR.

d. Blowing Dust: Because of the great extent of sparce desert vegetation and the unconsolidated nature of the soil, visibility restrictions due to blowing dust may occur at any time during the year when surface winds are in excess of 25 knots. The severity of the visibility restriction is directly proportional to the strength of the wind and the dryness of the soil. The area's worst dust storms occur in July with the onset of the monsoon season. They result from the cold downrush of air from thunderstorms hitting a hot desert floor and may travel as far as 40 miles in advance of the storms that spawned them. In extreme cases, a thunderstorm may completely die before its associated dust storm hits the base (fig 1-6).

e. Mountain and Valley Breezes: Luke AFB is affected only slightly by mountain and valley breezes. Occasionally, during winter nights, a venturi effect is produced by the Black Canyon, which is north of the base, when there is a strong northeast - southwest gradient. This reinforces the normal, northerly nocturnal drainage wind and creates gusts between 18 and 20 knots from the north-northeast.

f. Upslope and Downslope: The valley floor near Luke AFB slopes gently toward the south. With a weak pressure gradient, surface winds will be light and favor a northerly direction from within an hour after sunset until about three hours after sunrise during the summer and five hours after sunrise in other seasons. After the nocturnal inversion is broken, winds will favor a southwesterly direction. Upslope plays a small part in low cloud formation in this area provided low level winds blow from moisture sources such as the Pacific Ocean near San Diego or the Gulf of California. Downslope effect of the mountain ranges from the west through the north tend to dry and warm the lower atmosphere and result in significantly weakened frontal systems that traverse southern Arizona.

1-4. Location of Meteorological Equipment (fig 1-7).

a. AN/TMQ-11 (temperature-humidity set): Located just west of the tower between the taxiway and runway 03R.

b. AN/GMQ-20 (wind transmitter): Dual transmitters, one located just west of the approach end of runway 03R, the other northeast of the approach end of runway 21R.

c. AN/GMQ-13 (cloud height set): Detector and transmitter are located directly off the approach end of runway 21R.

d. AN/FPS-77 antenna: Located one block north of base operations.

e. AN/FPS-77 display console: Located in the base weather station in the base operations building.

f. Mercurial barometer: Also located in the base weather station.

g. Rain gauge: Located just south of the base operations building.

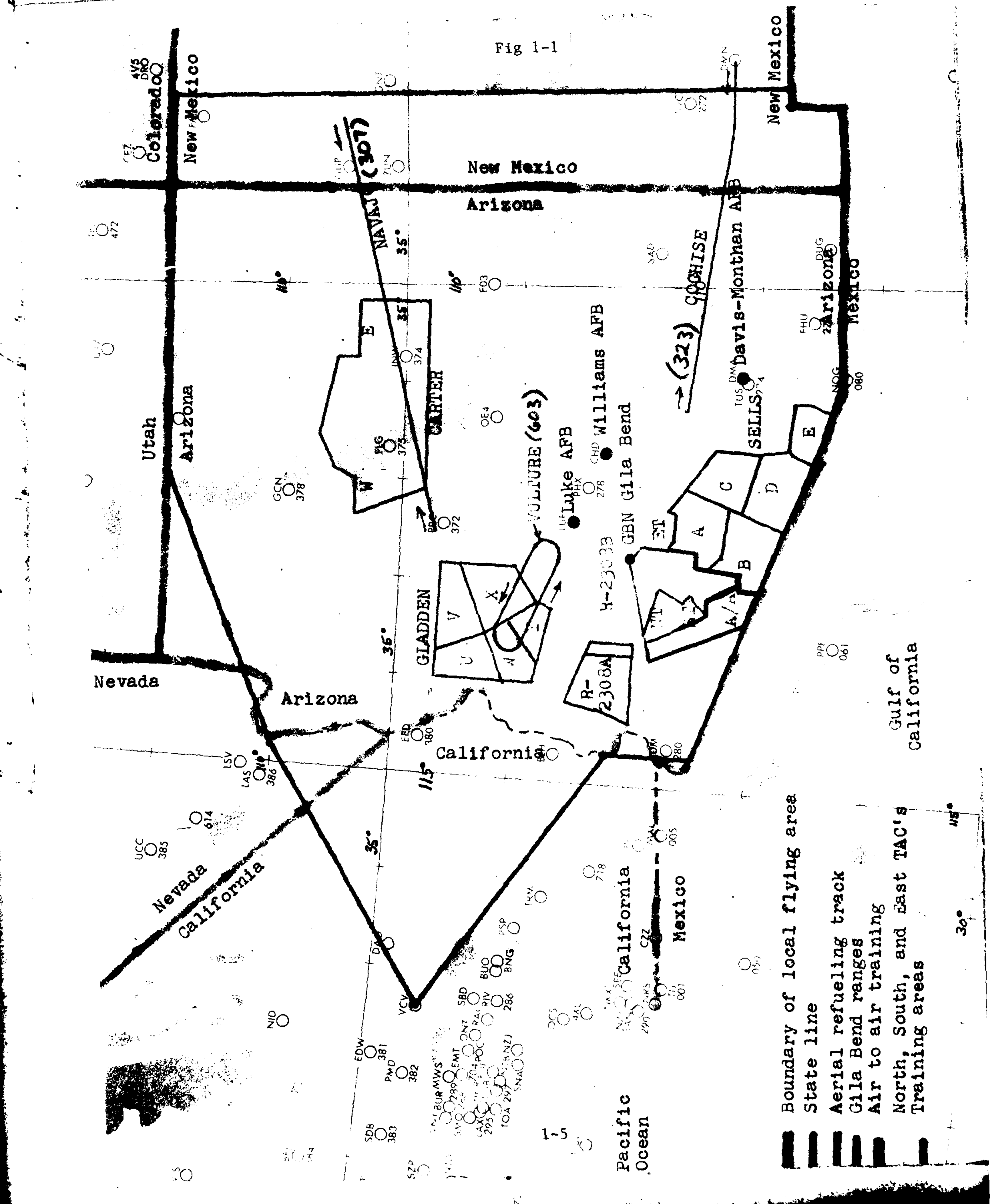
1-5. Effect of Environment on Meteorological Sensors.

a. FPS-77 Radar: The mountains and/or buildings surrounding the radar antenna produce significant ground clutter in all directions with antenna elevations below 2 degrees. The White Tank Mountains severely block the radar signal when the antenna elevation is below 5 degrees between 243 and 307 degrees in the horizontal. Even at 2 degrees antenna elevation, the radar pulse is partially blocked between 325 clockwise through 100 degrees by mountains between the Hieroglyphic and Bradshaw ranges to the north and Four Peaks to the east. At this elevation, South Mountain also partially blocks the signal between 125 and 140 degrees as does the Sierra Estrella between 152 and 210 degrees. Most radar signal blocking can be eliminated, with the exception of the White Tanks, by raising the antenna to 3 degrees. However, this causes the beam to overshoot the tops of distant convective storms and closer stratified precipitation. A compromise is reached by using lower antenna elevations in conjunction with the PPI, RHI, and A/R scopes to differentiate mountains from precipitation.

b. Observer's Field of Vision: The observer's vision field is severely limited in all directions except from the southwest clockwise through the north. From base operations, the observer can see between 252 to 320 degrees. By observing at the flight line, this is increased to between 230 and 360 degrees (fig 1-2). The inability to see over the roofs of neighboring buildings is the primary problem. This is unfortunate because most of the major dust storms come from the southeast and most fog comes from a south to southwesterly direction. At the present time, the control tower helps in alerting the weather staff to approaching visibility problems. Plans are being processed to build an observing platform on the roof of Base Operations.

c. Rain Gauge: The rain gauge is located in a confined area between Base Operations and the Fire Department's Crash Station. It is 10 feet north of the Crash Station. Because of its location, measured rainfall could be less than actual rainfall particularly if rain is coming from the north, south or southwest.

Fig 1-1



Utah
Colorado
Arizona
New Mexico
Nevada
California
Nevada
California
Arizona
Gulf of California
Pacific Ocean
Mexico
NAVAJO (307)
COCHISE
(323)
VULTURE (603)
GLADDEN
CARTER
Luke AFB
Williams AFB
GBN Gila Bend
Davis-Monthan AFB
SELLS
R-2308A
R-2308B
Boundary of local flying area
State line
Aerial refueling track
Gila Bend ranges
Air to air training
North, South, and East TAC's Training areas

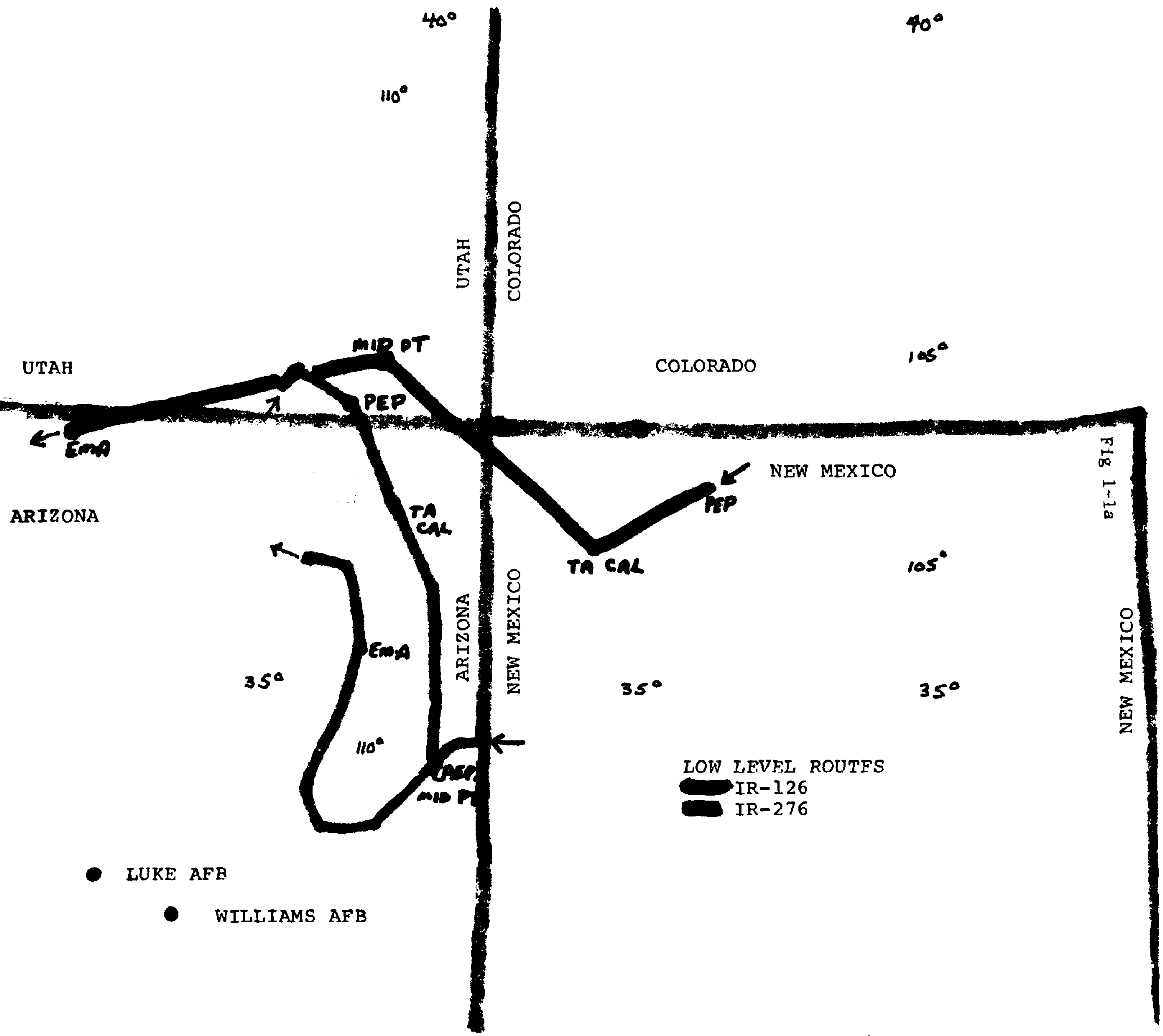

40°
40°
110°
UTAH
COLORADO
UTAH
COLORADO
MID PT
PEP
EMA
ARIZONA
TA CAL
NEW MEXICO
PEP
TA CAL
105°
105°
ARIZONA
NEW MEXICO
EMA
35°
35°
35°
110°
NEW MEXICO
MID PT
LOW LEVEL ROUTES
IR-126
IR-276
LUKE AFB
WILLIAMS AFB

Fig 1-1a

Fig 1-2

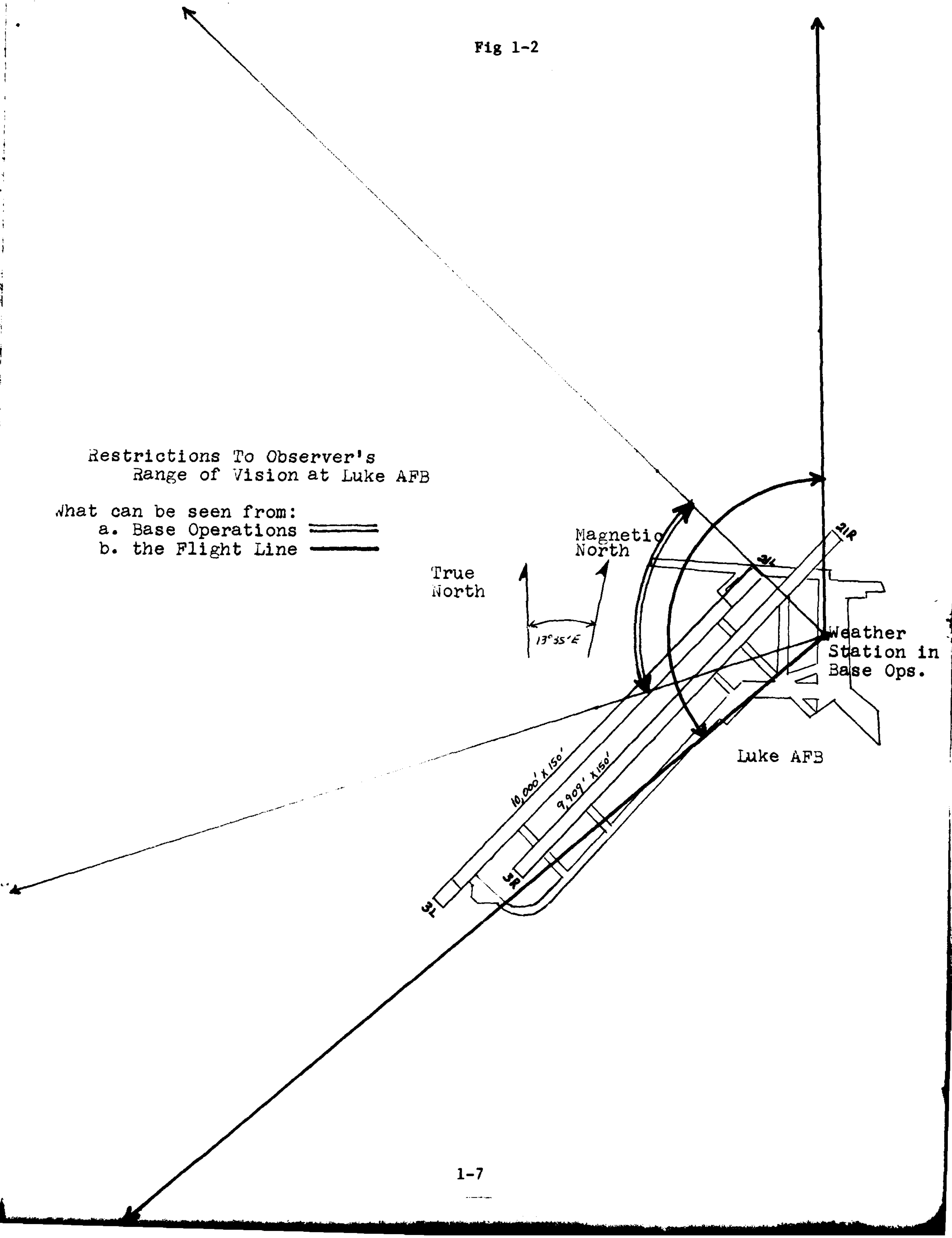
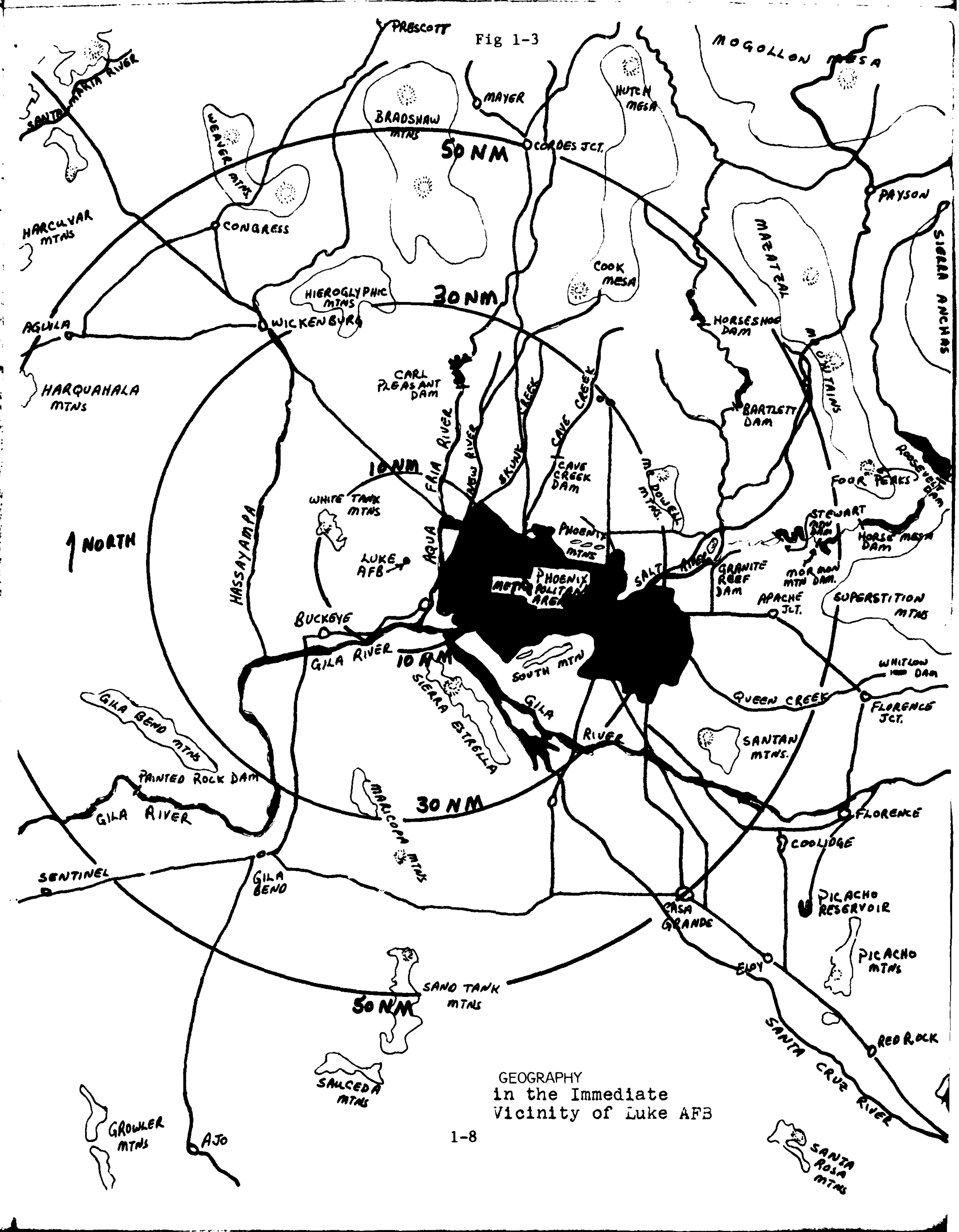
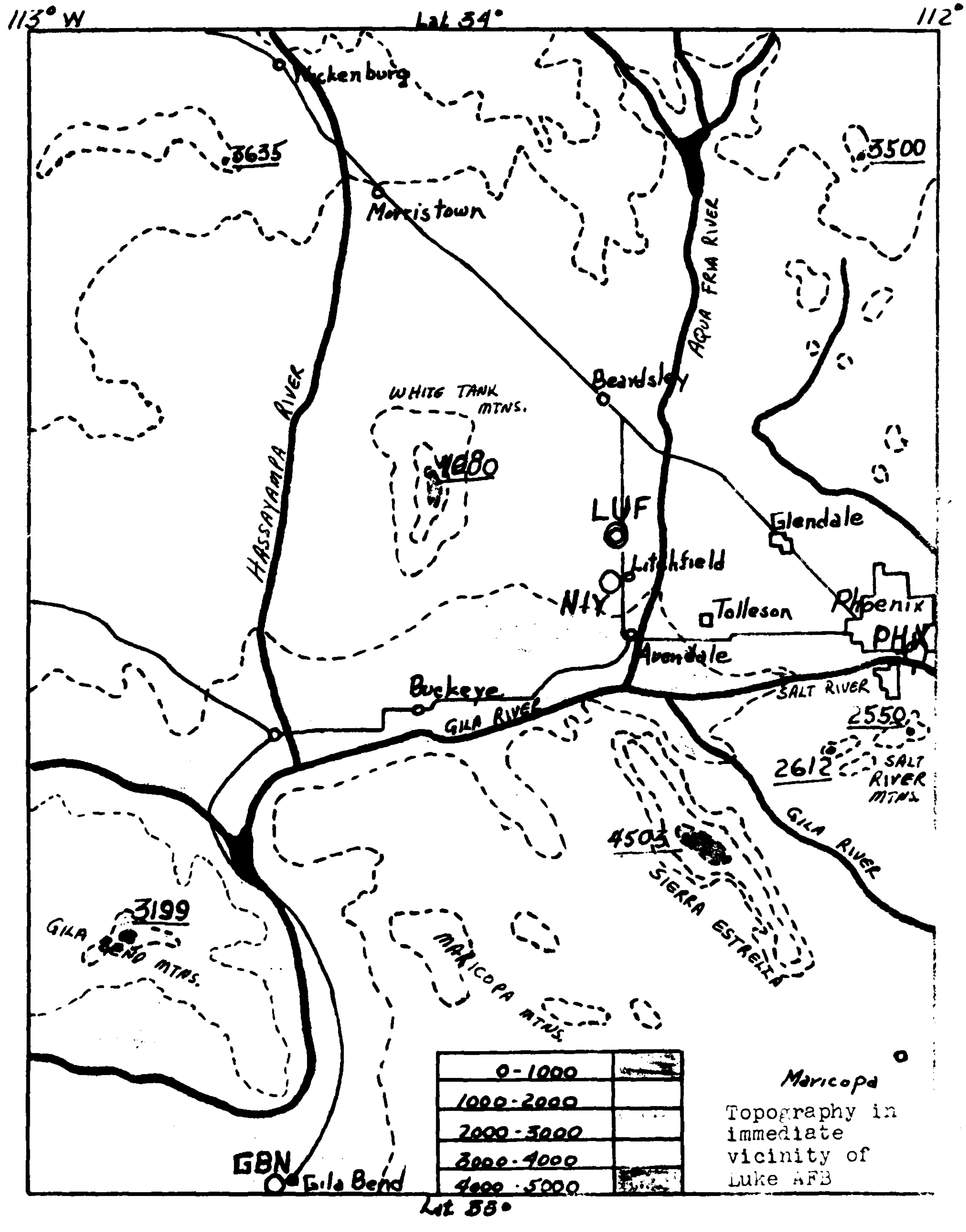

Restrictions To Observer's
Range of Vision at Luke AFB
What can be seen from:
a. Base Operations
b. the Flight Line
Magnetic
North
True
North
13°35'E
21R
21L
Weather
Station in
Base Ops.
Luke AFB
10,000' X 150'
9,909' X 150'
3R
3L

Fig 1-3



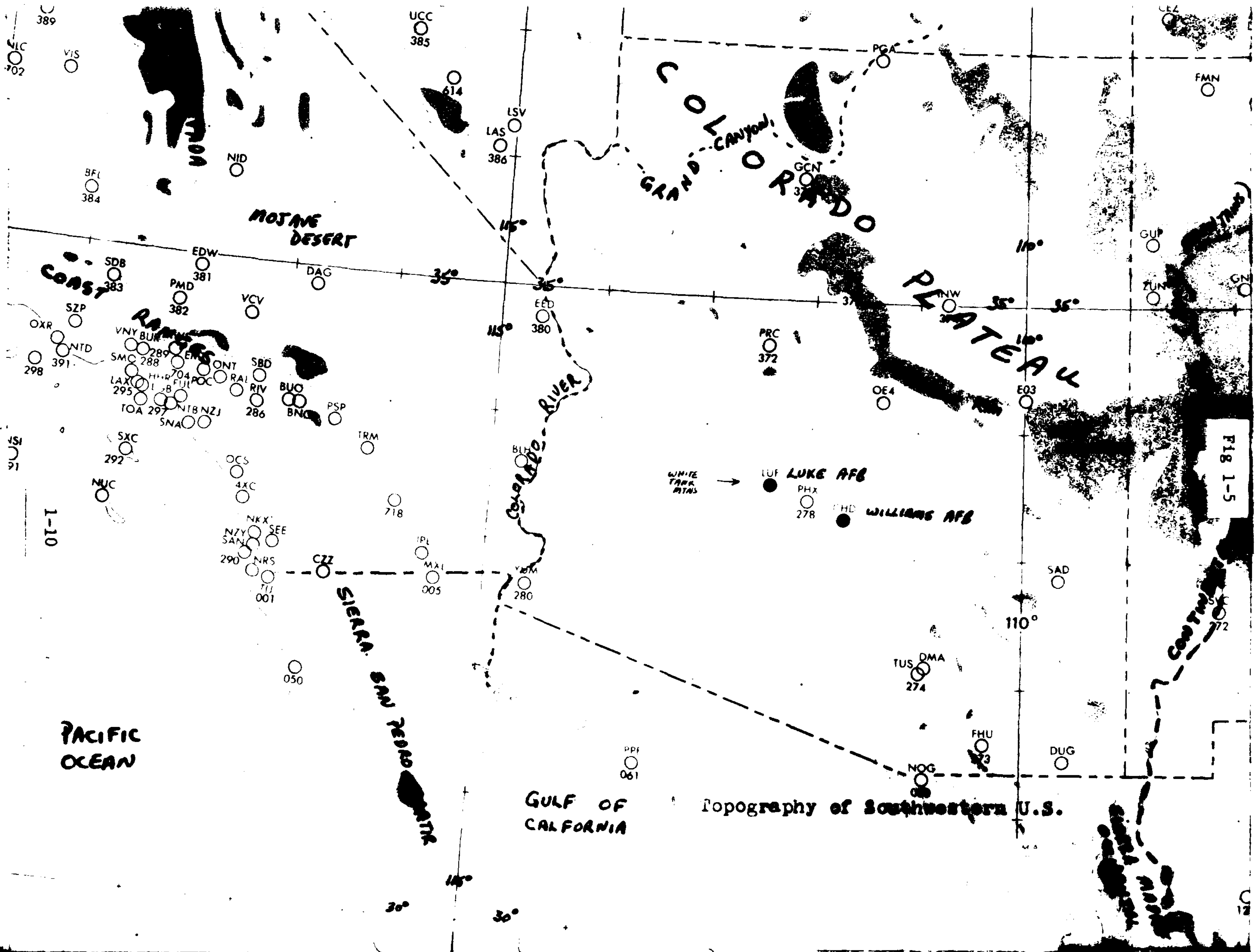
GEOGRAPHY
in the Immediate
Vicinity of Luke AFB

Fig 1-4



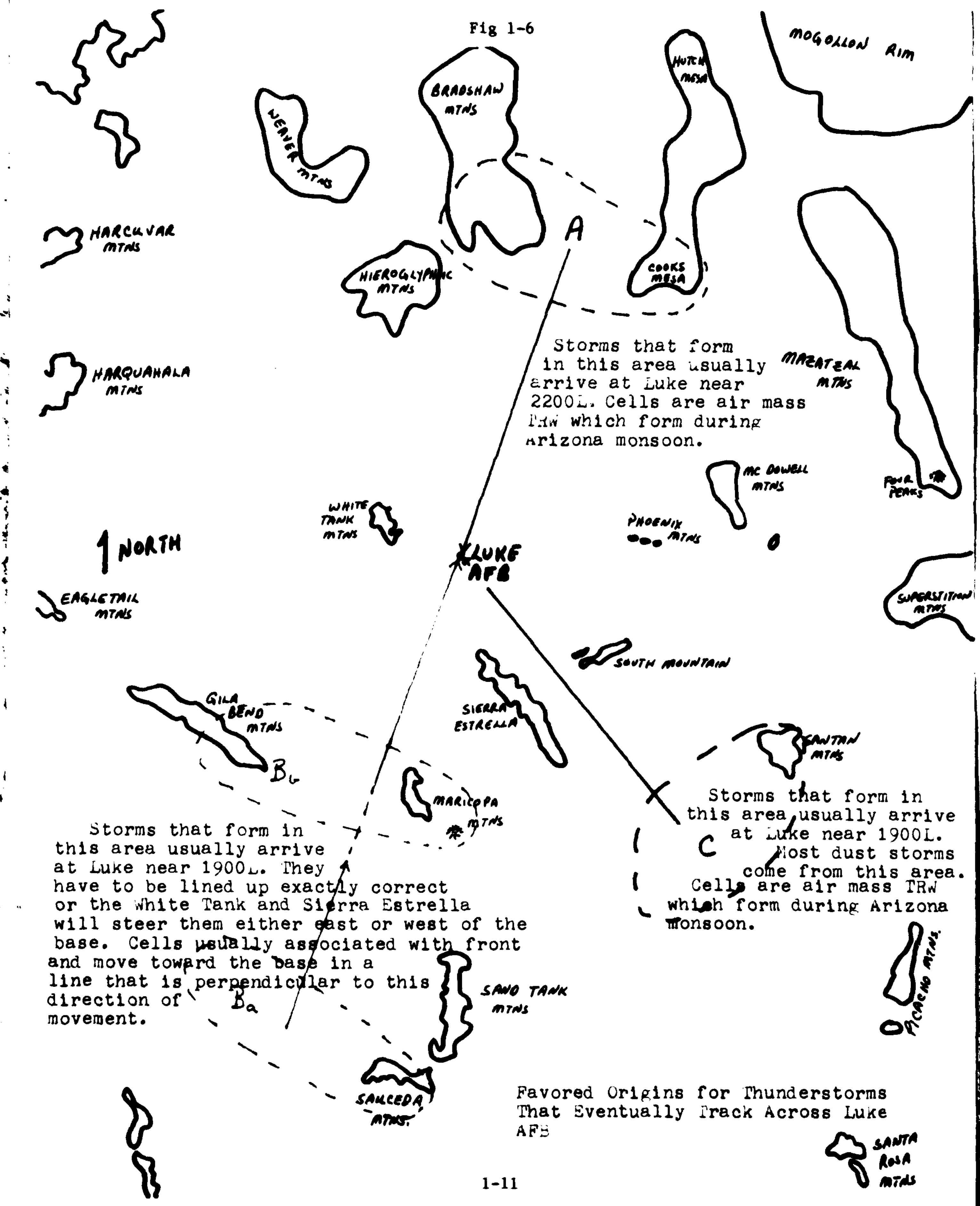
Topography in immediate vicinity of Luke AFB

Fig 1-5



Topography of Southwestern U.S.

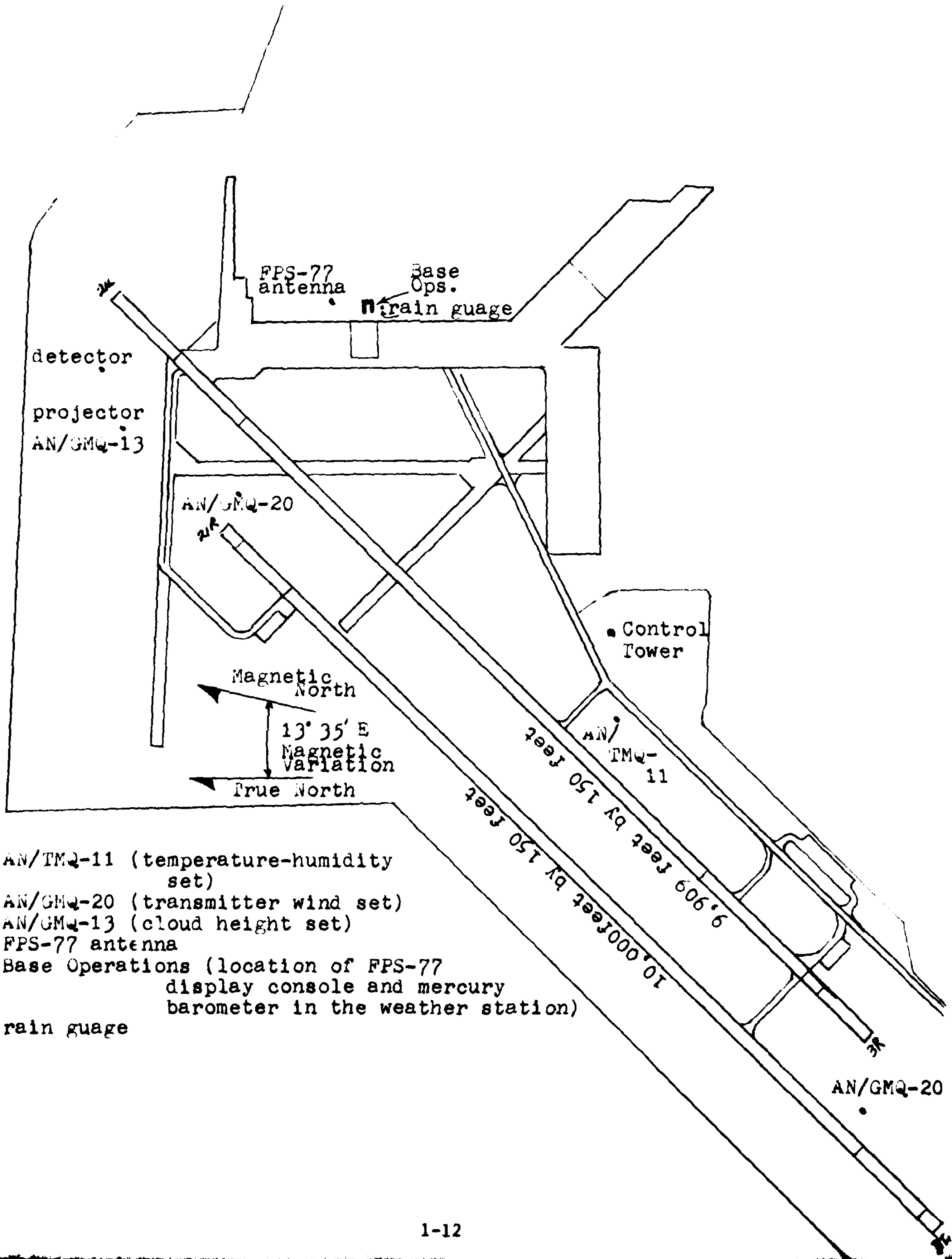
Fig 1-6



Favored Origins for Thunderstorms That Eventually Track Across Luke AFB

Fig 1-7

Sites of Meteorological Equipment at Luke AFB



AN/TMQ-11 (temperature-humidity set)
AN/GMQ-20 (transmitter wind set)
AN/GMQ-13 (cloud height set)
FPS-77 antenna
Base Operations (location of FPS-77 display console and mercury barometer in the weather station)
rain guage

CHAPTER 2

THE IMPACT OF WEATHER ON SUPPORTED UNITS

CHAPTER 2

LAFB IMPACT OF WEATHER ON SUPPORTED UNITS

69 TFTS (Tactical Fighter Training Squadron)

The 69TFTS is a unit of the 58th Tactical Training Wing and operates F-104 aircraft. The mission of the F-104 squadron is to train German student pilots in tactical flying skills. This training involves air combat maneuvers, basic flight maneuvers, day/night VFR ground attack, and day/night VFR low level navigational missions. They operate in the Gila Bend range complex area as well as most of Western Arizona.

THRESHOLD VALUE AT LUKE AFB	LEAD TIME	IMPACT	CUSTOMER ACTIONS
CEILING AND VISIBILITY BELOW			
500 ft/1½ miles	1 Hour	Cancel training missions	1. Cancel all training sorties. 2. Airborne aircraft divert to alternate.
1500 ft/3 miles	1 Hour	Cancel training missions	1. Cancel all student sorties. 2. Airborne aircraft divert to alternate, if required.
2400 ft/3 miles	Ø	Cancel some training missions. Affects scheduling and aircraft recovery.	1. Student training is severely restricted and probably cancelled. 2. Restricts number of aircraft landing together and per hour. 3. Airborne aircraft divert to alternate, if required.
3000 ft/3 miles	Ø	Cancel some missions. Affects scheduling.	1. Cancel all solo student training sorties. 2. Implement adverse weather procedures.
SURFACE WINDS			
15-34 Knots	1 Hour	Landing problems.	1. Cancel takeoff and landings if crosswind exceeds 25 knots. 2. Divert to alternate if crosswind exceeds 25 knots.

HAIL Any size	1 Hour	Possible damage to aircraft canopies.	1. Cancel takeoffs and landings.
THUNDERSTORMS	1 Hour	Affects training missions.	1. Avoid thunderstorms. 2. Cancel sorties if on the range. 3. Weather recall is possible if thunderstorm approaching Luke.
RAIN (2" or more in 12 hours)	NA	Safety problems	1. Reduce crosswind to RCR condition. 2. May require diversion to alternate base.
ICING (Moderate or Greater)	1 Hour	Affects training mission.	1. Avoid sustained flying in icing layer.
TURBULENCE (Severe or Greater)	NA	Affects training missions.	1. Cancel training flights.

LAFB IMPACT OF WEATHER ON SUPPORTED UNITS

310, 311, 426 TFTS (Tactical Fighter Training Squadrons)

The 310, 311, and 426 TFTS are units of the 58th Tactical Training Wing and operate F-4 aircraft. The mission of these F-4 squadrons is to train pilots in fighter aircraft tactics and weapons delivery for the United States Air Force. This training involves transition, instrument, formation, air combat maneuvers, basic flight maneuvers, day/night VFR ground attack, day/night low level navigation, air-to-air gunnery (DART), and day/night refueling missions. They operate in the Gila Bend range complex area as well as most of Western Arizona.

THRESHOLD VALUE AT LUKE AFB	LEAD TIME	IMPACT	CUSTOMER ACTIONS
CEILING AND VISIBILITY BELOW			
500 ft/1½ miles	1 Hour	Cancel training missions.	1. Cancel all training sorties. 2. Airborne aircraft divert to alternate.
1500 ft/ 3 miles	1 Hour	Cancel some training missions.	1. May affect student training sorties. 2. Airborne aircraft divert to alternate if required.
2400 ft/3 miles	Ø	Cancel some training missions. Affects scheduling and aircraft recovery.	1. Student training is severely restricted and probably cancelled. 2. Restricts number of aircraft landing together and per hour. 3. Airborne aircraft divert to alternate, if required.
3000 ft/3 miles	Ø	Affects training missions, creates rescheduling problems.	1. Some student training missions are cancelled. 2. Low level training missions cancelled when CIG/VIS decreases below 3000/3 over ranges. 3. Implement adverse weather procedures.
SURFACE WINDS			
15-34 Knots	1 Hour	Landing problems.	1. Cancel student take-off/landings if cross-wind exceeds 25 knots.

35 knots or greater	1 Hour	Cancel training missions.	1. Cancel all takeoffs/ landings and divert airborne aircraft for 35 knot crosswinds. 2. Cancel all takeoffs/ landings if winds exceed 50 knots. 3. Evacuate if winds of 80 knots are expected.
HAIL (any size)	1 Hour	Possible damage to aircraft canopies.	1. Cancel takeoffs and landings. 2. Evacuation of other aircraft is possible if 3/4 inch or greater.
THUNDERSTORMS	1 Hour	Affects training mission.	1. Avoid thunderstorms. 2. Cancel sorties if on the range. 3. Weather recall is possible if thunderstorm at Luke.
RAIN (2" or more in 12 hours)	NA	Safety Problems	1. Reduce crosswind to RCR condition. 2. May require diversion to alternate base. 3. Limits formation takeoff/landings.
ICING (Moderate or Greater)	1 Hour	Affects training mission.	1. Avoid sustained flying in icing layer.
TURBULENCE (Severe or extreme)	1 Hour	Affects training mission.	1. Cancel training flights.

LAFB IMPACT OF WEATHER ON SUPPORTED UNITS

461, 550, and 555 TFTS (Tactical Fighter Training Squadrons)

The 461, 550, and 555 TFTS are units of the 405th Tactical Training Wing and operate F-15 aircraft. The mission of these squadrons is to conduct training in F-15 to convert previously qualified fighter pilots to mission ready status in the F-15 and upgrade qualified F-15 pilots to instructor status. The syllabus requires 25 sorties. Eight are conversion, three are air-to-ground, and fourteen are air-to-air missions. The primary emphasis is on dissimilar air combat tactics that is accomplished in the Sells area with flight of 2 to 4 aircraft.

THRESHOLD VALUES AT LUKE AFB	LEAD TIME	IMPACT	CUSTOMER ACTIONS
CEILING AND VISIBILITY			
500 ft/1½ miles	1 Hour	Cancel training missions.	1. Cancel training sorties. 2. Airborne aircraft divert to alternate.
1500 ft/3 miles	1 Hour	Cancel training missions.	1. Cancel all student training sorties. 2. Airborne aircraft divert to alternate, if required.
2400 ft/3 miles	Ø	Cancel training missions. Affects scheduling and aircraft recovery	1. Student training is severely restricted and probably cancelled. 2. Restricts number of aircraft landing together and per hour. 3. Airborne aircraft divert to alternate, if required.
3000 ft/3 miles	Ø	Affects scheduling.	1. Cancel some missions because of ATC problems. 2. Implement adverse weather procedures.
SURFACE WINDS			
15-34 Knots	1 Hour	Landing problems.	1. Cancel takeoff/landings if crosswind exceeds 25 knots. 2. Cancel formation takeoff/landins if crosswind exceeds 10 knots. 3. Divert to alternate, if crosswind exceeds 20 knots. 4. Cancel takeoff/landings for winds greater than 30 knots.

35 Knots or greater	1 Hour	Cancel training missions.	1. Cancel all takeoffs/ landings. 2. Evacuate aircraft if winds of 80 knots are effected.
HAIL (any size)	1 Hour	Possible damage to aircraft canopies.	1. Cancel takeoffs and landings. 2. Evacuation of other aircraft is possible if 3/4 inch or greater.
THUNDERSTORMS	1 Hour	Affects training missions.	1. Avoid thunderstorms. 2. Cancel sorties if on the range. 3. Weather recall is possible if thunderstorms at Luke.
RAIN (2" or more in 12 hours)	NA	Safety Problems	1. Reduce crosswind to RCR condition. 2. Cancel takeoff/landings if standing water is on runway. 3. May require diversion to alternate base.
ICING (Moderate or Greater)	1 Hour	Affects training missions	1. Avoid sustained flying in icing layer.
TURBULENCE (Severe or Greater)	1 Hour	Affects training missions.	1. Cancel training flights.

LAFB IMPACT OF WEATHER ON SUPPORTED UNITS

302 Special Operations Sq/Air Force Reserve

The primary mission of the 302nd Special Operations Squadron (SOS) is to train for day/night infiltration, exfiltration, reinforcement and resupply into hostile or enemy controlled territory using air-land/air-drop techniques over land or water. In addition, aircrews will train for recovery of personnel, combat search and rescue operations, medial evacuation operations, and humanitarian operations. They also provide maintenance to the aircraft.

THRESHOLD VALUE AT LUKE AFB	LEAD TIME	IMPACT	CUSTOMER ACTIONS
CEILING AND VISIBILITY BELOW			
700 ft/1 mile	1 Hour	Cancel Training	1. Cancel all training sorties. 2. Airborne aircraft divert to alternates.
SURFACE WINDS			
15-34 Knots	1 Hour	Affects maintenance.	1. Secure all loose equipment. 2. If winds exceed 30 knots, tie down and/or hanger aircraft.
35 Knots or greater	1 Hour	Possible aircraft damage.	1. Tie down and/or hanger aircraft. 2 Evacuate or hanger if winds exceed 60 kts.
LIGHTNING	Ø	Affect flight and flightline operations.	1. Outside maintenance and refueling suspended when observed within 5NM of field. 2. Terminate flight operations.
HAIL (any size)	1 Hour	Possible aircraft damage.	1. Hanger four aircraft. 2. Possible evacuation of aircraft.
THUNDERSTORMS	1 Hour	Affect flying.	1. Avoid thunderstorms. 2. Secure aircraft and loose equipment. 3. Restrict flying. 4. Minimum maintenance on outside aircraft.

RAIN (2" or more in 12 hours)	1 Hour	Possible Flooding	1. Secure all aircraft and loose equipment. 2. Maintenance and flying ceases.
ICING (Moderate or greater)	1 Hour	Affects training missions.	1. Avoid sustained flying in icing layers.
TURBULENCE (Severe or Extreme)	1 Hour	Affects training missions.	1. Cancel training flights.

LAFB IMPACT OF WEATHER ON SUPPORTED UNITS

LAS, 58 and 405TTW/LGMC (Maintenance Control)

The 58 and 405TTW/LGMC provide maintenance of F-4, F-15 aircraft in support of gunnery and air-to-air training. They also maintain support aircraft and transient aircraft. LAS/LGMC providesmaintenance of F-104 aircraft by Lockheed Air Service (LAS) in support of advance flight training for the Germain Air Force.

THRESHOLD VALUE AT LUKE AFB	LEAD TIME	IMPACT	CUSTOMER ACTIONS
SURFACE WINDS			
15-34 Knots	1 Hour	Restricts Maintenance.	1. Stop aircraft washing and cleaning. 2. Cease jacking aircraft. 3. Restrain canopies of aircraft suspected of having depleted hydralic system.
35 Knots or greater	1 Hour	Aircraft damage by loose objects.	1. Close and lock all canopies, radomes, and access doors. 2. Remove aircraft from jacks. 3. Tie down aircraft. 4. Consider evacuation of aircraft. 5. Remove all loose equipment from the ramp if winds exceeds 50 knots.
LIGHTNING	Ø	Stop flightline.	1. Outside maintenance, munitions, and refueling operations suspended when observed within 5NM of field.
THUNDERSTORMS	1 Hour	Restricts maintenance	1. Secure aircraft canopies. 2. Monitor refueling. 3. Secure panels and loose equipment.
HAIL (any size)	1 Hour	Possible damage to aircraft canopies.	1. A few aircraft are hangered. 2. Possible evacuation of other aircraft if 3/4 inch or greater.

IMPACT OF WEATHER ON SUPPORTED UNITS

776 Radar Squadron, Pt Arena, CA
666 Radar Squadron, Mill Valley, CA
775 Radar Squadron, Cambria, CA
Radar Squadron, Estasquedero, CA (Paso Robles).
Det 1, 26ADS, San Pedro, CA
751 Radar Squadron, Mt Laguna, CA
26ADS, OLAF, Phoenix, AZ
26ADS, OLAG, Silver City, NM
26ADS, OLAH, El Paso, TX
26ADS, OLAA, Odessa, TX

The above Radar Sites provide surveillance operations of aircraft approaching and/or entering U.S. air space for 26 NORAD Region.

THRESHOLD VALUE	LEAD TIME	IMPACTS	CUSTOMER ACTIONS
SURFACE WINDS			
25-49 Knots (Mill Valley and Cambria only)	1 Hour	Limits Maintenance.	1. Secure loose equipment. 2. Limit maintenance on outside surfaces.
50 Knots or greater (35 knots for Odessa)	1½ Hour	Possible property damage.	1. Secure non-hooded antenna. 2. Remove property that could be damaged and secure loose equipment. 3. Limit outside maintenance.
TORNADOES	ASAP	Property damage.	1. Secure property that could be damaged. 2. May interupt mission temporarily.
THUNDERSTORMS	1 Hour	Property damage.	1. Run down some electrical equipment. 2. Remove property that could be damaged and secure loose equipment. 3. Limit outside maintenance.
HAIL			
½ inch or greater	1 Hour	Property damage.	1. Cover/store equipment that could be damaged.

<u>FREEZING PRECIPITATION</u>	1 Hour	Increased maintenance workload	1. Secure non-hooded antenna.

IMPACT OF WEATHER ON SUPPORTED UNITS

1. Unit Supported: GEODSS/Stallion.

2. Customer Operations Involved: Stallion Radar Site is a NORAD operated Geostationary Electronic Optical Deep Space Surveillance (GEODSS) site located near Socorro, NM.

3. Environmental Impact: Weather Warning support is strictly for protection of property. Tornadoes: The weathe- warning is issued as soon as possible. Customer actions include securing of property that could be damaged. It may also interrupt mission operations temporarily. Hail (any size): Customer actions include covering/storing equipment that could be damaged. One-half hour lead time is needed.

LAFB IMPACT OF WEATHER ON SUPPORTED UNITS

1. Unit Supported: 58 and 405 Tactical Training Squadrons

2. Customer Operations Involved: Operations of F-4, F-15, and F-104 flight simulators.

3. Environmental Impact: Lightning observed within 5 miles of Luke AFB: Usually, when a lightning advisory is received the only action taken is to monitor the voltage input more closely than normal for glitches. If advised of a severe/intense electrical storm nearby or voltage variations are observed, then the motion base and digital computers would be shut down. Normally the analog computer would continue to operate, if no significant voltage variations are present, so that some training could continue. It has been observed here at Luke AFB that about 95% of all glitches are not caused by the weather.

LAFB IMPACT OF WEATHER ON SUPPORTED UNITS

1. Unit Supported: 58CES Sq (Base Civil Engineers)

2. Customer Operations Involved: Base Civil Engineering is responsible for mission support by acquiring and maintaining all real property facilities, installed utility systems, base wide utility plants and systems, and by providing fire prevention, and aircraft crash rescue capability.

3. Environmental Impact:

a. Tornadoes/severe thunderstorms within 5 miles of Luke AFB: If any current work is in progress (new concrete, roofing, etc.) by BCE shops requires protective covering, the appropriate shops are notified and work accomplished. If the severity of the warning is such that extensive damage to utilities and/or equipment may be expected, the BCE Prime BEEF Recovery Team may be placed on alert for possible recall. The Chief of O&M is also the R team commander. When these actions are completed, the Base Civil Engineer is briefed and any further instructions from him/her are then carried out. Additionally, any contractors. working on station are provided with weather warnings. (Lead Time: ASAP).

b. Thunderstorms within 5 miles of Luke AFB, surface winds 35 knots or greater, heavy rain: The same actions are taken as above except the R team is not alerted unless severe weather occurs. (1 Hour lead time required).

c. Cost: The fire department reacts to weather warnings by being aware of the situation and alert to possible increase in alarm room calls. Since they are manned 24 hours a day, the only increase in posture could occur when and if the Prime BEEF R team is recalled. The R team (approximately 100 personnel of various AFSCs is provided for at the base to perform recovery operations from natural, or man made damage or disruption to base facilities, utilities, and the airfield. Given these variables, we have not attached any manhours or dollar figures. These are entirely dependent on the circumstances of the results of severe weather rather than being precipitated by weather warnings.

LAFB IMPACT OF WEATHER ON SUPPORTED UNITS

1. Unit Supported: 58 Sup Sq (Base Supply)

2. Customer Operations Involved: Supply storage and delivery, Computer operations.

3. Environmental Impact:

a. Tornadoes/Severe thunderstorms within 5 miles of Luke AFB: Secure open storage, remove property that could be damaged by large hail or heavy rain. Cost 3 manhours. Lead time: ASAP.

b. Thunderstorms within 5 miles of Luke AFB: Secure open storage, remove property that could be damaged by rain. Estimated cost is two (2) manhours. One (1) hour lead time.

c. Surface winds 35 knots or greater: Check property in open storage. Estimated cost is 1 manhour. One (1) hour lead time.

d. Heavy rain: Check for property in open storage that could be damaged by rain. Delivery of items is restricted. Uncovered pickup ed would allow rain to damage property. No estimate of cost involved. One (1) hour lead time.

e. Lightning within 5 miles of Luke AFB: Computer is shutdown if lightning is reported within 5 miles of Luke AFB. For every hour that the computer is down, it takes 10 manhours to process issues and receiving documents. Normally, documents are not processed manually if computer is down for a relatively short period of time. Computer operates 24 hours, 6 days per week and 10 hours on Sunday.

CHAPTER 3

SYNOPTIC CLIMATOLOGY

3-1 Major Controlling Features.

a. Spring:

(1) Low Levels - A thermal low begins to form over the southwest U.S. It is an open low oriented from northwest Mexico through western Arizona. The axis lies along the lower Colorado River Basin.

(2) Upper Levels - An upper ridge forms off the west coast, blocking most moisture advection into the area.

b. Summer:

(1) Low Levels - The thermal low continues to deepen and shows apparent change from day to day.

(2) Upper Levels - At upper levels, the westward extension of the Bermuda High dominates the circulation above 700mb. The actual flow will be northeast through south depending on the orientation of the ridge.

c. Fall:

(1) Low Levels - The thermal low begins to recede southward and flow begins to be system oriented.

(2) Upper Levels - The Pacific High and Bermuda High move southward and flow becomes more westerly as Gulf of Alaska low becomes established

d. Winter:

(1) Low Levels - The flow is system oriented, the Great Basin High and the Pacific High are the prevailing pressure systems.

(2) Upper Levels - The upper flow is moderate to strong westerly because of the Gulf of Alaska Low.

3-2 Synoptic Weather.

a. Winter Air Masses - The principal air mass in this area is modified maritime polar air with varying degrees of moisture but usually relatively dry. There are, however, infrequent outbreaks of continental polar air in late winter associated with strong polar surges crossing the Continental Divide.

b. Winter Weather - Wintertime flying weather, except during the infrequent passage of troughs and fronts, is excellent.

(1) Practically all of our inclement weather in the winter is caused by cold or occluded fronts or troughs. The most common of our frontal types is also the one with the least weather (See Fig 3-1). The surface low enters the West Coast between 50-60 north and continues on an ESE track to near the Great Lakes. Aloft, the long wave trough is east of the Rockies, consequently, the front moves rapidly and appears as a minor perturbation on the upper air charts. These frontal systems, though clearly defined in Central and Southern California, usually become diffuse after they cross the Sierra Nevada mountains. This frontal track, once established, often persists for days.

(2) The system that by far causes the lowest ceilings and most precipitation is also the most infrequent. This system is a cut-off upper air low centered west and southwest of Southern California - referred to locally as the "San Diego Low". The winds aloft become southwesterly at all levels, bringing moisture in from the Gulf of California and the Pacific Ocean. This low sometimes remains stationary for several days. As it moves eastward it will produce high and middle clouds then rapidly low clouds as it moves east of the coastal mountains. Low clouds and rain will prevail until the low center passes the station (See fig 3-2).

c. Summer Air Masses - The air mass in central Arizona becomes a modified maritime tropical type with dew points over 50 F. The Gulf of Mexico is a moisture source and so is the Gulf of California. Which source is actually primary is a matter for conjecture. The important thing is that the moisture is available in quantity, and combined with thermal convection, orographic lift and nocturnal cooling, thunderstorms form in large numbers.

d. Summer Weather - The thermal low is well established and extends 5,000 to 6,000 feet in depth. No fronts penetrate this area during the summer. Day time temperatures of 110-115 are common. It is during July and August that we have our maximum thunderstorm activity.

(1) In early July, thick cloud canopies with embedded showers and/or thunderstorms move across the mouth of the Gulf of California as tropical disturbances develop along Mexico's central Pacific coast or as easterly waves move from the mainland over the gulf itself. Surges of low level mousture are trapped between the mountain ranges of Baja California and the foothills of the Sierra Madre Occidental of central Mexico. They travel north into southern Arizona. Probable dynamics for the moisture pump are higher pressure under the convective clouds associated with evaporational cooling from precipitation and differential heating in and outside of the cloud area. The net effect is an increased slope of the tropical air mass boundary to the extent that the air mass moves up the progressively hotter gulf toward the heat low in Nevada.

(2) As one might expect, diurnal variations in thunderstorm activity occur in the desert like anywhere else. Observations at the ground and satellite pictures show that thunderstorms first form over the higher peaks (White Mountains, 125 miles ENE, and then northwest to the San Francisco Peaks near Flagstaff) during late morning or early afternoon. At that time, there is no activity in the desert valleys. As the afternoon progresses, the maximum activity moves southwest to the Mongollon Rim and then shifts to the lower mountains and foothills. This results in primarily nocturnal convective activity in the Phoenix area with occarrences 1800-0000L in half the cases

(3) In the desert, winds near 10,000 feet give the best direction of movement. A few more severe cells will appear to stand against the flow perhaps attributable to movement by propagation.

(4) If a thunderstorm does move over Luke AFB, visibility may be reduced to near zero as the gust front passes through. Winds of 35 knots are relatively common, and higher gusts occur occasionally. Rain shafts are very isolated, and so the chances of significant rain at a point are slim.

e. Transition Periods:

(1) Spring: Flying weather at Luke during spring is usually excellent. The Pacific high moves northward,and by the middle of April, tends to block frontal systems moving in from the west. The ceilings get fewer, humidity less, and temperatures higher. The thermal low becomes established and the prevailing air mass is most nearly a continental tropical type.

(2) Fall: Flying weather is usually excellent. The heat low begins to break down and weak migratory fronts start moving through the area.

f. Cyclogenesis - Arizona is not a favored region for cyclogenesis. Usually cyclogenesis occurs in Nevada with deep systems (See fig 3-1).

3-3. <u>Fronts (Storm Tracks):</u> All weather in this area cannot be accounted for completely as air mass type or as due to frontal passages during the winter. Deep systems may persist off the Pacific coast of California and many frontal systems that may have been present have completely occluded and are not recognizable. Shallow systems move rapidly across the western states from the Pacific and may or may not have any recognizable fronts associated with these systems.

a. Deep Systems: Cyclonic wind Patterns to the minimum of 30,000 feet over the area:

(1) Accompanied by Definite Frontal Passages: (See fig 3-1). Center of the low on the surface moves into Utah from the Pacific off the coast of California; cold air is drawn into the system and a frontal discontinuity is set up. This situation is dominant in the latter part of winter when a cold air source is available in the Great Basin area. Fronts that are associated with Pacific systems of the northwest Pacific coast may be intensified by the cold air available in the Great Basin area.

(a) Sky Conditions: Warm front type cloudiness. Generally 25,000 feet cirrus lowering to 18,000 feet altostratus, then to 10,000 feet thick altostratus with stratocumulus to 2-3,000 feet in rain. Ceilings to 500 feet for periods of less than 1 hour occur but are infrequent. Duration of ceilings below 20,000 feet average 40 hours with extreme conditions of 72 hours.

(b) Precipitation: Light intermittent rain becoming moderate along frontal zone for 1-2 hours. Average rainfall .3 to .4 inches for a period of 24 hours.

(c) Visibility: Above 10 miles lowering to 3-5 miles in moderate rain and conditions of ½ to 1 mile in rain and blowing dust for 15 to 30 minute periods. Heavy rains occur but are infrequent.

(d) Winds: Slowly increasing from the southwest to 30 knots with gusts to 35 knots as the system approaches; after the center of the system passes winds become 15 knots with gusts to 20 knots from west to northwest.

(2) Not Accompanied by Frontal Passage: (See fig 3-2). These systems are similar to those noted in "a" above; however, no frontal systems are apparent since: The center of the system passes through Arizona and definite frontal line may be in Mexico where analysis is difficult and the system passes during the autumn or ealy winter and no source of cold air is available in the Great Basin. Weather patterns with these systems are similar to those noted above except no intense activity for a short period is noted along any line denoting a frontal zone. An analysis of the deep systems indicated are as follows:

(a) These systems move very slightly and are at times stationary for periods of 24-48 hours.

(b) Ceilings below 20,000 feet started when the center of the low at 700mb was in a radius of approximately 450 miles from this station in an arc from the southwest to northwest.

(c) Precipitation began over this station when the center of the low at 700mb was in a radius of approximately 300 miles in an arc from the southwest to northwest. Precipitation began approximately 24 hours after ceilings below 20,000 feet first were reported.

b. Shallow Systems:

(1) (See fig 3-3). Deep systems coming in from the Pacific onto the northwest coast of the United States with a frontal system extending southward generally frontalyze in Southern California or Arizona and appear as a shallow system in this area. Low center appeared on the surface over the southwest area only 50% of the time and central pressures were above 1000mb.

(a) Sky Condition: Cirrus may or may not be present. Altostratus or altocumulus at 18,000 feet lowering to 10-12,000 feet average. Duration or ceilings below 20,000 feet average 12 hours with a maximum of 18 hours.

(b) Precipitation: None to .1".

(c) Visibility: Above 10 miles.

(d) Winds: 10-15 knots from SW as system approaches.

(2) (See fig 3-4). Shallow systems (cyclonic wind pattern to 10,000 feet) without a frontal passage over this station. High index pattern over western states. These systems pass rapidly over this station with a strong west flow at all levels. Weather associated with these systems is similar to weather noted in 3-3b(1) above.

(3) (See fig 3-3). Shallow systems develope when a large continental high covers the Rocky Mountain states, New Mexico and Texas. Low pressure area in Mexico is displaced westward over the Gulf of California or the Pacific coast off southern California. This displacement apparently makes available an additional source of moisture for the low. Low level convergence is noticeable to 10,000 feet. Conditions are similar to those noted in 3-3b(1) above. This system may become deep if associated with a trough aloft off the coast of California and the weather conditions are then similar to those noted under 3-3a(1) above.

c. High Level Systems: No surface or upper air convergence zones could be detected for a number of systems which produced a consistent weather pattern over this area. Moisture was present at levels from 500-300mb; 700-500mb remained very dry.

(1) Sky Conditions: Clouds move in from the west as cirrus at 20,000 feet and lower to 15,000 feet very rapidly (2-3 hours). Overcast conditions at 15,000 feet remain for 12 hours. Invariably cloudiness occurred during daylight hours with clearing sunset.

(2) Precipitation: None. Virga is present.

(3) Visibility: Above 7 miles.

(4) Winds: Light and variable.

d. Post Frontal Conditions: Post frontal conditions are quite variable. Shallow systems are associated with very rapid clearing. Deep systems have greater frontal activity. Deep systems moving through central or southwest Arizona have the greatest duration of post frontal activity.

(1) Sky Conditions: 5-7,000 feet broken cumulus or towering cumulus for a period of 10-12 hours following deep systems. Clear conditions or 3-4 hours of scattered cumulus following shallow systems.

(2) Precipitation: None.

(3) Visibility: Above 7 miles.

(4) Winds: May remain high and gusty for 11-24 hours after frontal passage but not over 24 knots unless upper air trough lags behind the front.

3-4. Visibility Obstructions:

a. Fog: Occurrence of fog is infrequent even if sufficient moisture is present. It occurs on the average of about twice a year, and only in the winter. The most favorable time is the morning following the passage of a deep cold low that had previously been off the coast of California and passes through or south of Arizona. (See fig 3-2). Also in addition to the above prerequisites, the following appear to be necessary for fog formation in this area:

(1) A temperature-dew point spread of 3 degrees or less for a relatively long period (5-10 hours).

(2) A weak pressure gradient and calm or light southeast to southwest wind (upslope over the area) at the surface and 850mb level.

**The following conditions appear to be detrimental to fog formation even though a small temperature-dew point difference exists:

(1) Any winds from a northerly gradient at the surface and 850mb.

(2) Rain prevailing during the period of otherwise optimum conditions.

b. Smoke: Smoke seldom is a problem, though the occurence of a brush fire up wind from the runway complex has the potential for creating a short term visibility obstruction.

c. Haze: Haze seldom is operationally significant. Visibilities as low as 2-3 miles have been recorded in extreme situations. Conditions for these extreme cases are a very stagnant air mass over Arizona and southern California and a light easterly wind drift in the valley. Onset of significant haze is afternoon until 2-3 hours after sunset when the natural drainage wind from the northwest pushes the haze back over the city. Most frequent time of occurence is late summer through early fall.

d. Dust: Blowing dust occurs most frequently during the summer when the ground is very dry and the air unstable. Dust storms usually form ahead of a moving thunderstorm or during the dissipating stage due to the downrush of air. They last on the average of 20 minutes or until the rain starts to fall. Occasionally they will last for two or three hours when there is no rain falling from the thunderstorm. Surface winds from the east through southwest are much more likely to give blowing dust than winds from the west through north.

e. Pollution: Air pollution seldom is operationally significant but the haze condition in 3-4c is usually accompanied with significant amounts of air pollutants.

3-5. Stratus: Stratus is usually the result of lifted fog at Luke see 3-4a.

3-6. Hazardous Weather.

a. Thunderstorms

(1) Air Mass: Our thunderstorm season usually starts by the middle of June when the western extension of the Bermuda High shifts westward over New Mexico and Texas bringing in moist southeasterly air from the Gulf of Mexico. The air mass type over Arizona becomes maritime tropical. In addition, moist low level air is drawn into the desert from the Gulf of California via the mechanism described in 3-1d. The combination of intense daytime heating and the orographic effect of the mountains will give scattered thunderstorms throughout the state. This condition will prevail unitl the Bermuda High retreats eastward and the low level moisture supply is shutoff; normally, in the first half of September. The 700mb chart has been the most successful for following this moisture pattern.

(2) Nocturnal: Summer thunderstorms usually occur between 1800 and 0200 local time. The base of the cumulonimbus is seldom below 6,000 AGL and tops extend to about 40,000 feet. There is usually no general cloudiness preceding the thunderstorms except for high cirrus associated with the anvil tops. Altocumulus and altostratus layers form during the early morning hours from the dissipating thunderstorms. These clouds disappear rapidly after sunrise.

(3) Frontal: Frontal thunderstorms are rare in Arizona, when they do occur it is with an unusually strong winter system that has captured subtropical moisture.

b. Gusty Winds:

(1) Gradient Winds: During the winter, wind velocities of 20-25MPH are common for several hours after a fast moving cold frontal passage. Higher post frontal wind speeds are possible and have occurred. Generally winter frontal winds can be forecast by carefully tracking the fronts or troughs and watching the upstream stations.

(2) Low-Level Jet: Low-Level Jet winds are not a problem at Luke AFB.

(3) Thunderstorms: Strong or damaging winds do occur and are associated mostly with summer thunderstorms. Our maximum recorded wind gust was 69 knots, reported in July 1959. Local winds of 25-35 MPH are common with much higher winds possible for brief periods near thunderstorms.

c. Hail: Damaging surface hail is a very rare occurrence at this station. While hail does occasionally occur, it is usually a small and soft type.

d. Tornadoes: Tornadoes are rare in Arizona. Although frequently reported in the Phoenix area, most reported "tornadoes" are probably dust devils or shafts of rain and/or virga. The best reference for tornado forecasting and what to look for is AWS TR200, especially chapter 2, section F.

e. Turbulence: Most reports of turbulence are associated with thunderstorm activity. The potential exists for turbulence associated with strong gusty gradient winds, but because of the mean direction of the strong winds, relatively flat terrain in those directions, and runway orientation there have been few reports.

f. Icing: Icing should be considered anytime heavy, dense mid-cloud is forecast. The majority of occurrences of icing are associated with thunderstorms/rainshowers.

g. Flooding: Flooding at Luke is relativley rare: however, during the summer of 1951, Luke AFB was flooded three times due to abnormally heavy rains and runoff from the mountains to the west and north. A series of drainage ditches and canals have been constructed around the base. This, for the most part, will protect the base from all but the worst floods.

h. Tropical Storms and Hurricanes: Occasionally the weather at Luke is affected by the extra-tropical remnants of a tropical storm or hurricane that move up the Gulf of California.

i. Other Hazardous Conditions: Lightning strikes to aircraft are a potential when there are rainshowers in the area and the flight profile is near the freezing level.

FIG 3-1

WINTER WEATHER PATTERNS AFFECTING LUKE AIR FORCE BASE

Deep system with frontal passage. Surface low moved through northern states with southern end of front developing cyclogenesis in Nevada and Utah and frontal passage through Arizona. Rapid clearing behind surface front.

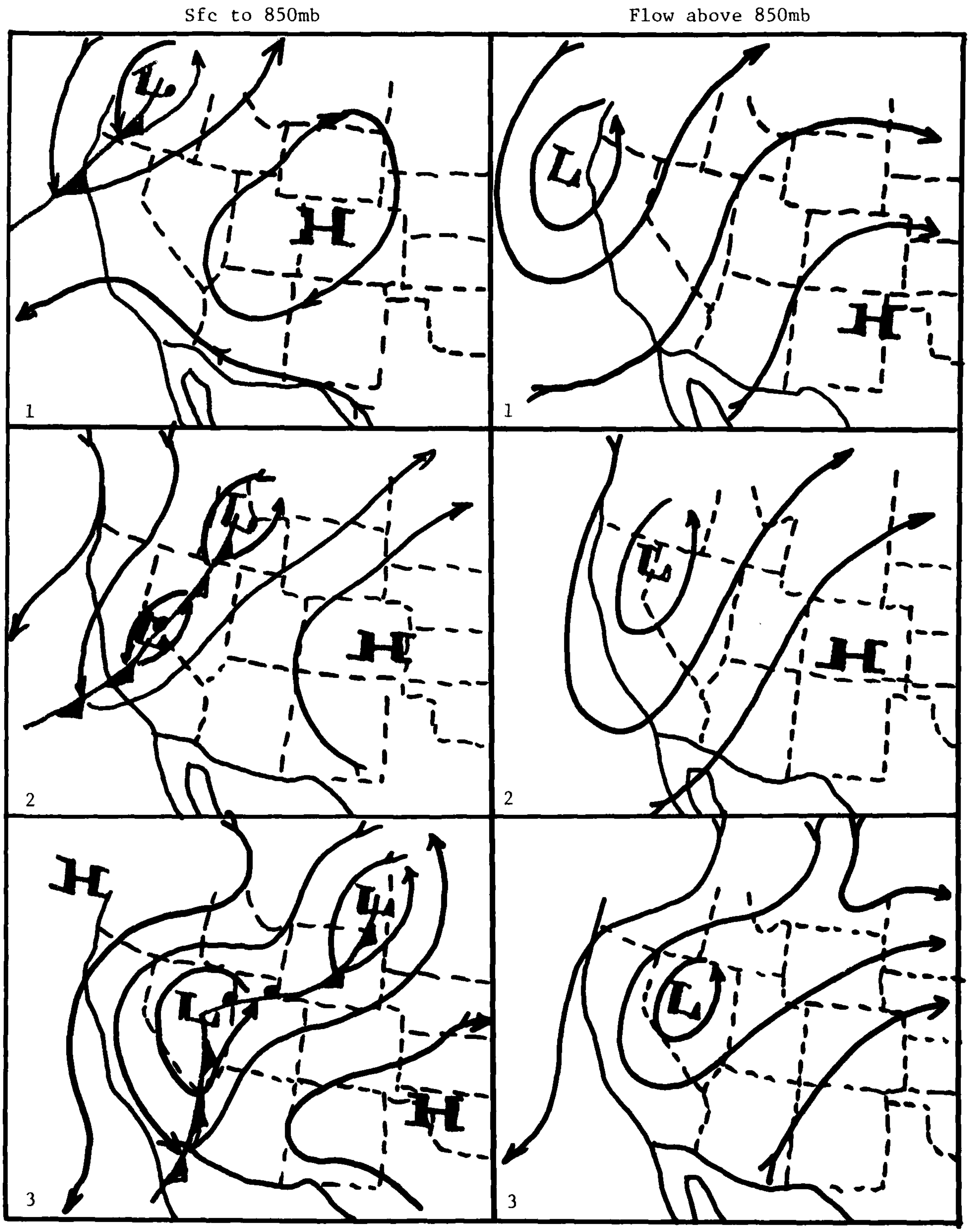


FIG 3-2

WINTER WEATHER PATTERNS AFFECTING LUKE AIR FORCE BASE

Deep systems with no frontal passage. Surface low moves through Arizona or northern Mexico. Slow clearing behind system.

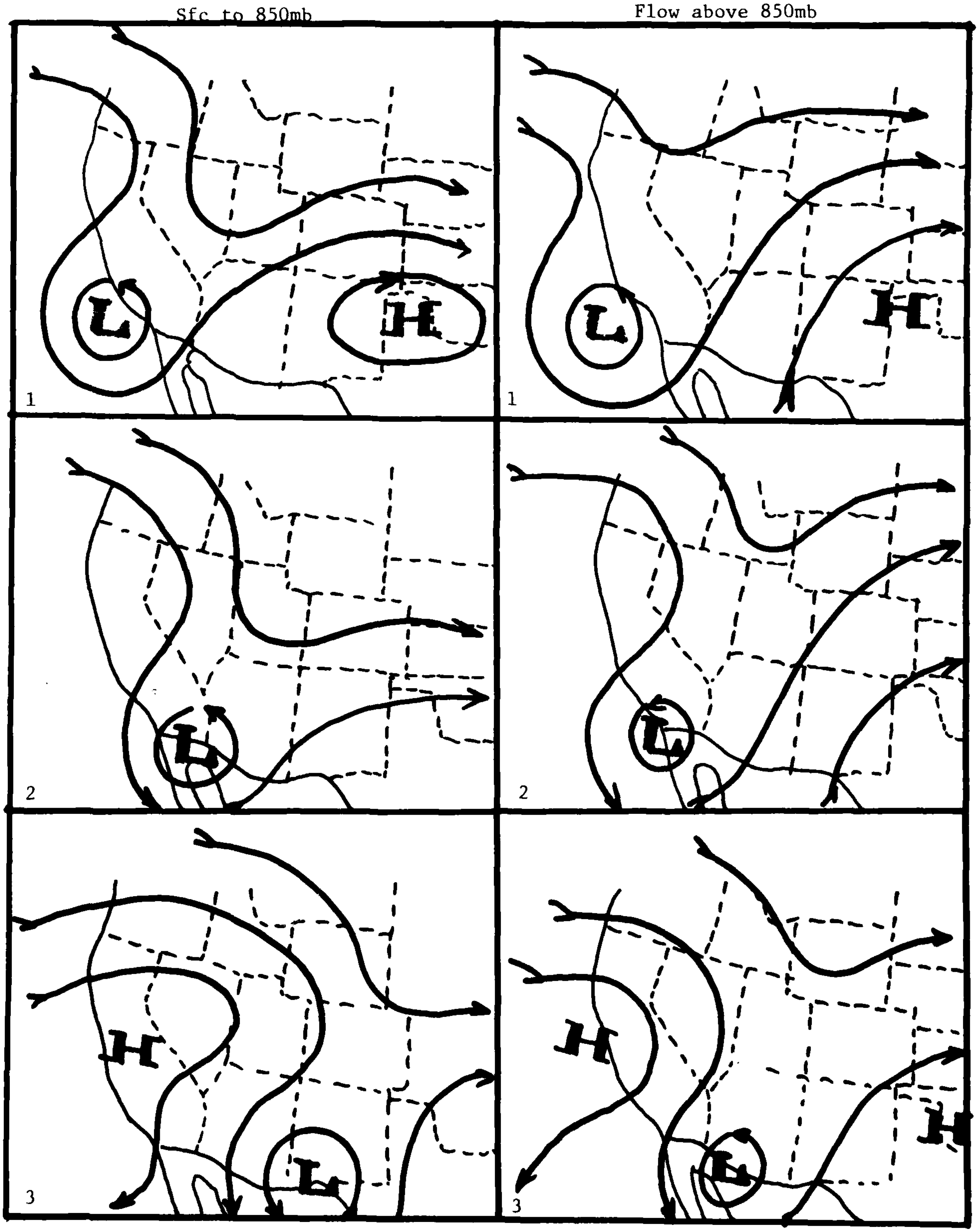


FIG 3-3

WINTER WEATHER PATTERNS AFFECTING LUKE AIR FORCE BASE

Shallow systems: Shallow trough upper levels; surface front front analysis over southern California or Arizona. Rapid clearing behind surface trough.

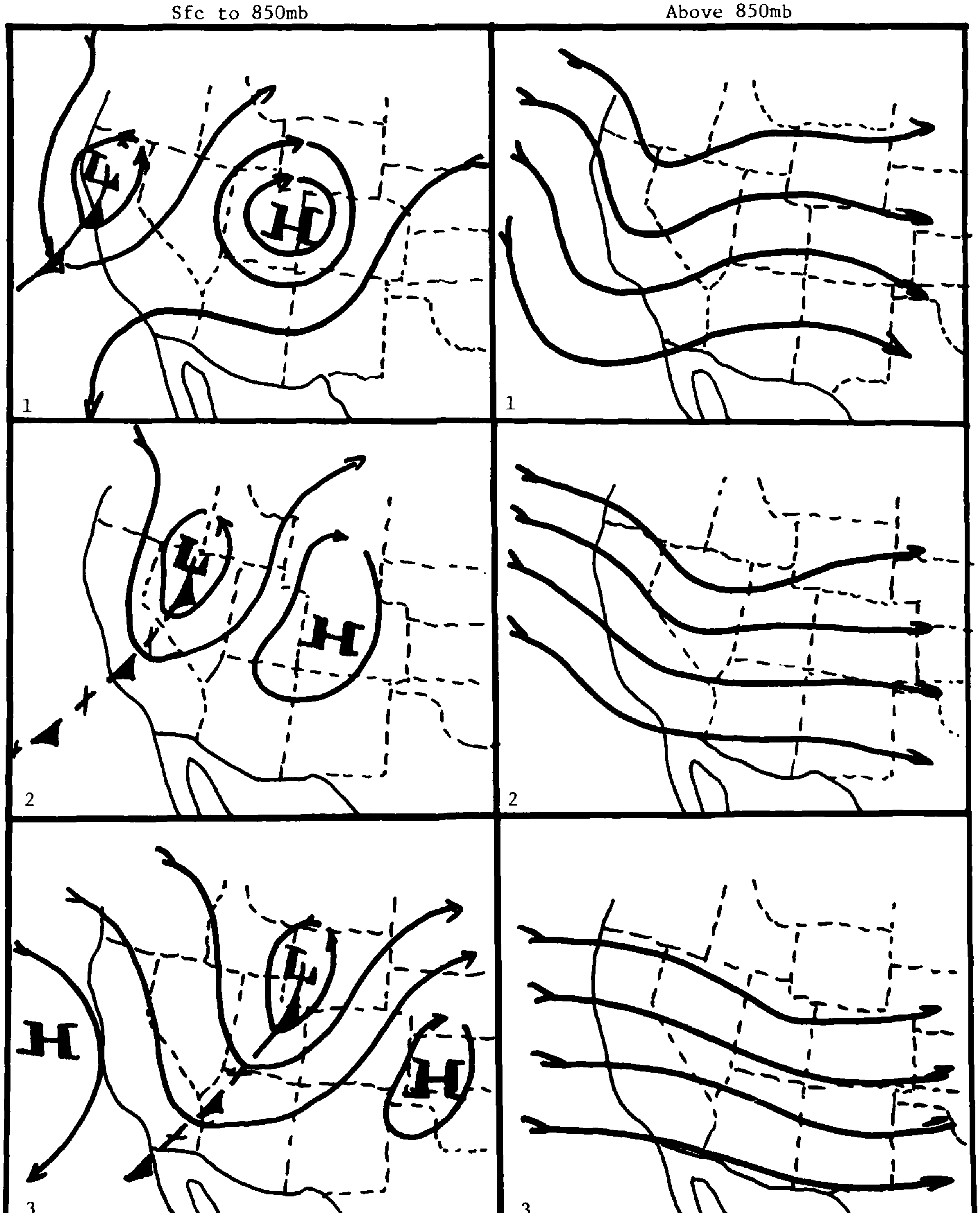
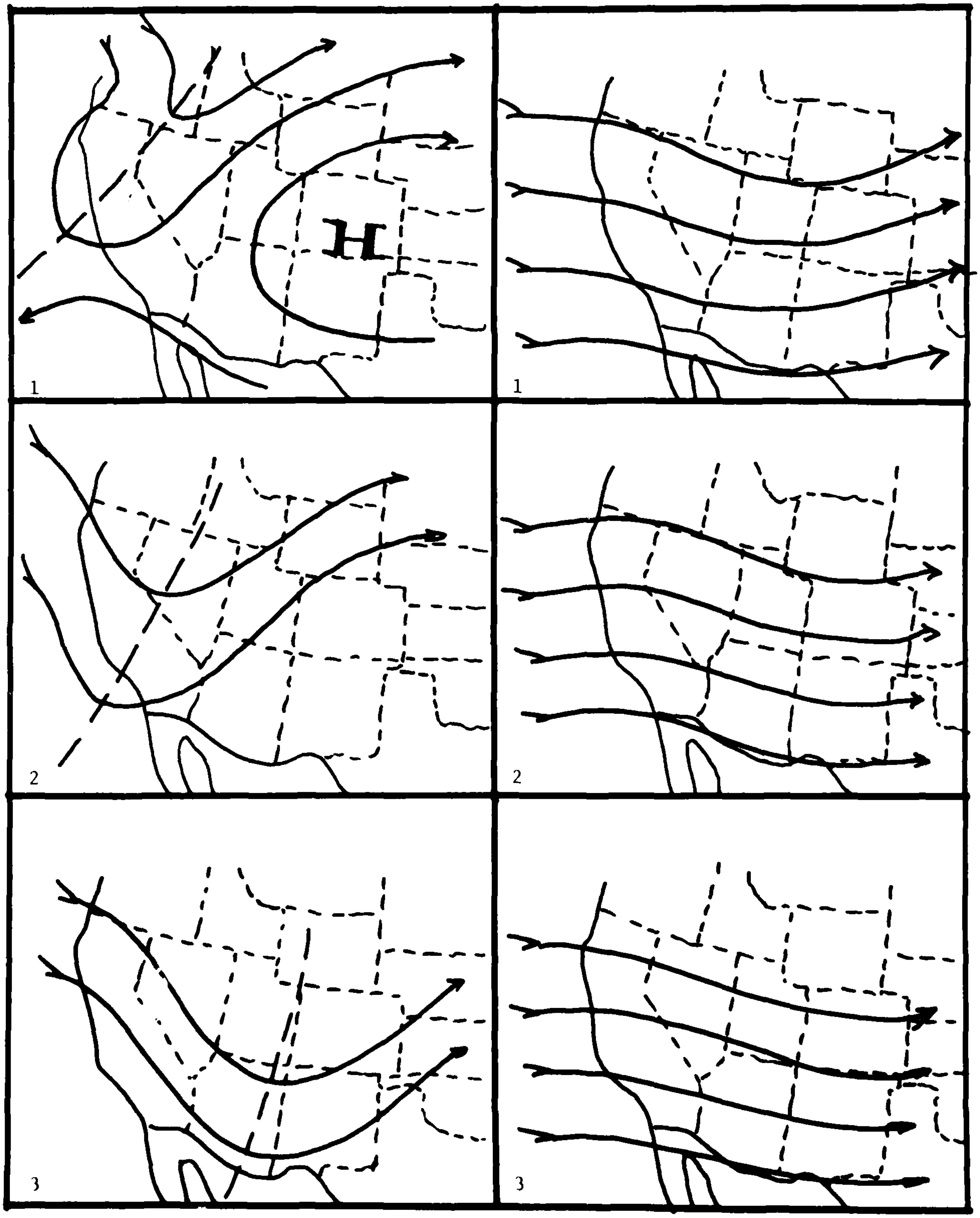


FIG 3-4

WINTER WEATHER PATTERNS AFFECTING LUKE AIR FORCE BASE

Shallow system: trough with no apparent frontal system and westerly flow above 700mb. Rapid clearing behind surface trough.

Sfc to 700mb　　　　Above 700mb



CHAPTER 4

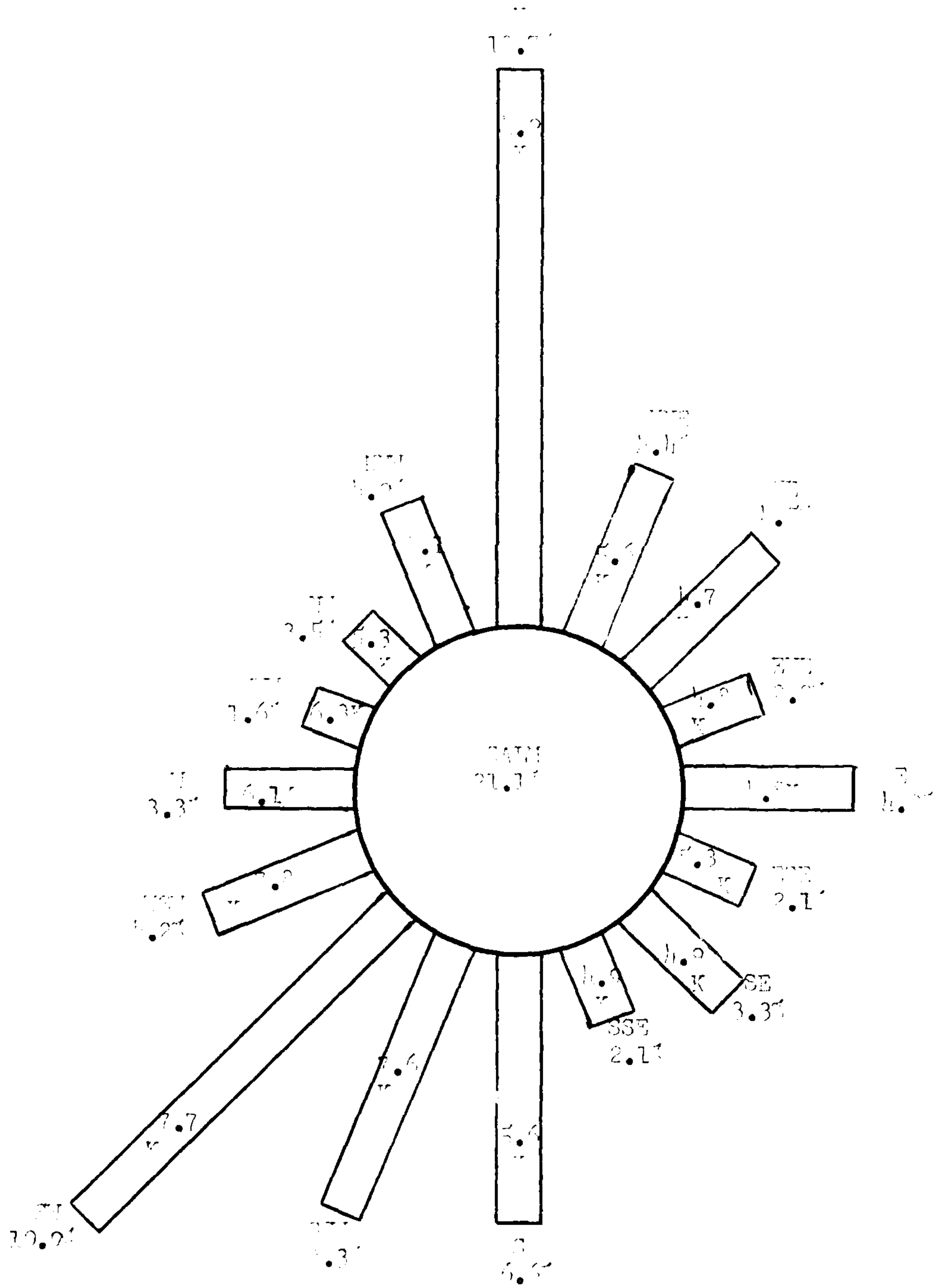
CLIMATIC AIDS

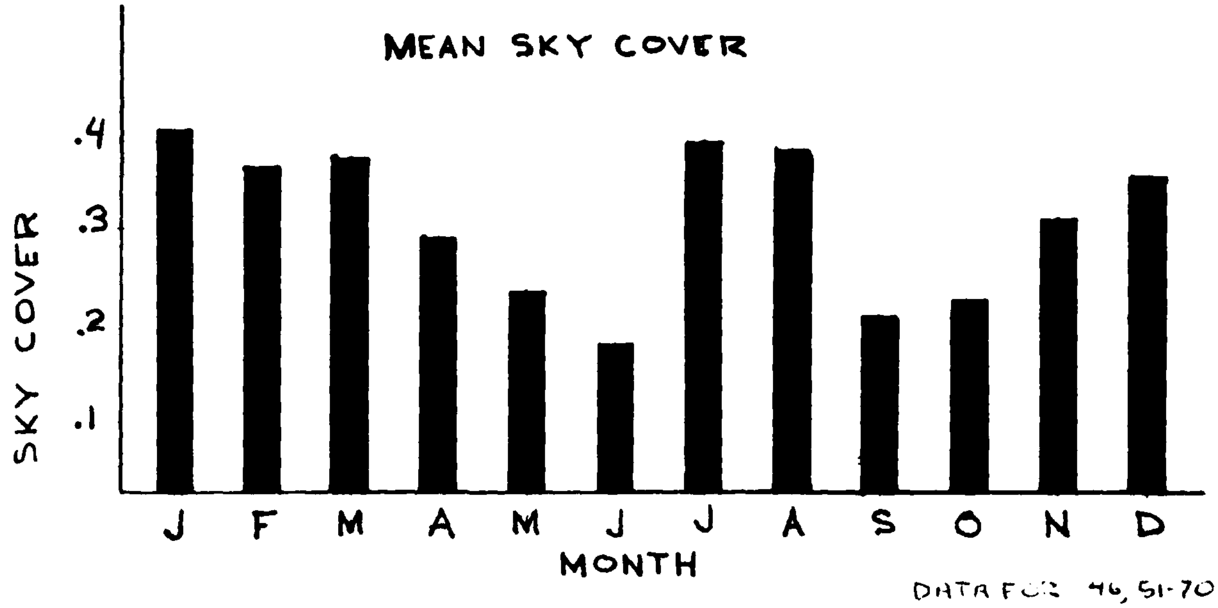
4-1. Climatic Aids: The following graphs and charts are presented to give an insight into average type weather experienced at this station. In this area where 99.3% of all observations have ceiling of 3000 feet or more and visibilities of 3 miles or more, it is sometimes difficult to imagine that there is a weather problem. The following charts will show that there are forecasting problems and can assist in solving some of them.

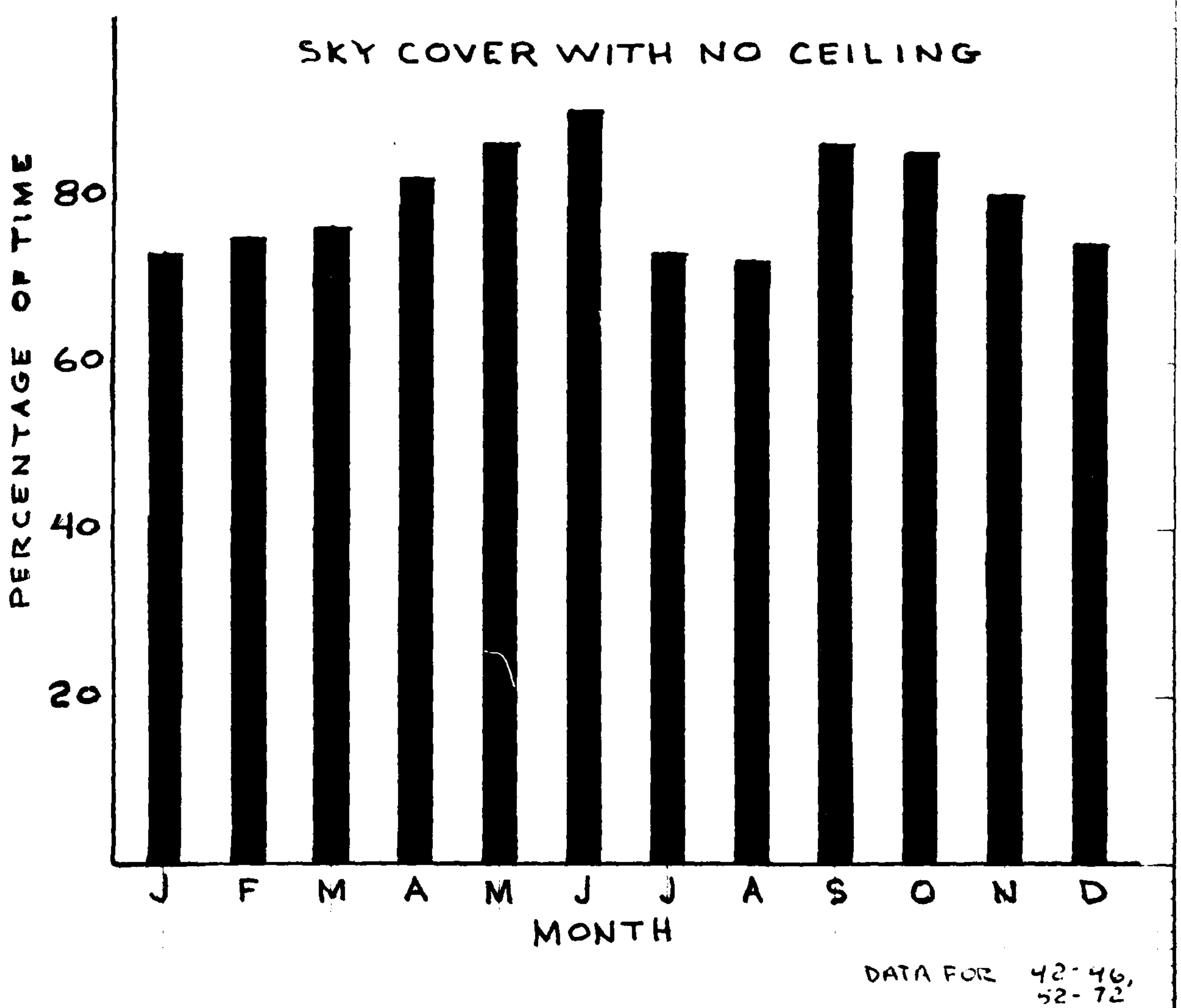
CLIMATIC DATA
Annual Summary
for

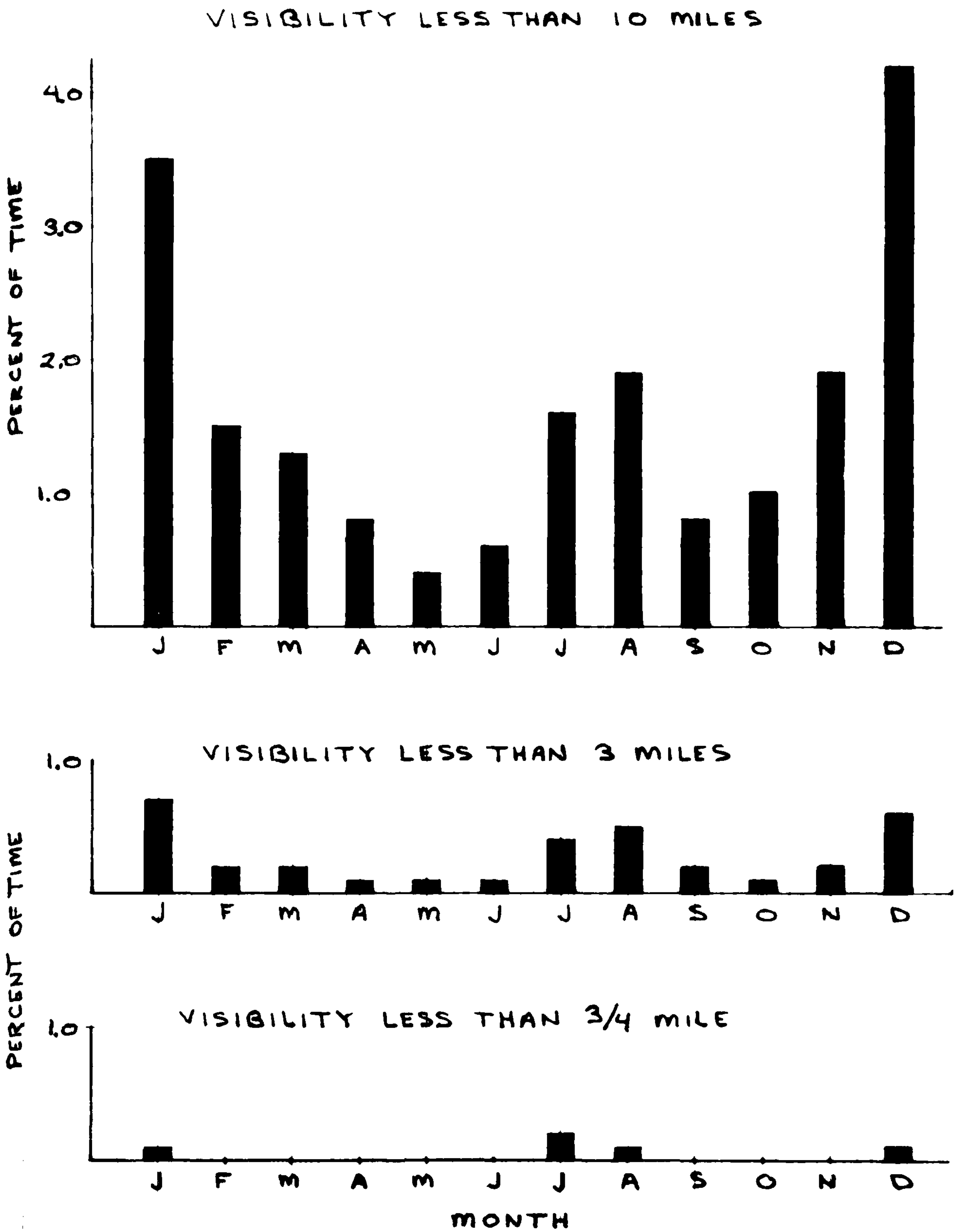
LUKE AFB, ARIZONA

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temperature (°F)												
Highest	83	87	93	103	113	115	117	111	113	105	89	81
Avg Max	66	68	74	83	92	101	105	102	100	89	75	67
Avg Min	39	40	45	52	61	68	77	76	69	57	44	39
Lowest	26	24	32	34	44	52	60	60	52	38	30	22
Precipitation												
Avg Amount (in)	1.1	0.5	0.7	0.3	0.1	0.1	0.9	1.5	0.7	0.4	0.5	0.5
Avg No Days	3	3	3	2	<1	<1	4	4	2	2	2	3
Avg Snowfall (in)	<.1	<.1	<.1	0	<.1	0	0	0	0	0	<.1	<.1
Avg No Days	<1	<1	<1	0	<1	0	0	0	0	0	<1	<1
Ceiling/Visibility (Frequency in % of time)												
< 200 and/or ½	<1	<1	<1	<1	0	<1	<1	<1	0	0	0	<1
< 500 and/or 1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0	0	<1
< 1500 and/or 3	1	<1	1	<1	<1	<1	1	1	<1	<1	<1	<1
< 5000 and/or 5	5	4	5	1	<1	<1	1	2	1	1	2	2


SE
3.3%
SSE
2.1%

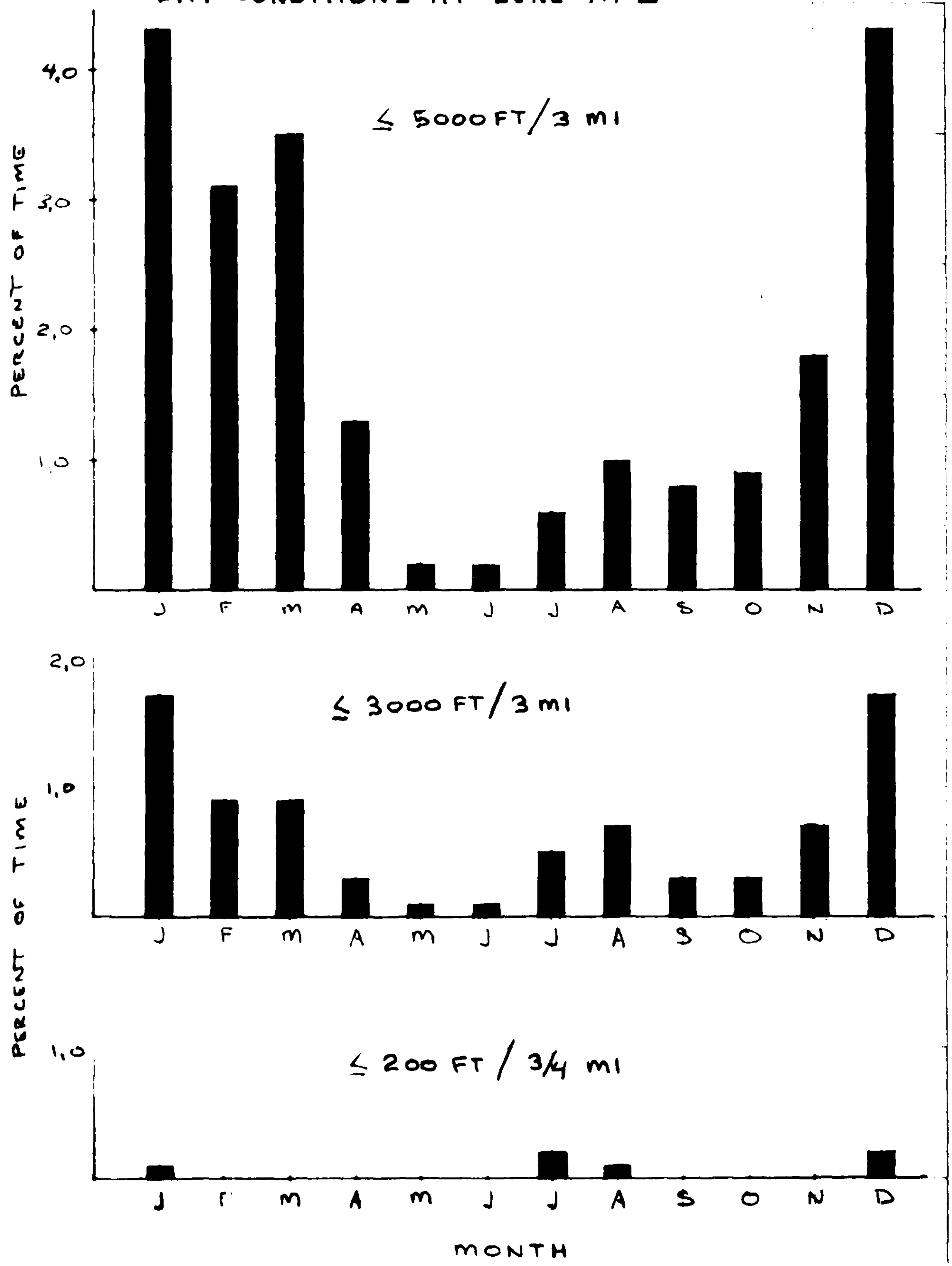

MEAN SKY COVER
SKY COVER
.4
.3
.2
.1
J F M A M J J A S O N D
MONTH
DATA FOR 46, 51-70


SKY COVER WITH NO CEILING
PERCENTAGE OF TIME
80
60
40
20
J F M A M J J A S O N D
MONTH
DATA FOR 42-46, 52-72



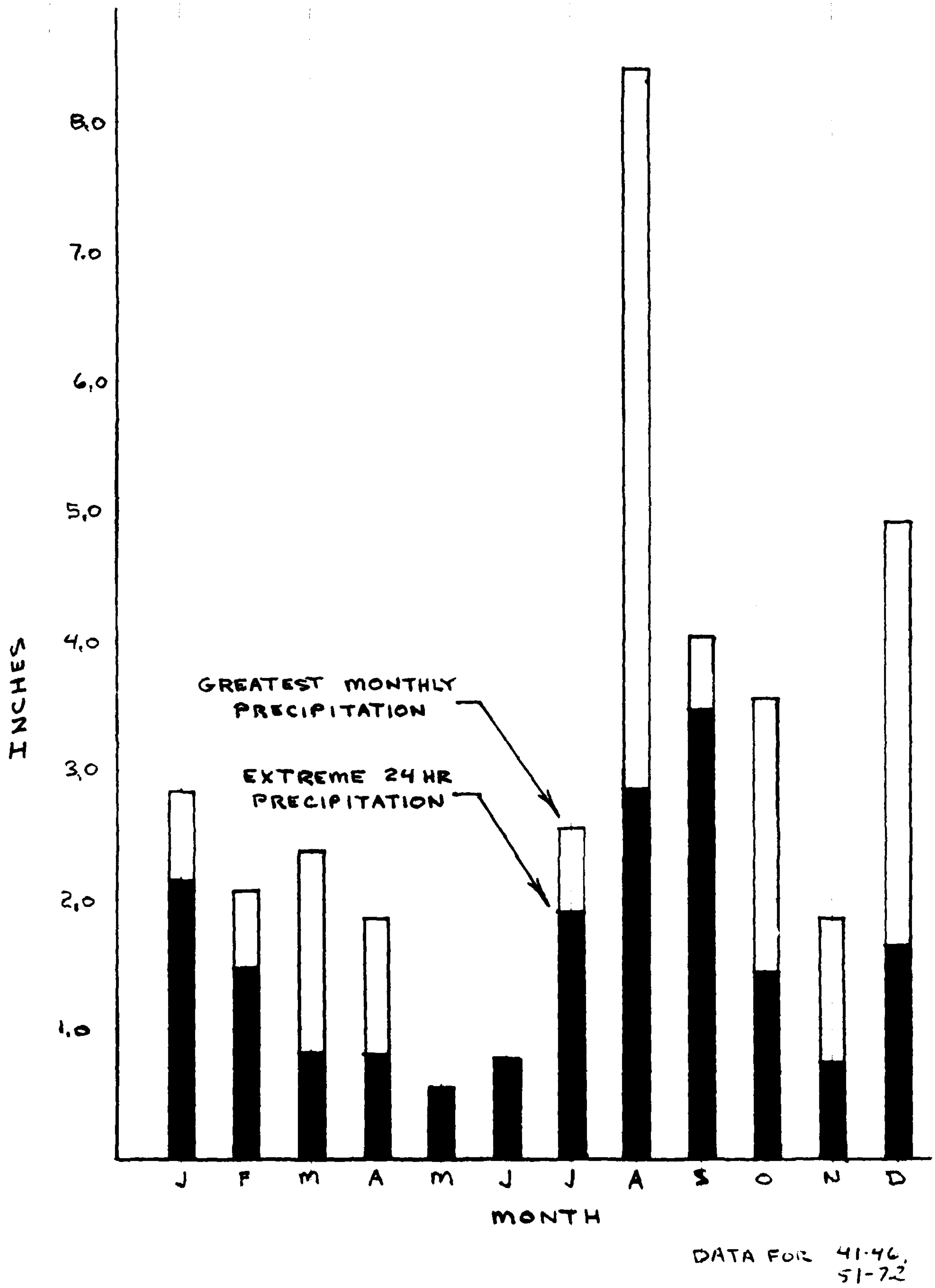
DATA FOR 42-46, 52-72

SKY CONDITIONS AT LUKE AFB

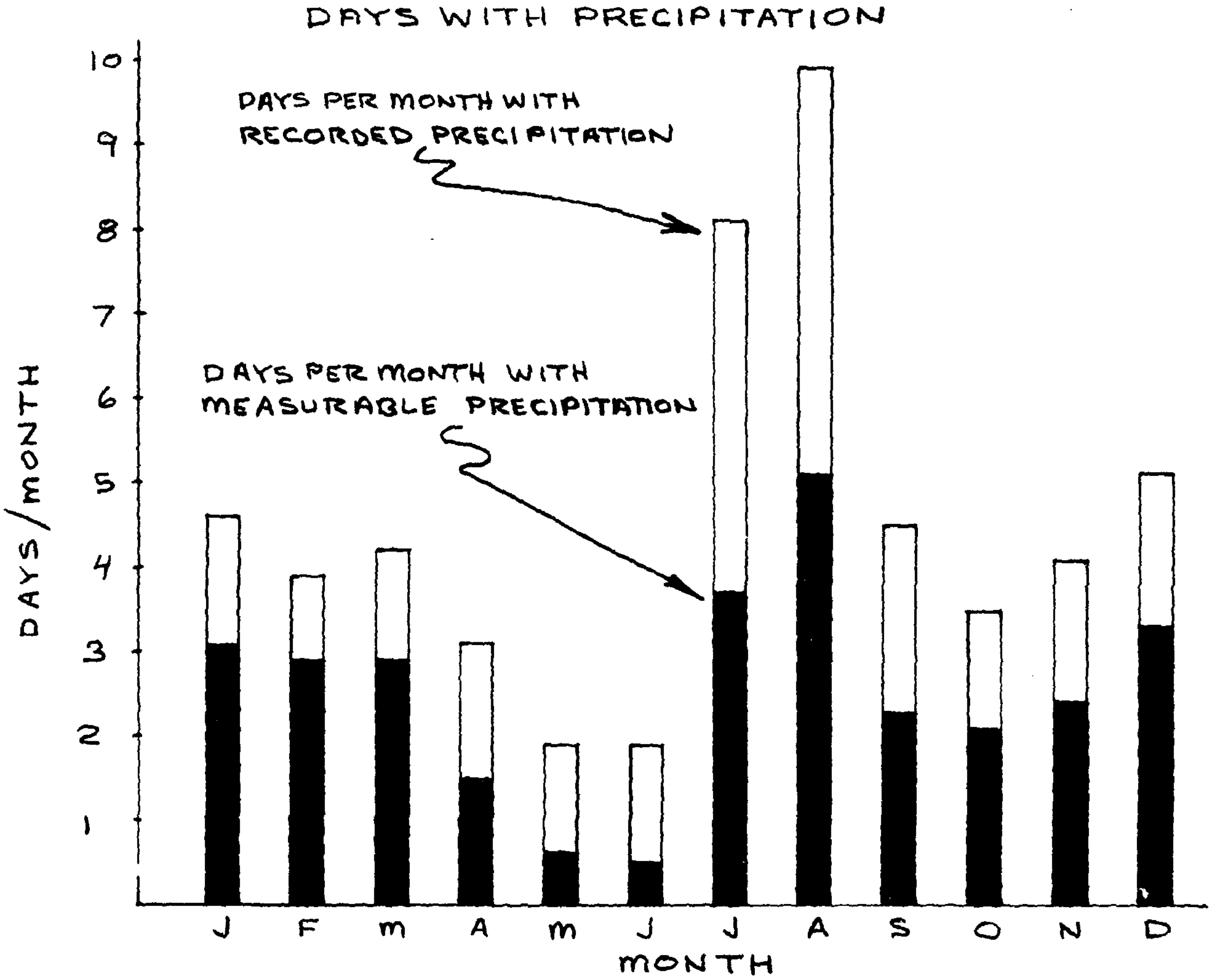


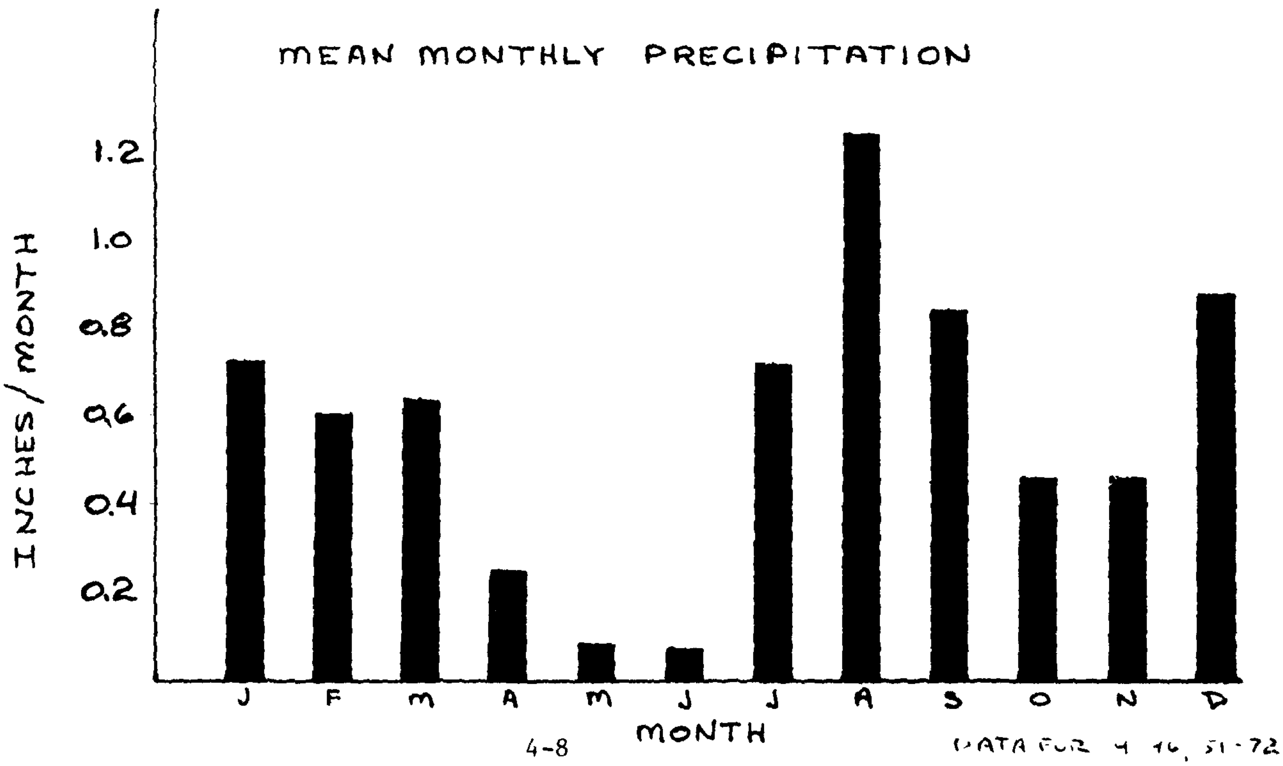
DATA FOR 42-46, 52-72

PRECIPITATION DATA FOR LUKE AFB

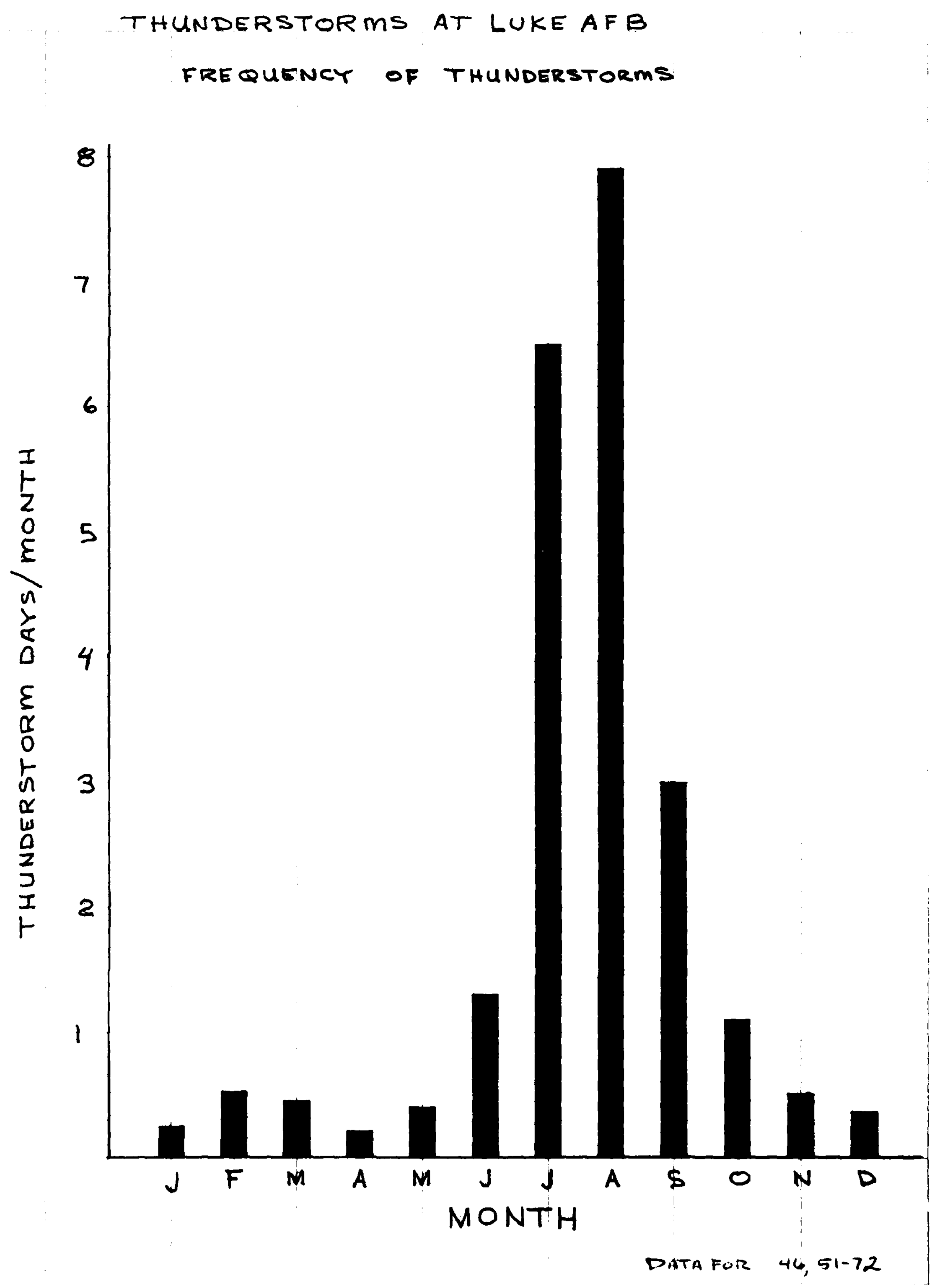


PRECIPITATION DATA FOR LUKE AFB



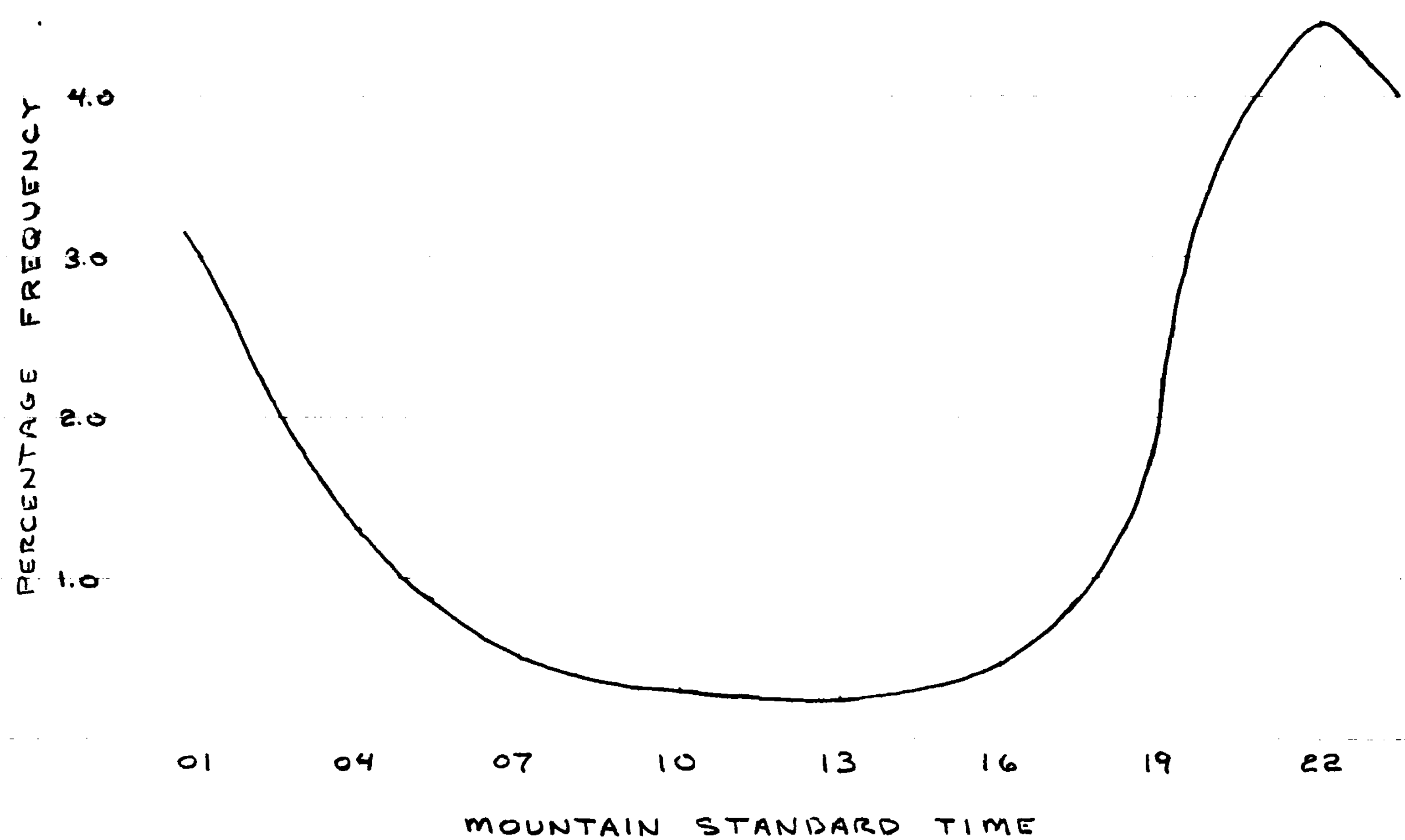


DATA FOR 4 46, 51-72



THUNDERSTORMS AT LUKE AFB
FREQUENCY OF THUNDERSTORMS
THUNDERSTORM DAYS/MONTH
8
7
6
5
4
3
2
1
J F M A M J J A S O N D
MONTH
DATA FOR 46, 51-72

TIME OF OCCURRENCE OF THUNDERSTORMS
AT LUKE AFB DURING JULY AND AUGUST



SYNOPSIS OF WEATHER NORMALS, MEANS AND EXTREMES

FLYING WEATHER:	JAN	FEB	MAR
Below Ceiling 300'/Vis 1 mi.	0.1%	0.1%	0.1%
" " 2500'/Vis 3 mi.	1.3%	0.6%	0.9%
" " 5000'/Vis 5 mi.	5.1%	3.6%	5.1%
Visibility below 1 mile in fog	0.1%	0.1%	0.0%
Visibility below 1 mile in blowing dust	0.0%	0.0%	0.1%
SKY CONDITION:			
Clear	40.9%	56.2%	49.8%
Scattered	20.5%	20.2%	19.1%
Broken or Overcast	38.2%	23.6%	31.1%
TEMPERATURES (o F):			
Extreme Maximum	83	87	92
Average Daily Maximum	66	68	74
Mean Daily	52	54	60
Average Daily Minimum	39	40	45
Extreme Minimum	26	24	32
Mean number of hours per month with the temperature at or below 32°F	5.1	6.3	0.1
PRECIPITATION:			
Monthly Average	1.1 in	0.5 in	0.7 in
Average number of days with measurable precipitation	3.3	2.7	2.9
Average number of thunderstorms per month	0.2	0.3	0.4

WIND (KNOTS):	JAN	FEB	MAR
Mean Speed	2.9	4.0	4.8
Prevailing Direction	N	N	N
Direction of Max Mean Wind Speed	WSW	WNW	WNW

MONTHLY MEAN TEMPERATURES ALOFT

Degrees Celsius (Centigrade) to nearest degree

HEIGHT	JAN	FEB	MAR	DEVIATION
5,000 feet	7.3	9.4	10.5	± 7
10,000 feet	-1.3	-1.3	-0.6	6
15,000 feet	-11.0	-11.2	-10.7	6
20,000 feet	-21.4	-22.0	-21.1	5
25,000 feet	-32.0	-33.2	-32.3	5
30,000 feet	-43.0	-44.3	-43.8	4
35,000 feet	-51.8	-53.3	-52.9	5
40,000 feet	-56.4	-56.6	-57.6	6

Deviation: 80% of the temperatures will be in the range plus/minus the deviation applied to the average temperature.

CLIMATOLOGICAL DATA

TEMPERATURE

HOURS (GMT)	JANUARY MEAN	JANUARY S.D.*	FEBRUARY MEAN	FEBRUARY S.D.*	MARCH MEAN	MARCH S.D.*
0000-0200	45.6	± 5.2	47.0	± 7.0	52.5	± 6.2
0300-0500	42.2	5.4	45.0	6.9	49.1	7.8
0600-0800	42.2	5.6	44.3	7.0	49.8	6.3
0900-1100	53.0	6.5	56.6	7.6	62.5	7.6
1200-1400	62.6	6.9	65.6	7.9	70.4	8.7
1500-1700	64.1	7.2	67.5	8.2	72.4	8.9
1800-2000	54.8	5.9	59.2	7.6	65.5	8.3
2100-2300	49.7	5.3	51.9	6.8	57.6	6.9

* STANDARD DEVIATION: A measure of the spread or variation from the mean. 66.6% of the data will be within the limits of 1σ (standard deviation), and 95% of the data will be within the limits of 2σ.

WIND

DIRECTION	JANUARY %	JANUARY MEAN SPEED (kts)	FEBRUARY %	FEBRUARY MEAN SPEED (kts)	MARCH %	MARCH MEAN SPEED (kts)
N	9.2	3.9	9.2	4.4	7.4	4.5
NNE	3.4	5.1	3.3	5.3	3.3	5.4
NE	2.6	4.1	3.3	4.4	3.4	4.7
ENE	0.8	4.2	0.9	4.4	1.2	4.4
E	1.7	4.0	1.6	4.0	2.4	4.3
ESE	0.9	4.0	1.0	4.2	1.5	4.8
SE	1.5	3.6	1.9	4.0	2.5	4.2
SSE	0.5	3.3	1.0	4.3	1.1	4.5
S	0.8	3.4	2.5	4.4	3.6	4.9
SSW	1.1	4.5	2.7	6.1	4.5	6.9
SW	3.0	5.3	6.5	6.6	9.4	7.3
WSW	0.7	6.3	2.4	7.9	3.4	8.5
W	0.7	5.6	1.9	7.6	2.4	7.6
WNW	0.4	5.0	1.4	8.8	1.8	10.3
NW	2.6	4.1	3.1	5.3	4.6	6.1
NNW	3.6	4.1	4.3	4.6	3.7	5.2
UNDER 4K	67.7	-	53.1	-	43.9	-

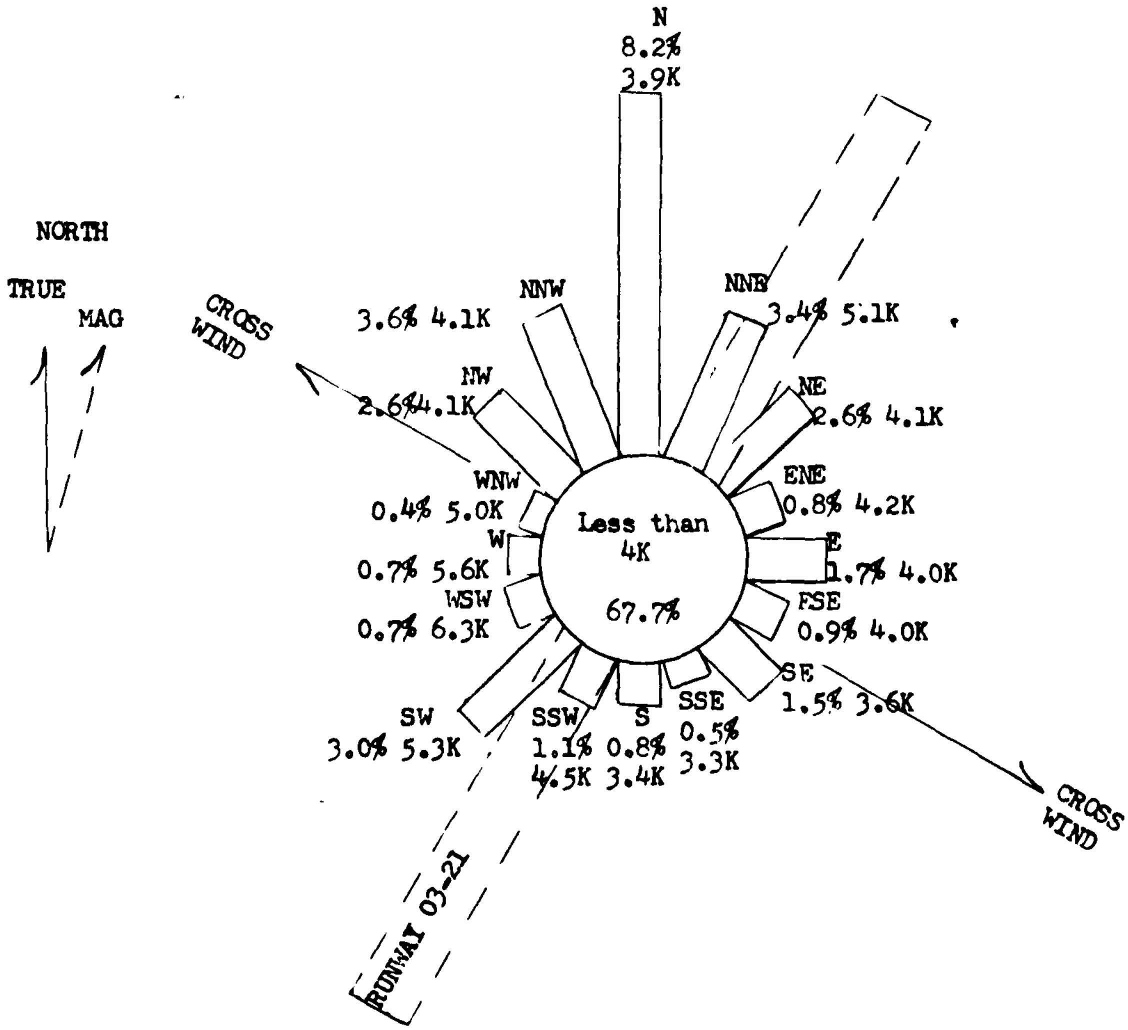
NOTE: % indicates the percent of the time that the wind is 4 knots or greater from the direction indicated.

JANUARY

CEILING VS VISIBILITY

Below indicated limits the following % of time.

TIME (MST)	300'/1 mi	500'/2 mi	1000'/2 mi	2500'/3 mi	5000'/5 mi	10000'/10 mi
01-03	0.0	0.0	0.0	0.1	3.0	8.5
04-06	0.2	0.5	0.5	0.9	2.9	11.1
07-09	0.1	0.1	0.4	0.7	6.5	13.0
10-12	0.4	0.6	0.7	2.9	7.1	13.0
13-15	0.0	0.3	0.9	2.6	7.4	14.0
16-18	0.0	0.2	0.4	1.5	5.7	12.8
19-21	0.0	0.0	0.0	1.5	4.3	10.9
22-24	0.0	0.0	0.0	0.1	3.5	8.6

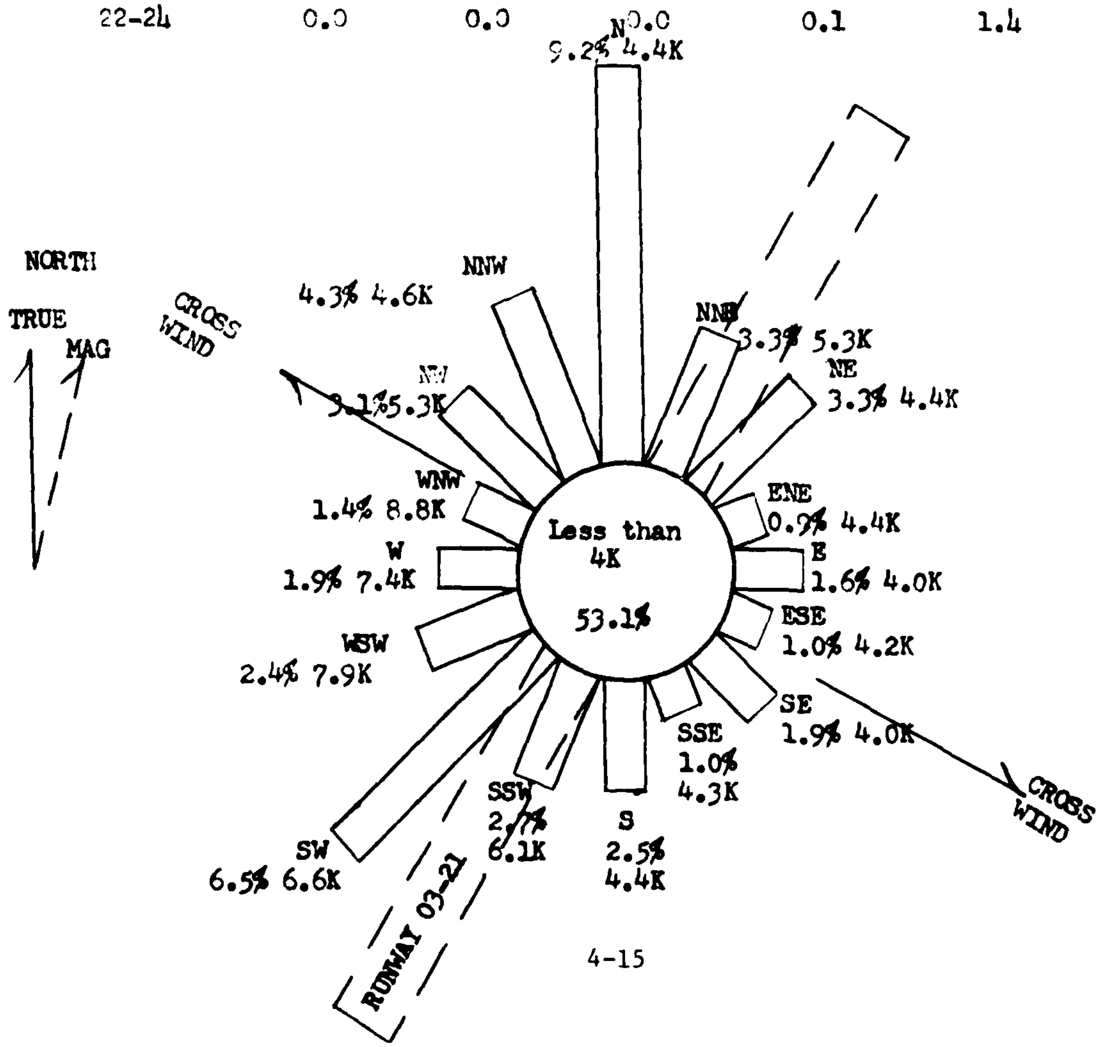


FEBRUARY

CEILING VS VISIBILITY

Below indicated limits the following % of time

TIME (LST)	300'/1 mi	500'/2 mi	1000'/2 mi	2500'/3 mi	5000'/5 mi	10000'/10 mi
01-03	0.0	0.0	0.0	0.1	2.3	8.9
04-06	0.1	0.1	0.1	0.3	2.3	9.0
07-09	0.4	0.4	0.4	0.9	3.5	10.7
10-12	0.1	0.4	0.4	0.6	4.3	10.3
13-15	0.1	0.2	0.4	0.7	6.0	13.3
16-18	0.3	0.5	0.5	1.1	5.1	13.7
19-21	0.0	0.1	0.3	0.7	4.0	10.1
22-24	0.0	0.0	0.0	0.1	1.4	8.7

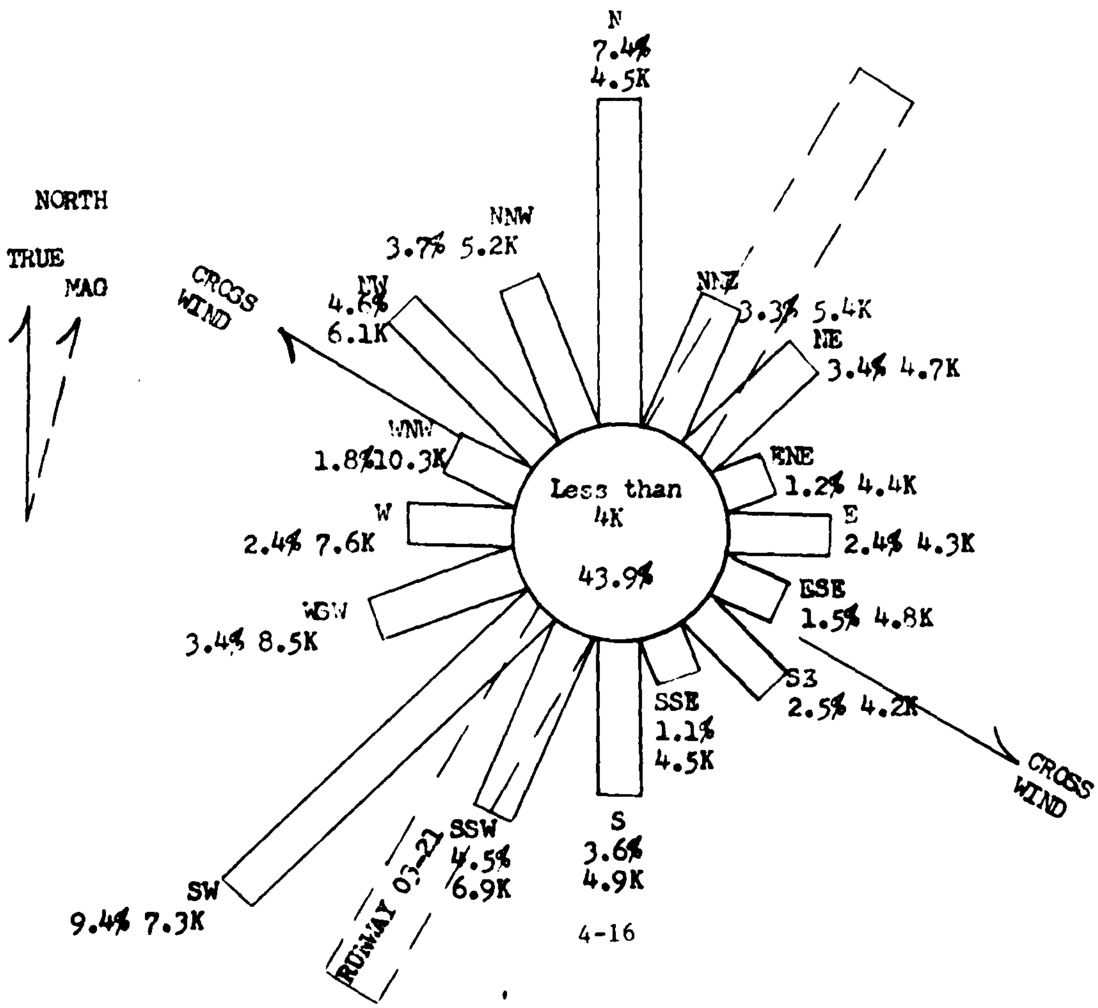


MARCH

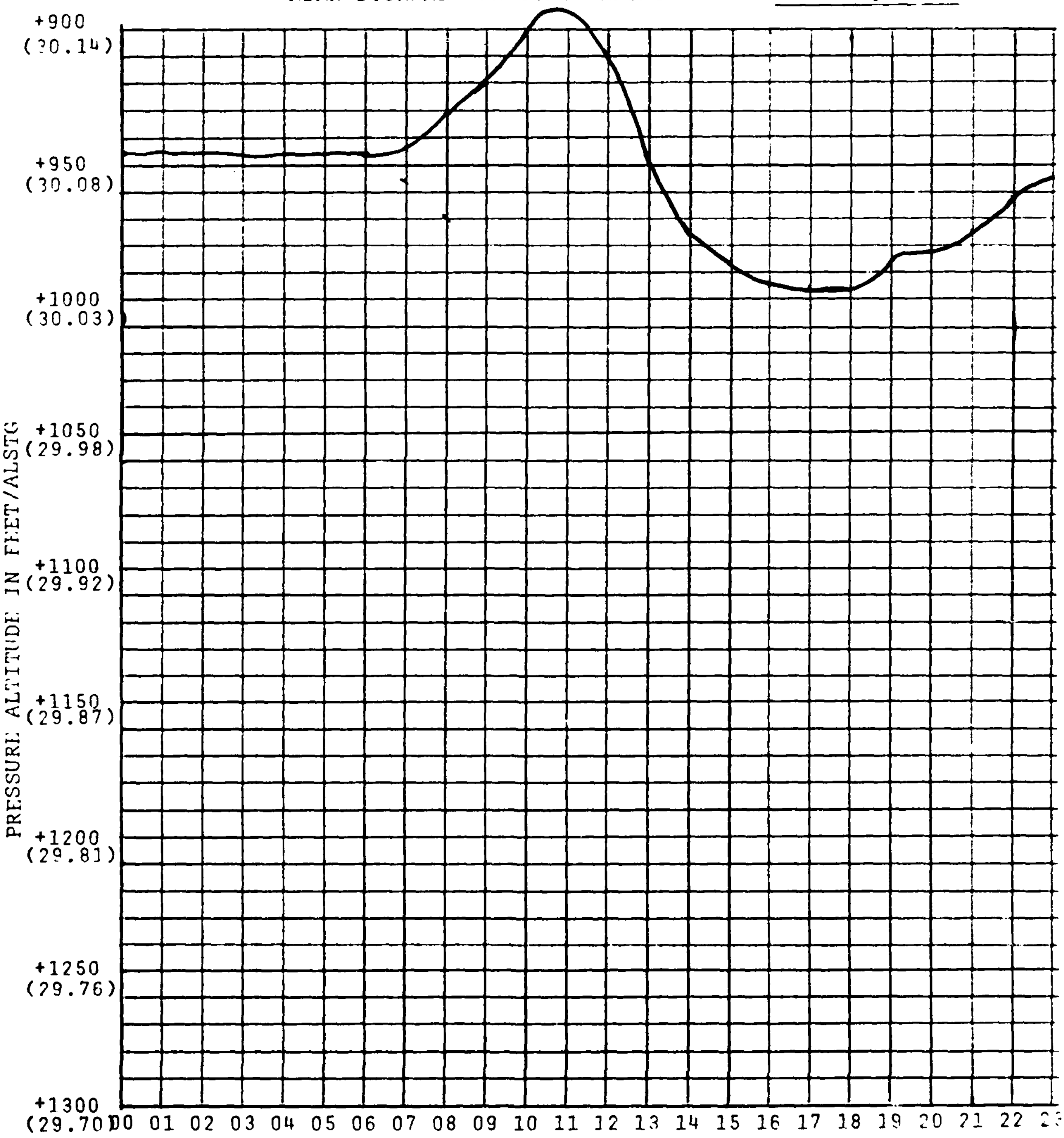
CEILING VS VISIBILITY

Below indicated limits the following % of time

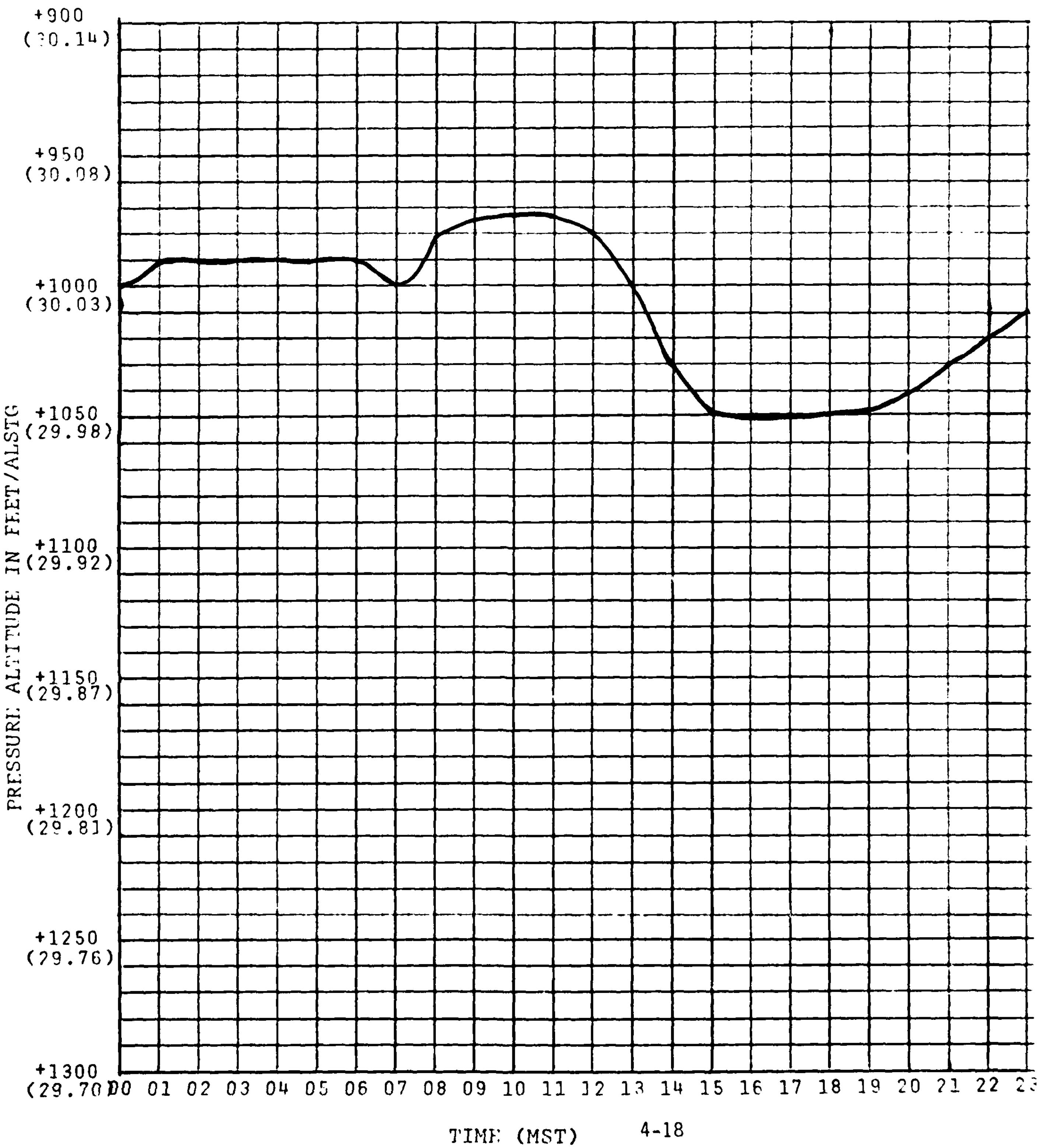
TIME (LST)	300'/1 mi	500'/2 mi	1000'/2 mi	2500'/3 mi	5000'/5 mi	10000'/10 mi
01-03	0.0	0.0	0.0	0.0	3.0	8.5
04-06	0.1	0.1	0.1	0.3	4.3	9.3
07-09	0.0	0.0	0.1	1.5	5.2	11.3
10-12	0.1	0.3	0.9	2.0	5.9	12.0
13-15	0.0	0.3	0.5	1.6	8.0	14.8
16-18	0.1	0.9	1.0	1.1	7.0	15.0
19-21	0.0	0.0	0.0	0.6	4.2	10.6
22-24	0.0	0.0	0.0	0.1	2.8	7.9



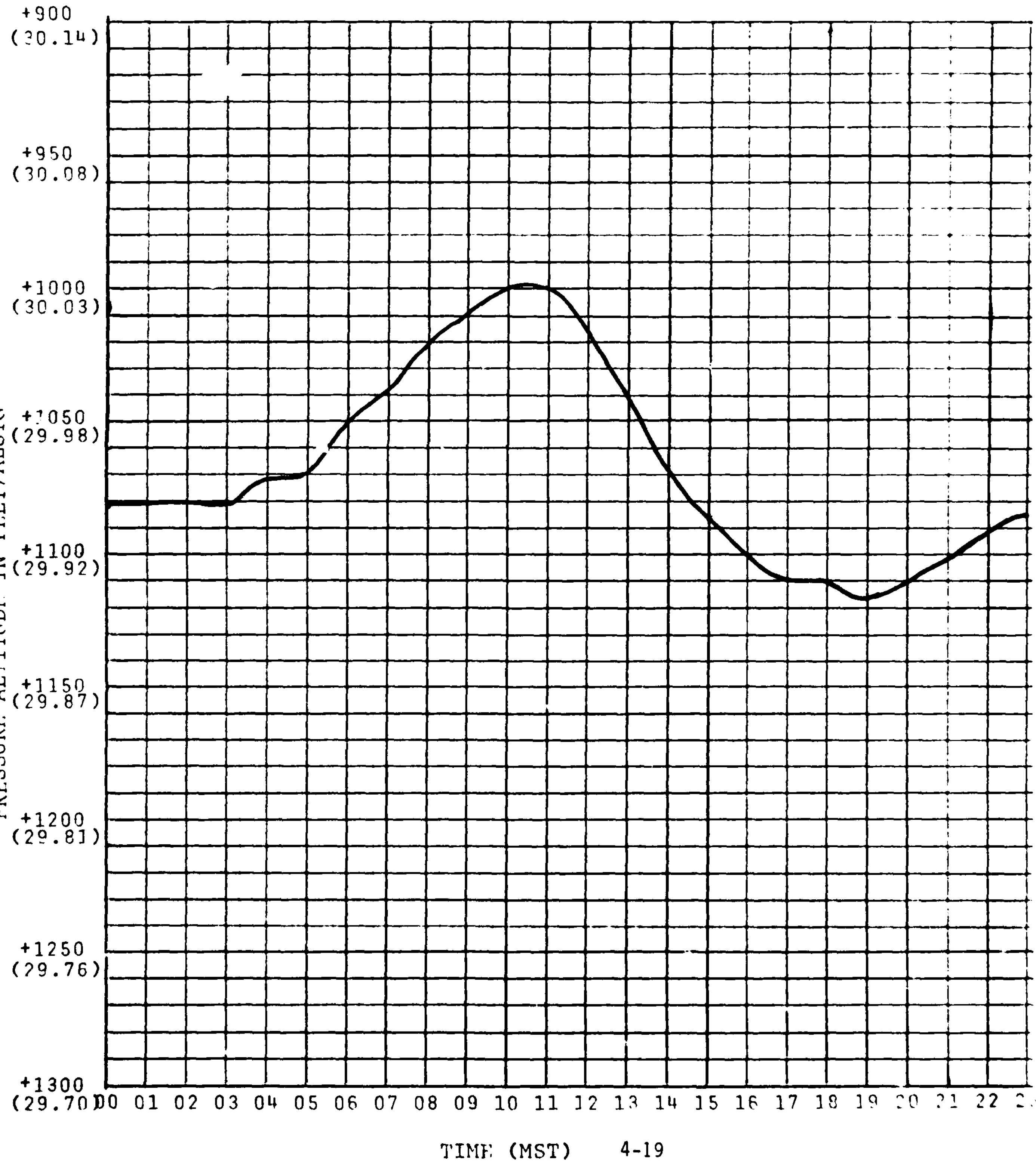
MEAN DIURNAL PRESSURE VARIATION FOR January.



MEAN DIURNAL PRESSURE VARIATION FOR February.



MEAN DIURNAL PRESSURE VARIATION FOR March



SYNOPSIS OF WEATHER NORMALS, MEANS AND EXTREMES

FLYING WEATHER:	APR	MAY	JUN
Below Ceil, 300'/Vis 1 mi.	0.1%	0.1%	0.1%
" " 1500'/Vis 3 mi.	0.3%	0.1%	0.1%
" " 5000'/Vis 5 mi.	1.4%	0.3%	0.2%
Visibility below 1 mile in blowing dust	0.1%	0.0%	0.1%

SKY CONDITION:			
Clear	54.1%	60.6%	70.4%
Scattered	20.4%	21.2%	16.7%
Broken or Overcast	25.5%	10.2%	12.9%

TEMPERATURES (°F):			
Extreme Maximum	102	112	115
Average Daily Maximum	83	92	101
Mean Daily	68	77	84
Average Daily Minimum	52	61	68
Extreme Minimum	35	44	53

PRECIPITATION:			
Monthly average	0.3 in	0.1 in	0.1 in
Average number of days with measurable precipitation	1.3	0.5	0.5
Average number of thunderstorms per month	1.2	0.1	0.9

WIND (KNOTS):			
Mean Speed	4.7	4.9	4.6
Prevailing Direction	SW	SW	SW
Max Wind Speed Recorded	39	46	46

MONTHLY MEAN TEMPERATURES ALOFT

Degrees Celsius (Centigrade) to nearest degree

HEIGHT	APR	MAY	JUN	DEVIATION
5,000 feet	15.8	20.2	24.6	± 6
10,000 feet	3.0	6.6	11.5	5
15,000 feet	- 7.3	- 4.6	+ 0.5	4
20,000 feet	- 18.6	-15.8	- 9.8	4
25,000 feet	- 29.7	-26.7	-20.6	3
30,000 feet	- 41.5	-38.5	-33.1	3
35,000 feet	-52.2	-50.0	-44.6	4
40,000 feet	-58.5	-57.5	-55.5	4

Deviation: 80% of the temperatures will be in the range plus/minus the deviation applied to the average temperature.

CLIMATOLOGICAL DATA

TEMPERATURE

HOURS (MST)	APRIL MEAN	APRIL S.D.*	MAY MEAN	MAY S.D.*	JUNE MEAN	JUNE S.D.*
0000-0200	61.0	± 7.3	70.1	± 7.5	78.2	± 6.8
0300-0500	56.4	6.8	64.6	6.9	72.3	7.0
0600-0800	58.9	7.6	63.7	7.4	76.8	7.3
0900-1100	72.3	8.3	81.9	7.5	90.2	6.5
1200-1400	79.5	9.2	89.0	7.7	97.5	6.8
1500-1700	81.5	9.6	91.0	8.0	100.1	7.0
1800-2000	75.3	9.4	85.8	8.2	95.0	7.4
2100-2300	67.0	7.8	76.7	7.2	85.4	6.8

* STANDARD DEVIATION: A measure of the spread or variation from the mean. 66.6% of the data will be within the limits of 1 σ (standard deviation), and 95% of the data will be within the limits of 2 σ.

WIND

DIRECTION	APRIL %	APRIL MEAN SPEED (kts)	MAY %	MAY MEAN SPEED (kts)	JUNE %	JUNE MEAN SPEED (kts)
N	4.6	4.0	2.2	3.8	1.4	3.4
NNE	4.8	4.3	1.0	4.1	0.9	3.9
NE	2.2	4.1	1.6	3.5	1.1	3.3
ENE	0.8	4.6	0.5	3.8	0.3	3.6
E	2.3	4.2	1.5	3.9	0.9	3.4
ESE	[illegible]	4.5	0.3	4.4	0.7	4.2
SE	3.0	4.6	2.6	4.5	2.4	4.2
SSE	1.4	[illegible]	0.9	4.4	1.4	4.7
S	4.2	5.7	3.8	4.8	3.7	4.7
SSW	6.5	7.7	8.1	7.3	7.1	7.0
SW	14.4	7.8	20.3	7.4	20.2	7.0
WSW	4.5	9.1	5.0	8.0	5.7	7.6
W	1.9	6.7	2.5	5.8	3.9	5.9
WNW	0.9	8.7	1.2	7.4	0.7	5.2
NW	2.4	5.2	2.0	5.4	1.7	4.4
NNW	2.1	4.8	1.0	4.4	0.7	3.8
UNDER 4K	45.6	-	44.9	-	47.3	-

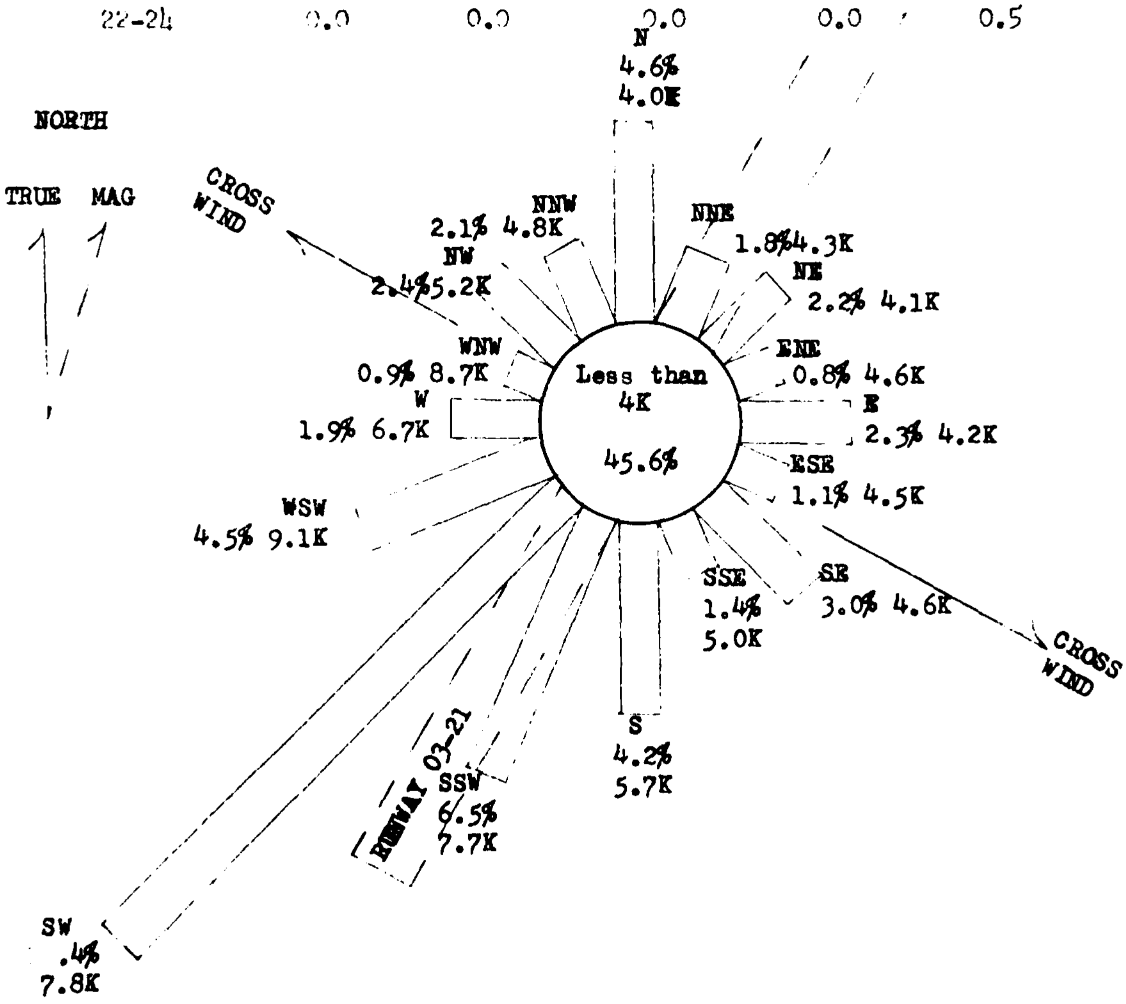
NOTE: % indicates the percent of the time that the wind is 4 knots or greater from the direction indicated.

APRIL

CEILING VS VISIBILITY

Below indicated limits the following % of time

TIME (LST)	300'/1 mi	500'/2 mi	1000'/2 mi	2500'/3 mi	5000'/5 mi	10000'/10 mi
01-03	0.0	0.0	0.0	0.0	0.3	3.8
04-06	0.0	0.0	0.0	0.0	0.9	4.7
07-09	0.0	0.0	0.0	0.0	2.1	7.7
10-12	0.0	0.0	0.0	0.5	1.7	7.9
13-15	0.1	0.1	0.1	0.7	2.3	10.5
16-18	0.1	0.1	0.1	0.5	1.7	12.7
19-21	0.4	0.4	0.4	0.4	1.9	10.3
22-24	0.0	0.0	0.0	0.0	0.5	5.7

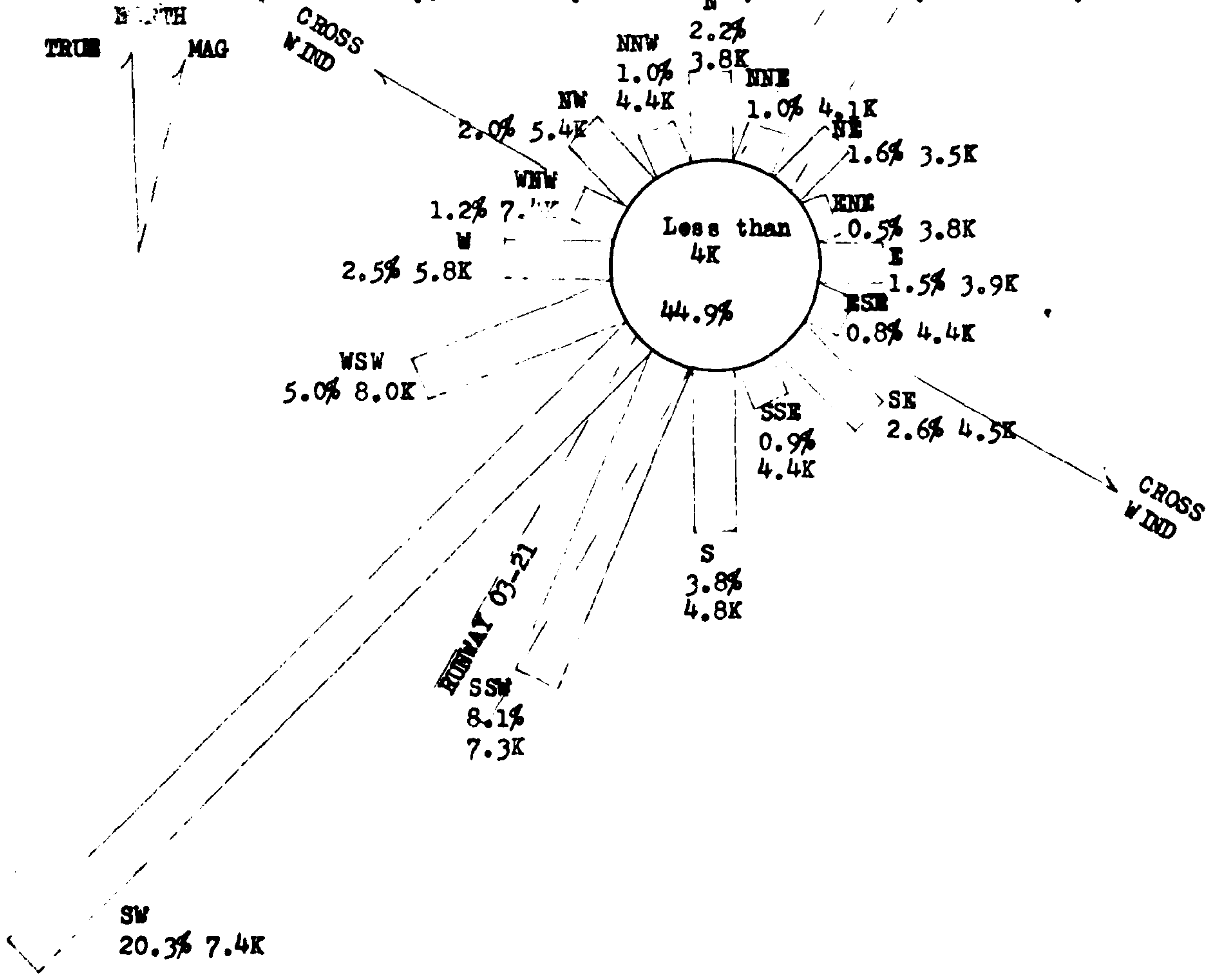


ZY

CEILING VS VISIBILITY

Below indicated limits the following % of time

TIME (GMT)	300'/1 mi	500'/2 mi	1000'/2 mi	3000'/3 mi	5000'/5 mi	10000'/10 mi
01-03	0.0	0.0	0.0	0.0	0.2	1.4
04-06	0.0	0.0	0.0	0.0	0.3	1.0
07-09	0.0	0.0	0.0	0.0	0.3	1.0
10-12	0.0	0.0	0.0	0.0	0.3	0.9
13-15	0.1	0.1	0.1	0.1	0.4	2.5
16-18	0.1	0.2	0.2	0.3	0.4	4.0
19-21	0.2	0.2	0.2	0.2	0.4	3.3
22-24	0.0	0.0	0.0	0.0	0.0	1.6

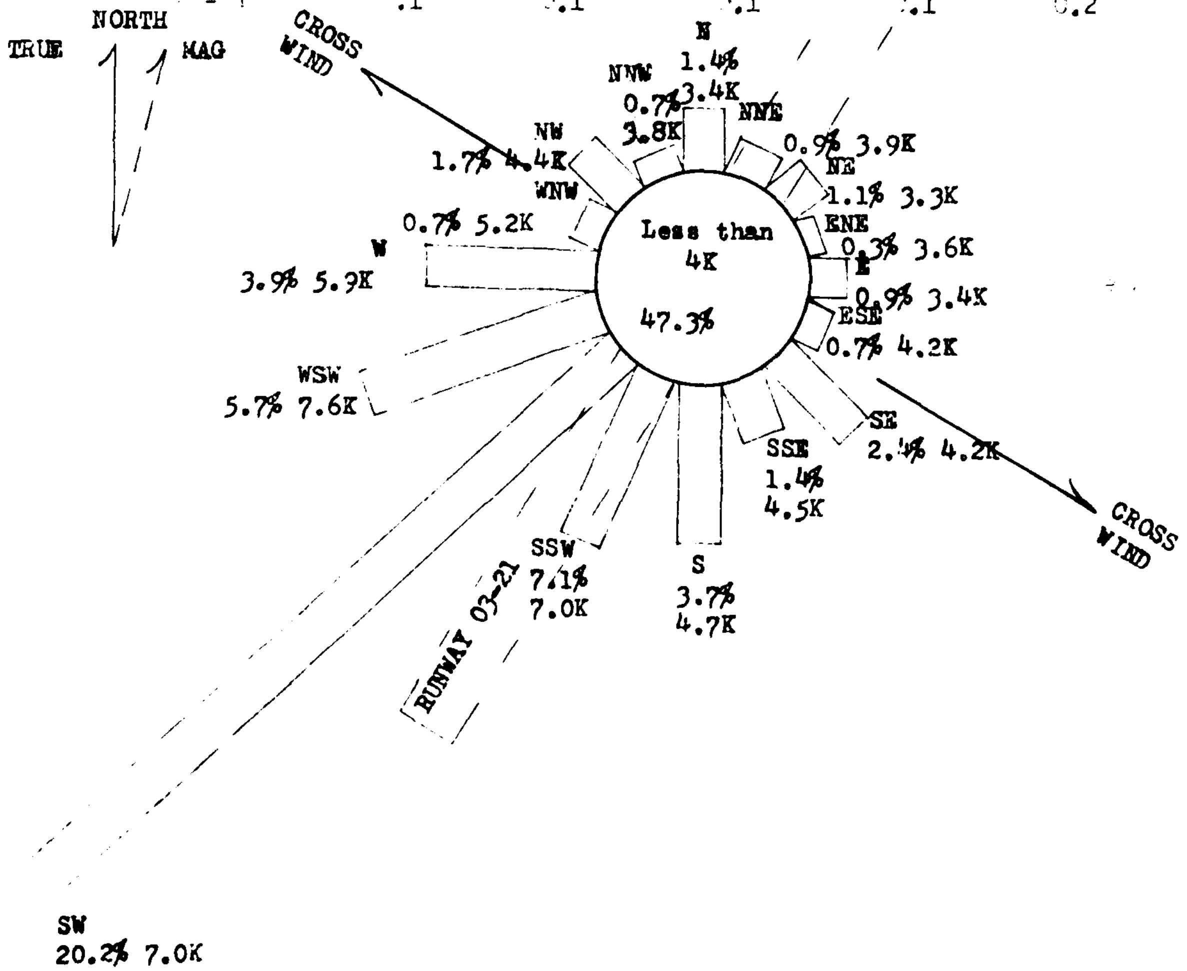


[illegible]

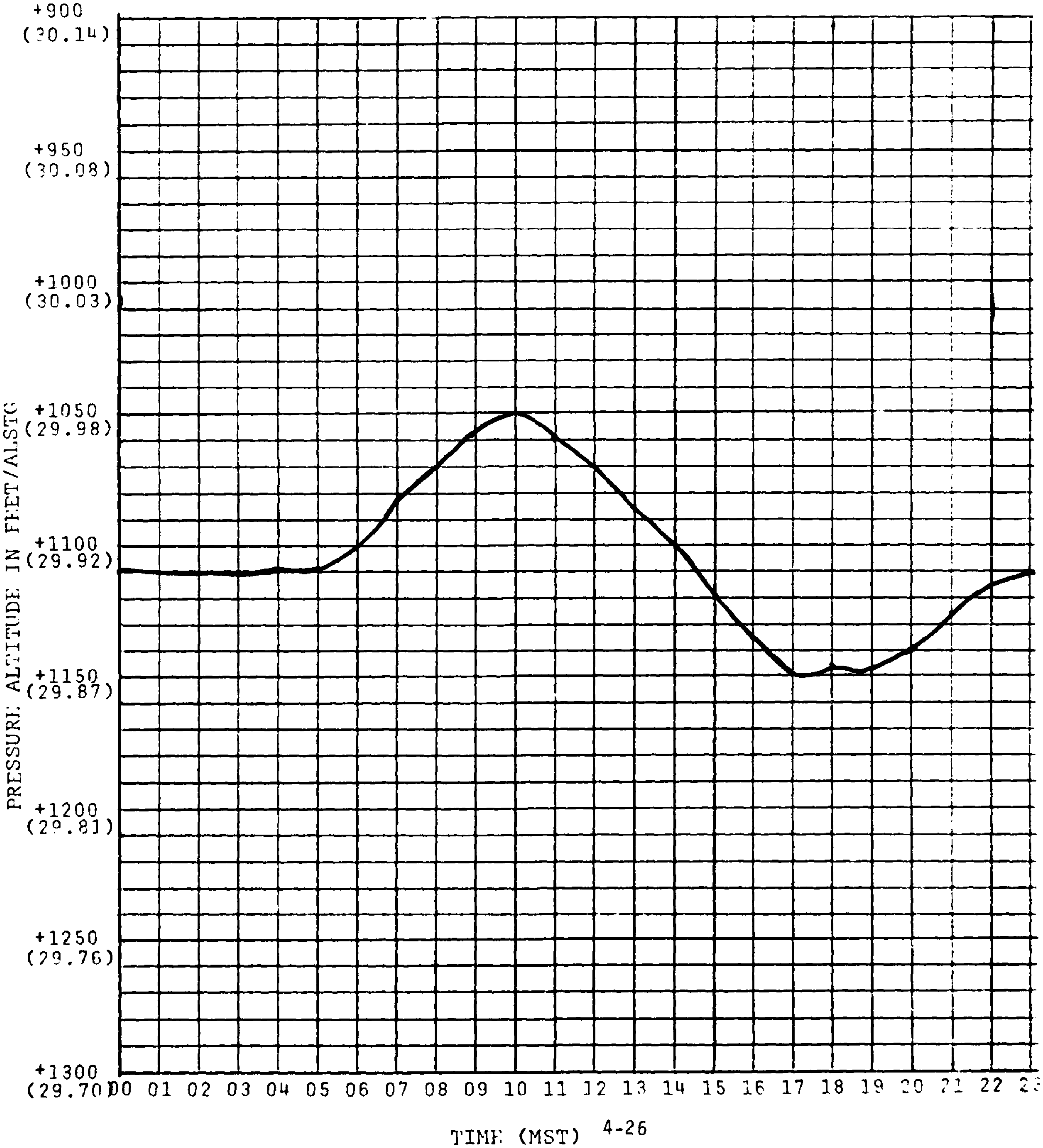
CEILING VS VISIBILITY

Below indicated limits the following % of time

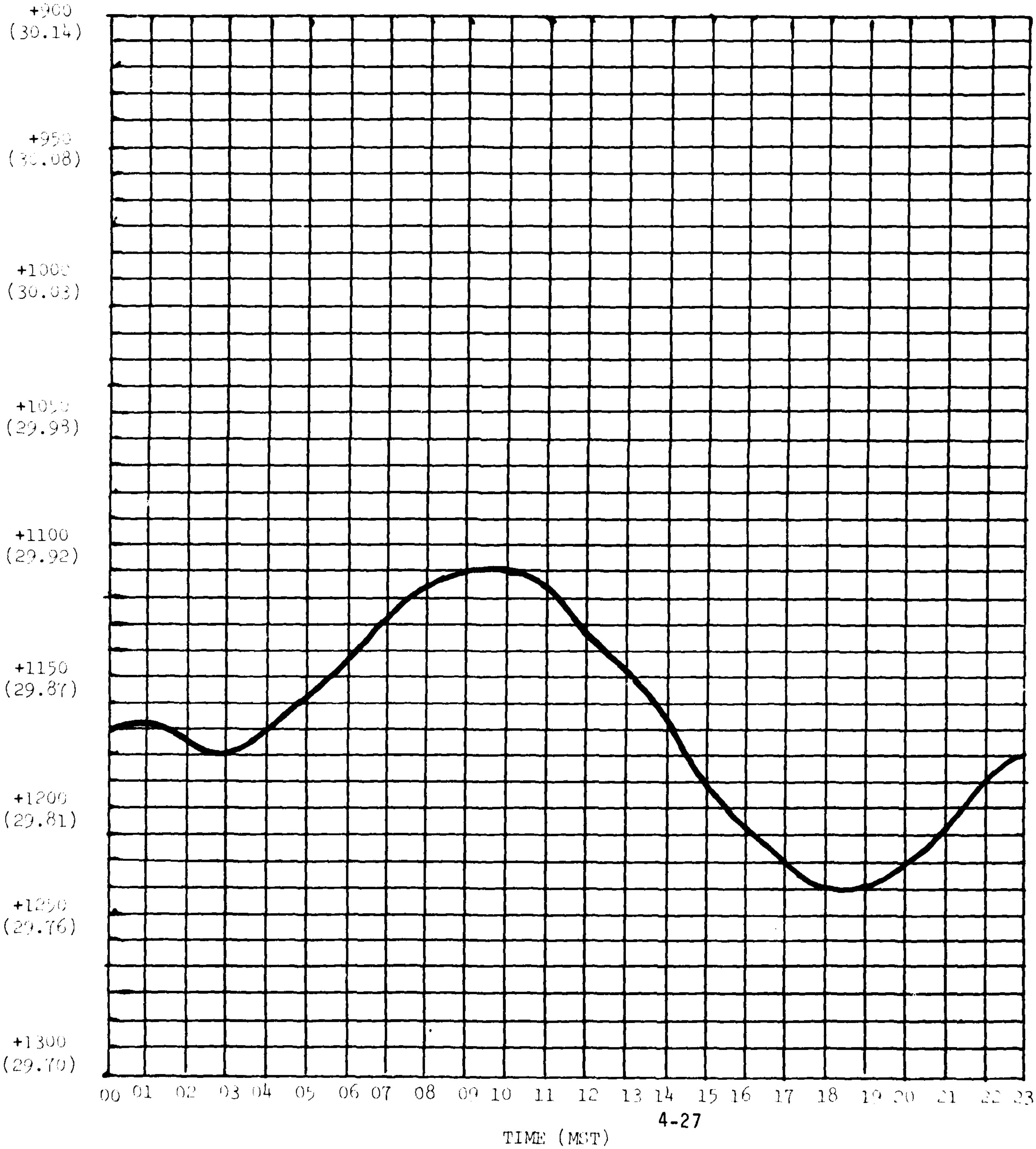
HRS (LST)	[illegible]'/[illegible] mi	500'/[illegible] mi	[illegible]'/[illegible] mi	[illegible]'/3 mi	[illegible]'/[illegible]	10000'/10 mi
01-03	0.0	0.0	0.0	0.0	0.0	0.8
04-06	0.0	0.0	0.0	0.0	0.0	0.8
07-09	0.0	0.0	0.0	0.0	0.0	0.9
10-12	0.0	0.0	0.0	0.0	0.3	1.5
13-15	0.0	0.0	0.0	0.0	0.1	1.2
16-18	0.0	0.0	0.0	0.0	0.1	1.3
19-21	0.3	0.3	0.3	0.4	0.7	1.3
22-24	0.1	0.1	0.1	0.1	0.2	1.1



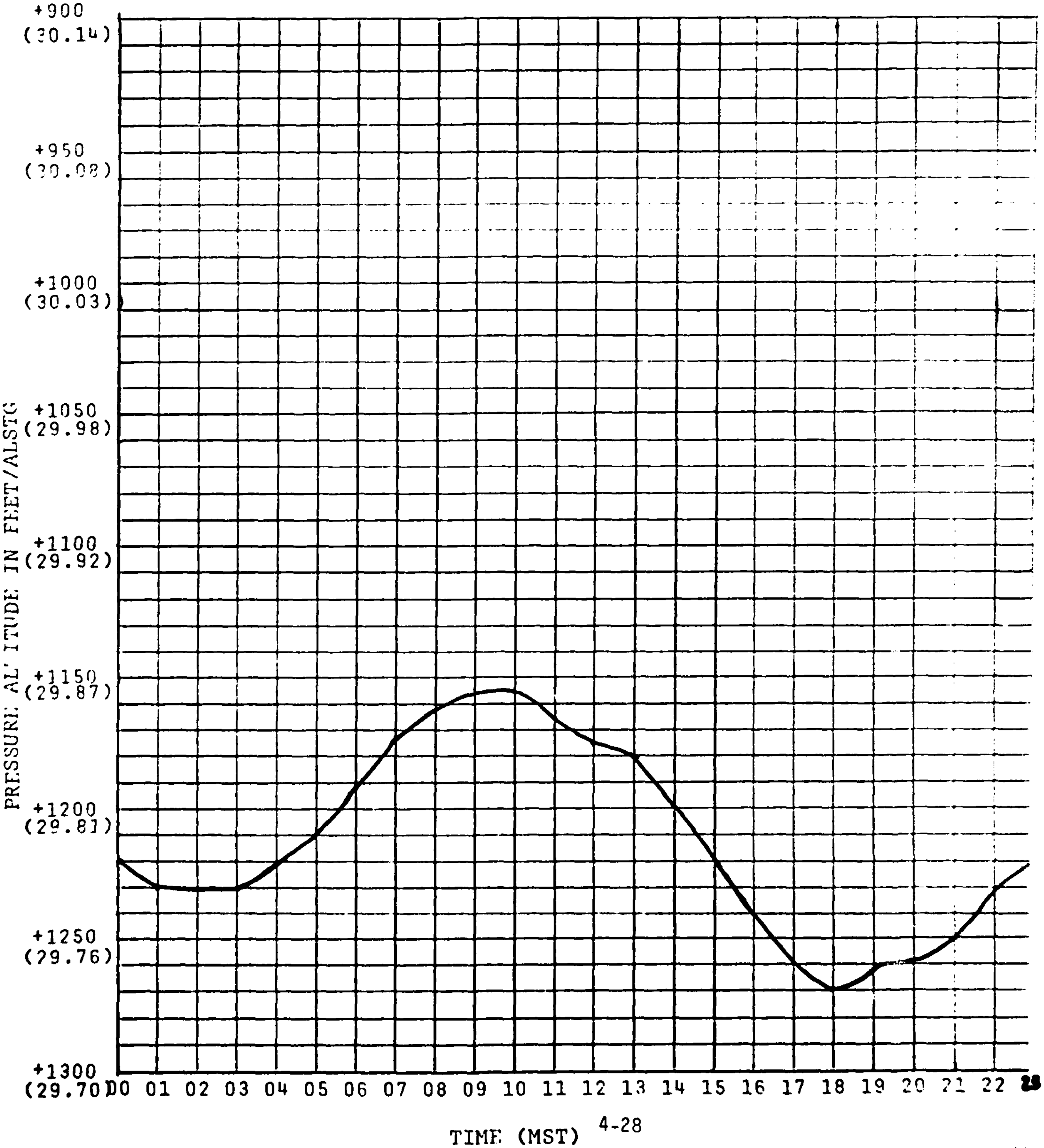
MEAN DIURNAL PRESSURE VARIATION FOR April.



MEAN DIURNAL PRESSURE VARIATION FOR May.



MEAN DIURNAL PRESSURE VARIATION FOR June



SYNOPSIS OF WEATHER NORMALS, MEANS AND EXTREMES

FLYING WEATHER:	JULY	AUGUST	SEPTEMBER
Below Ceiling 300'/Vis 1 mi.	0.3%	0.3%	0.1%
" " 2500'/Vis 3 mi.	0.6%	0.8%	0.3%
" " 5000'/Vis 5 mi.	1.0%	1.3%	0.7%
Visibility below 1 mi in blowing dust	0.3%	0.2%	T
SKY CONDITIONS:			
Clear	32.0%	[illegible]	71.4%
Scattered	33.4%	33.6%	17.9%
Broken or Overcast	34.6%	28.1%	10.7%
TEMPERATURES:			
Extreme Maximum	[illegible]°F	111°F	112°F
Average Daily Maximum	105	102	100
Mean Daily	91	89	85
Average Daily Minimum	77	76	69
Extreme Minimum	61	60	52
PRECIPITATION:			
Monthly Average	0.9 in.	1.5 in.	0.7 in
Average number of days with measurable precipitation	3.7	4.1	1.7
Average number of Thunder-storms per month	8.1	7.9	3.7

[illegible]:	[illegible]	[illegible]	[illegible]
Mean Speed	[illegible]	[illegible]	[illegible]
Prevailing Direction	[illegible]		
Direction of Max Speed	[illegible]		

[illegible]

[illegible]	[illegible] (σ)		[illegible] (σ)		[illegible] (σ)	
[illegible]	[illegible]	±5.2	[illegible]2.7°F	±1.9	[illegible]	[illegible]
0300–[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0600–[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

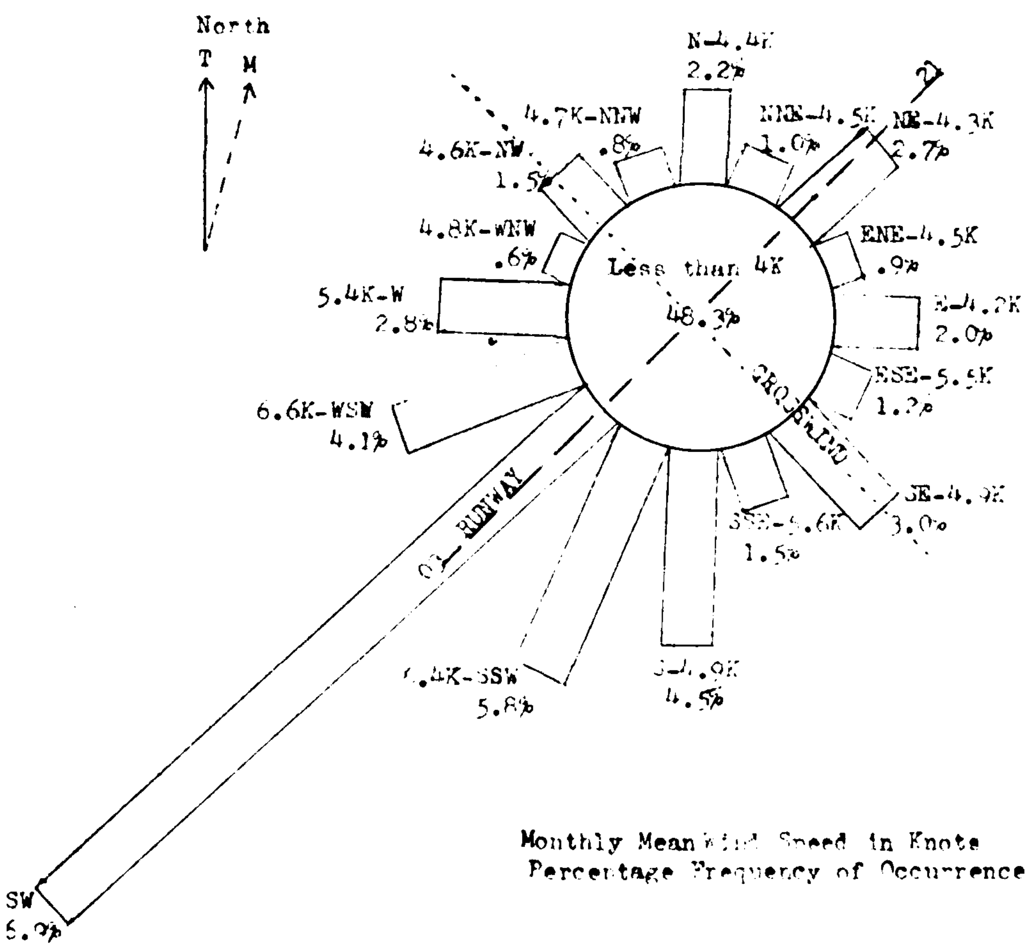
JULY

CEILING VS VISIBILITY

At or below indicated limits the following % of time.

TIME (MST)	300'/1 mi	500'/2 mi	1000'/2 mi	2500'/3 mi	5000'/5 mi	10000'/10 mi
01-03	0.1	0.2	0.2	0.3	0.3	6.6
04-06	0.2	0.2	0.2	0.2	0.9	5.0
07-09	0.0	0.0	0.1	0.3	0.4	4.9
10-12	0.0	0.0	0.0	0.2	0.4	4.2
13-15	0.0	0.0	0.0	0.1	0.6	2.3
16-18	0.2	0.3	0.3	0.6	1.1	2.0
19-21	1.1	1.6	1.6	1.9	2.8	10.0
22-24	0.5	0.7	0.7	0.7	2.0	10.7

SURFACE WINDS



Monthly Mean Wind Speed in Knots
Percentage Frequency of Occurrence

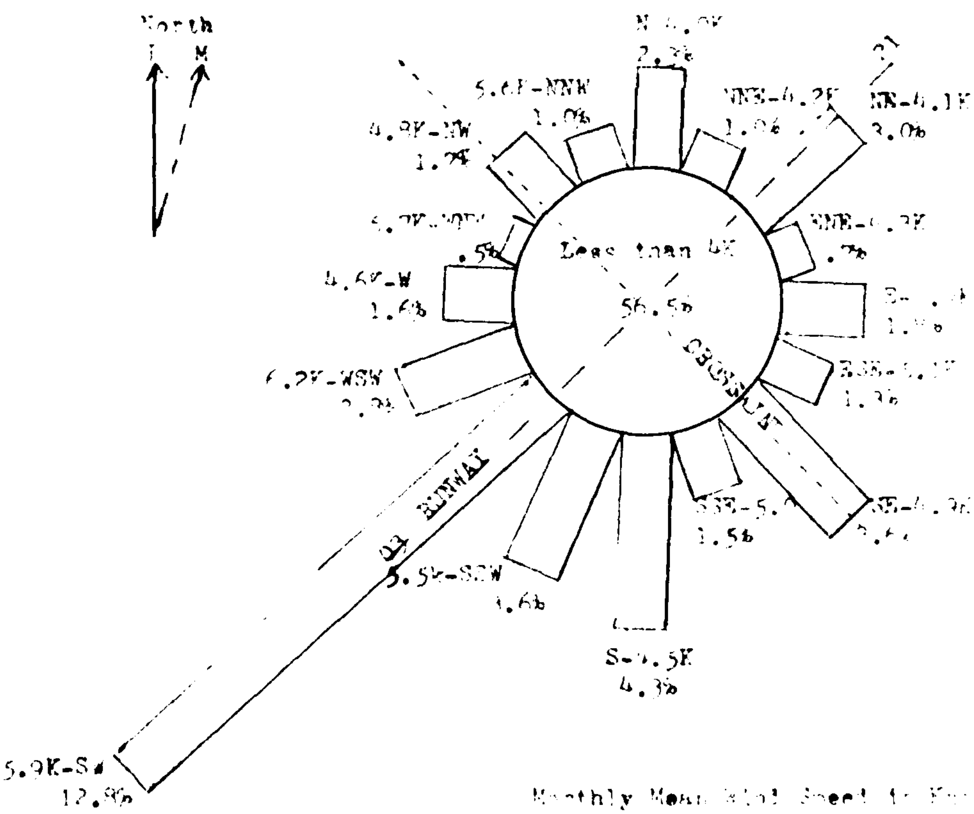
AUGUST

CEILING VS VISIBILITY

At or below indicated limits the following % of time.

TIME (MST)	300'/1 mi	500'/2 mi	1000'/2 mi	2500'/2 mi	5000'/5 mi	10000'/10 mi
01-03	0.0	0.3	0.5	0.5	1.0	6.2
04-06	0.0	0.2	0.2	0.6	1.2	5.1
07-09	0.0	0.1	0.1	0.6	1.1	5.0
10-12	0.0	0.3	0.4	0.7	1.6	4.3
13-15	0.2	0.3	0.5	0.6	1.3	4.5
16-18	0.4	0.6	0.9	1.1	1.6	4.0
19-21	[illegible]	[illegible]	1.0	1.1	[illegible]	8.6
22-24	0.3	0.7	0.7	1.2	1.7	[illegible]

SURFACE WINDS



Monthly Mean Wind Speed in Knots
Percentage Frequency of Occurrence

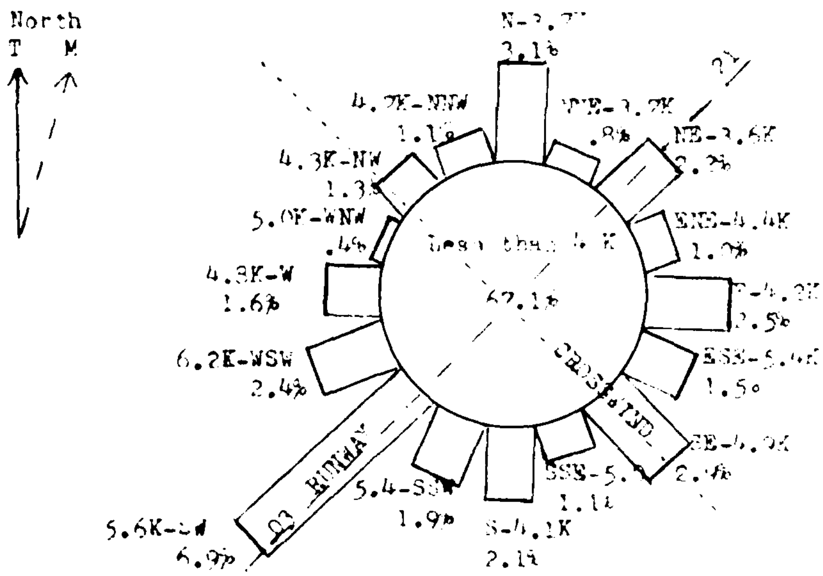
SEPTEMBER

CEILING VS VISIBILITY

At or below indicated limits the following % of time.

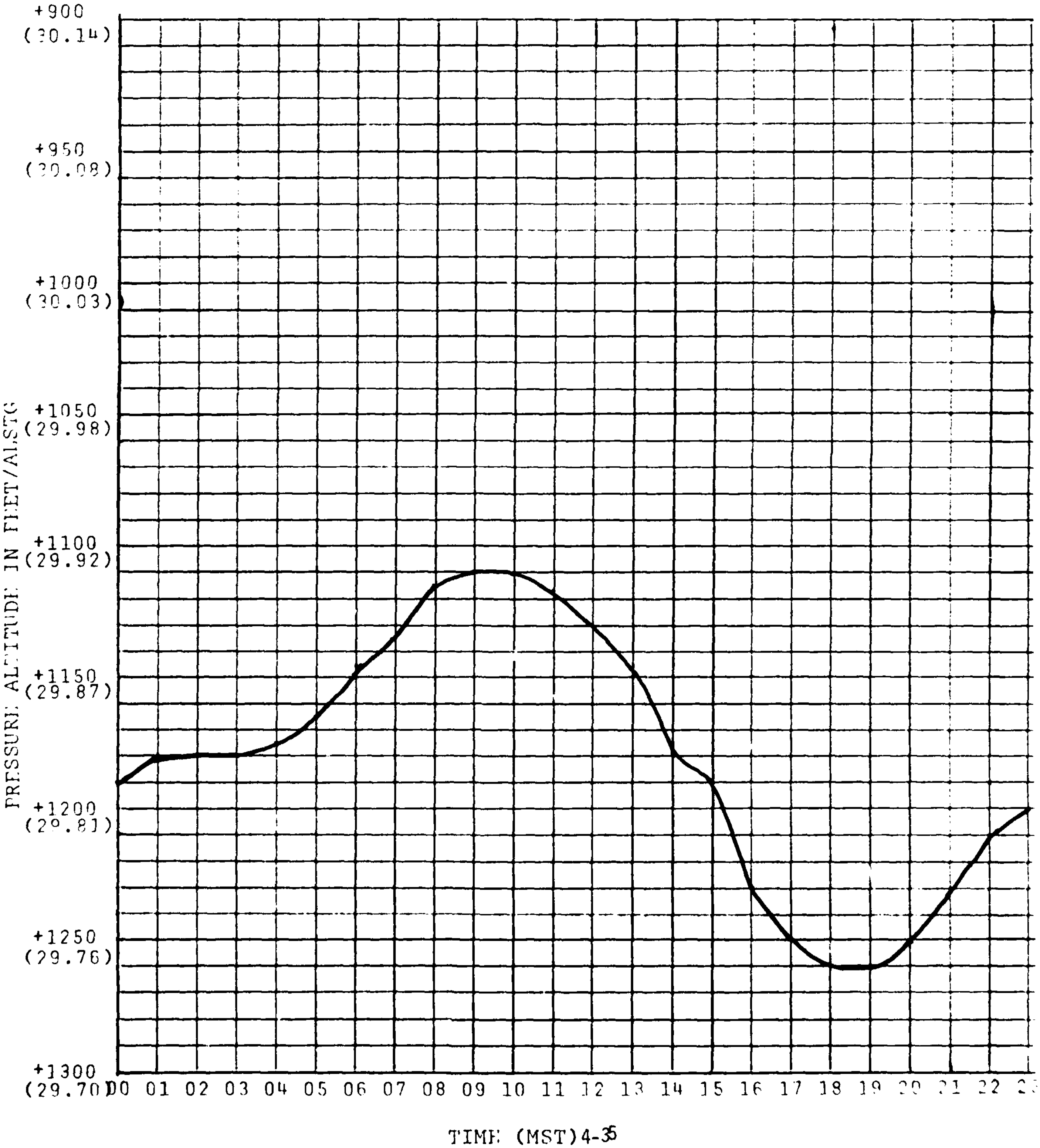
TIME (MST)	300'/1 mi	500'/2 mi	1000'/2 mi	2500'/3 mi	5000'/5 mi	10000'/10 mi
01-03	0.0	0.0	0.0	0.4	0.4	2.4
04-06	0.1	0.1	0.1	0.5	0.6	2.0
07-09	0.0	0.0	0.0	0.6	0.7	3.3
10-12	0.0	0.0	0.1	0.3	1.0	2.4
13-15	0.0	0.0	0.2	0.2	0.9	3.9
16-18	0.0	0.1	0.1	0.2	0.7	4.7
19-21	0.2	0.3	0.4	0.4	0.7	4.7
22-24	0.0	0.0	0.0	0.4	0.6	4.9

SURFACE WINDS

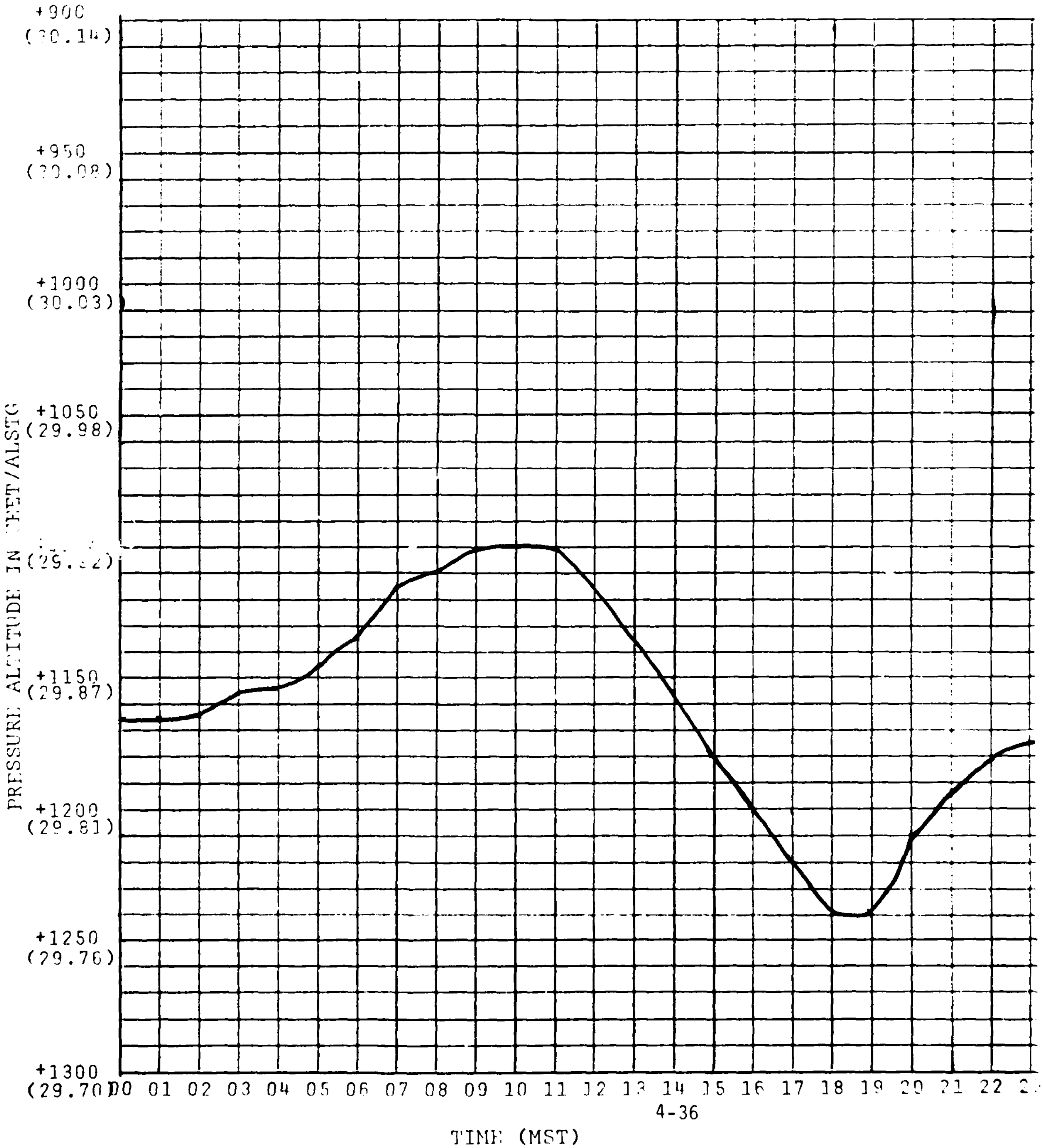


Monthly Mean Wind Speed in Knots
Percentage Frequency of Occurrence

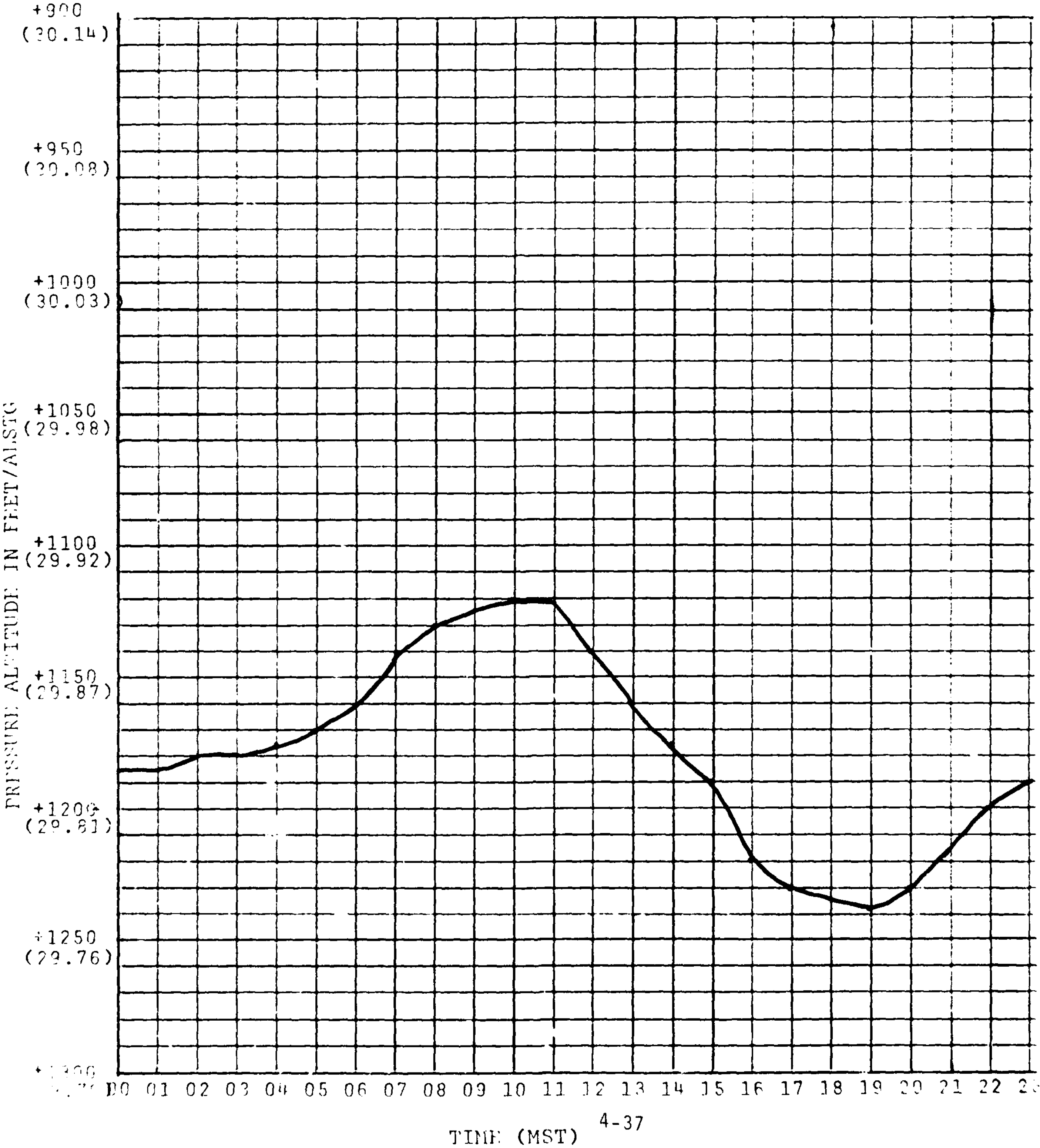
MEAN DIURNAL PRESSURE VARIATION FOR July .



MEAN DIURNAL PRESSURE VARIATION FOR August



MEAN DIURNAL PRESSURE VARIATION FOR September .



SYNOPSIS OF WEATHER NORMALS, MEANS AND EXTREMES

	OCT	NOV	DEC
FLYING WEATHER:			
Below Ceiling 300'/Vis 1 mi.	0.0%	0.0%	0.3%
" " 2500'/Vis 3 mi.	0.2%	0.6%	0.7%
" " 5000'/Vis 5 mi.	0.7%	2.1%	2.5%
Visibility below 1 mile in fog	0.0%	0.0%	0.2%
SKY CONDITION:			
Clear	63.9%	60.7%	51.3%
Scattered	20.1%	16.9%	18.4%
Broken or Overcast	16.1%	22.4%	30.3%
TEMPERATURES:			
Extreme Maximum	104	89	81
Average Daily Maximum	89	75	67
Mean Daily	73	60	53
Average Daily Minimum	57	44	39
Extreme Minimum	38	30	23
PRECIPITATION:			
Monthly Average	0.4 in.	0.5 in.	0.5 in.
Average number of days with measurable precipitation	1.8	2.0	2.9
Average number of thunderstorms per month	1.3	0.4	0.5

WIND:	OCT	NOV	DEC
Mean Speed	2.8	2.9	2.7
Prevailing Direction	N	N	N
Direction of Max Speed	SW	NW	NNE
Max Wind Gust	38	36	34

MONTHLY MEAN TEMPERATURES ALOFT

Degrees Celsius (Centigrade) to nearest degree

HEIGHT	OCT	NOV	DEC	DEVIATION
5,000 ft	19.5	12.9	9.4	± 9
10,000 ft	7.8	3.4	0.4	7
15,000 ft	- 2.2	- 6.0	-9.0	5
20,000 ft	-12.7	-16.4	-19.5	5
25,000 ft	-24.0	-28.0	-30.3	5
30,000 ft	-35.7	-39.0	-41.5	4
35,000 ft	-46.2	-45.5	-51.4	4
40,000 ft	-55.0	-57.1	-57.6	5

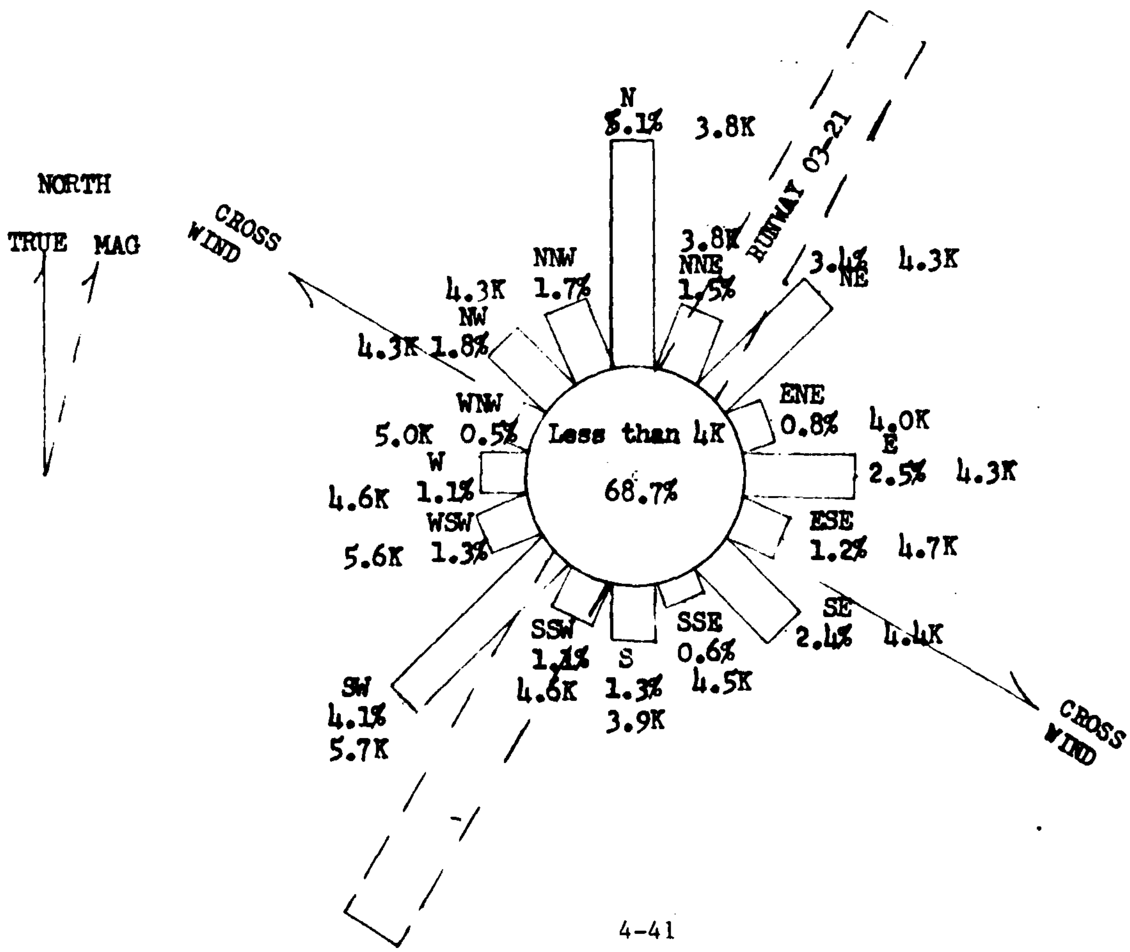
Deviation: 80% of the temperatures will be in the range plus/minus the deviation applied to the average temperature.

OCTOBER

CEILING VS VISIBILITY

At or below indicated limits the following % of time

TIME (MST)	300'/1 mi	500'/2 mi	1000'/2 mi	2500'/3 mi	5000'/5 mi	10000'/10 mi
01-03	0	0	0	0.1	0.6	3.2
04-06	0	0	0	0	0.6	3.3
07-09	0	0.1	0.1	0.2	1.2	5.3
10-12	0	0	0	0.5	1.2	5.1
13-15	0	0	0	0.1	0.5	4.4
16-18	0	0.1	0.1	0.3	0.4	4.2
19-21	0	0	0	0.3	0.5	4.6
22-24	0	0	0	0.1	0.4	2.9

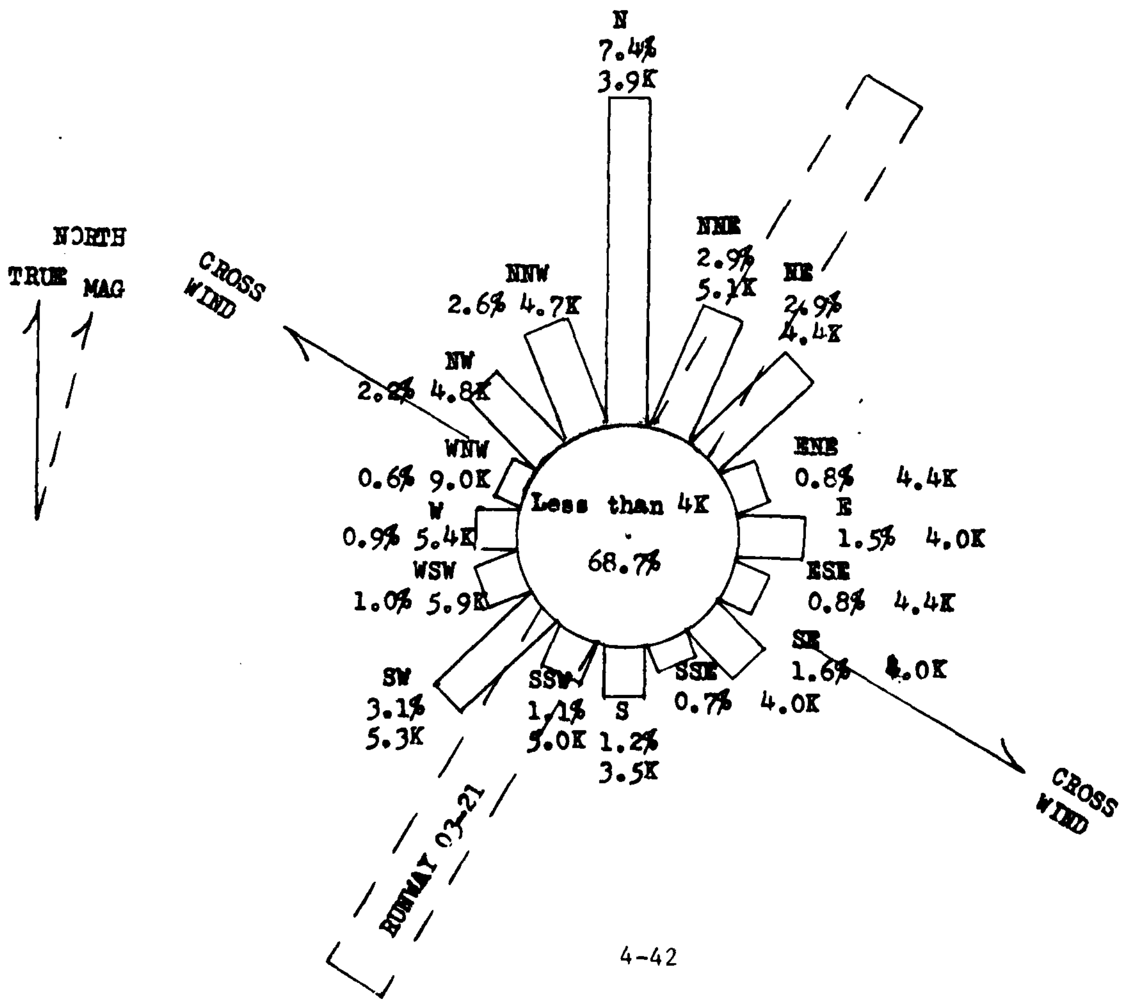


NOVEMBER

CEILING VS VISIBILITY

At or below indicated limits the following % of time

TIME (MST)	300'/1 mi	500'/2 mi	1000'/2 mi	2500'/3 mi	5000'/5 mi	10000'/10 mi
01-03	0	0	0	0.1	1.4	5.4
04-06	0	0	0	0.1	1.0	5.9
07-09	0	0	0	0.2	2.2	7.6
10-12	0	0.1	0.2	1.1	3.8	7.3
13-15	0.1	0.1	0.3	1.0	3.3	8.2
16-18	0.1	0.1	0.1	0.9	1.9	6.3
19-21	0	0.1	0.1	0.8	1.8	6.1
22-24	0	0	0	0.2	1.1	5.4

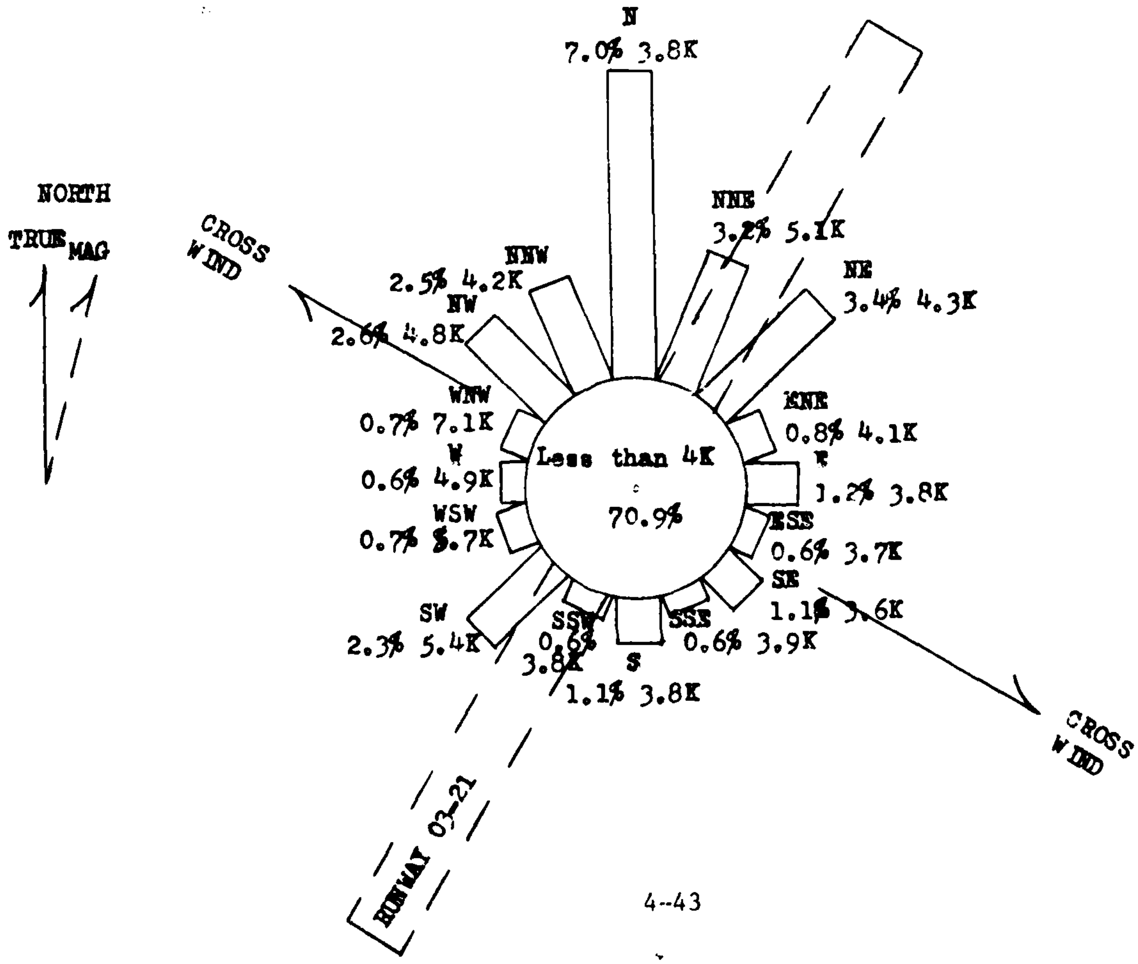


DECEMBER

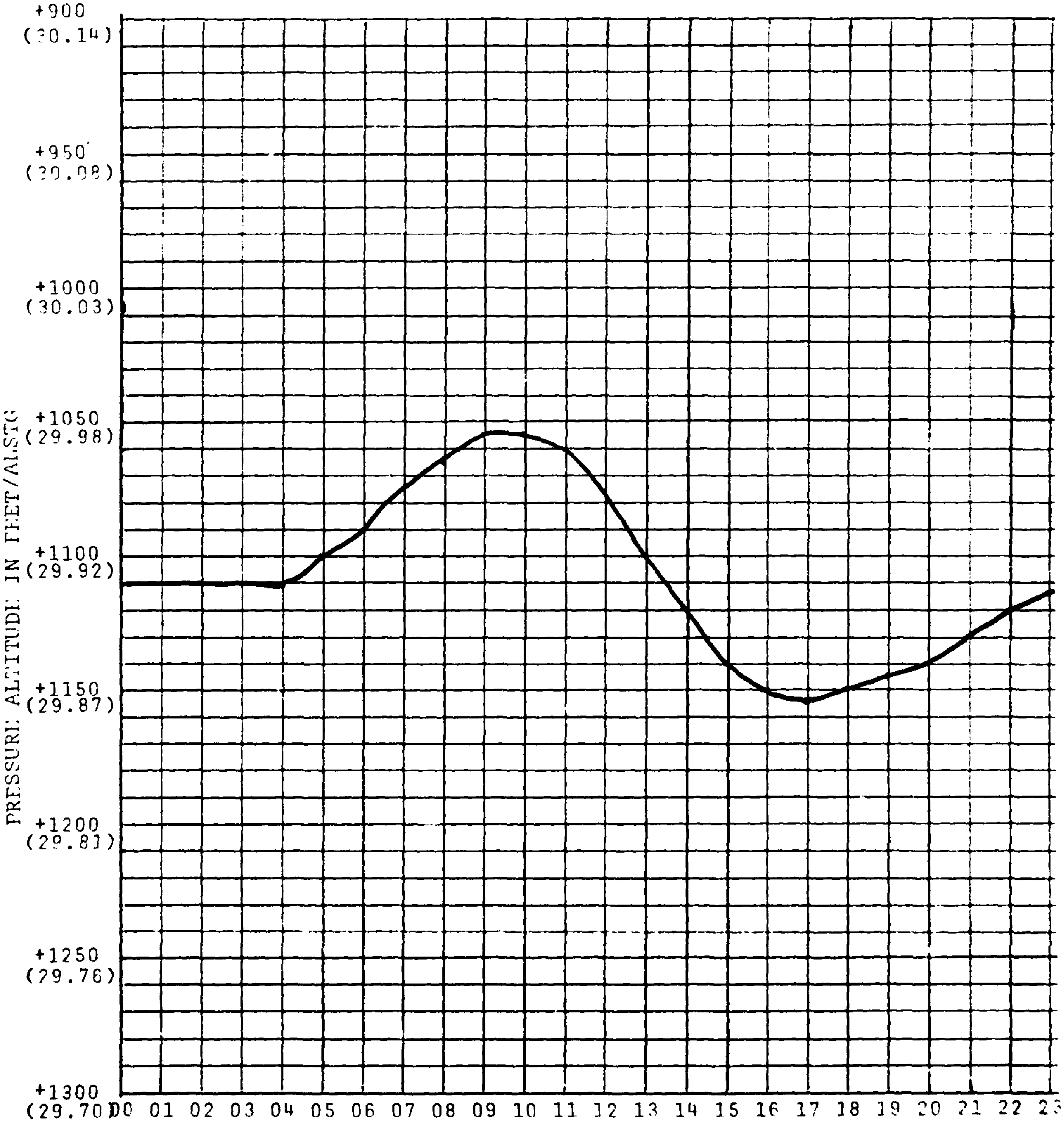
CEILING VS VISIBILITY

At or below indicated limits the following % of time

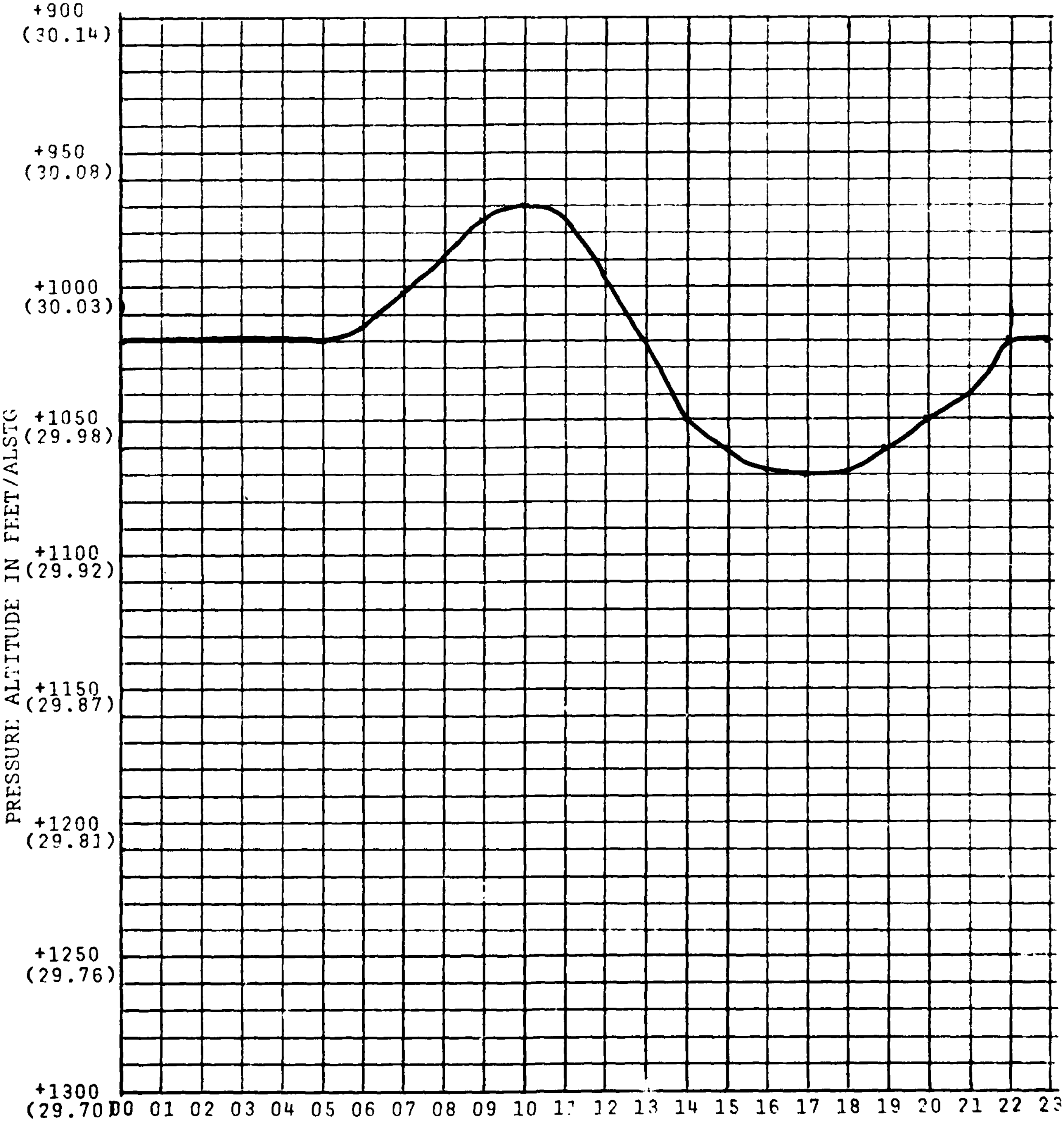
TIME (MST)	300'/1 mi	500'/2 mi	1000'/2 mi	2500'/3 mi	5000'/5 mi	10000'/10 mi
01-03	0.3	0.3	0.3	0.3	1.1	6.1
04-06	0.6	0.6	0.6	0.9	1.9	7.1
07-09	0.5	0.7	0.7	1.0	2.5	10.0
10-12	0.2	0.2	0.2	0.9	3.7	10.8
13-15	0	0	0	0.5	2.7	10.5
16-18	0	0	0.2	0.6	3.3	11.6
19-21	0	0	0	0.2	2.5	10.4
22-24	0	0	0	0	1.6	6.7



MEAN DIURNAL PRESSURE VARIATION FOR OCTOBER

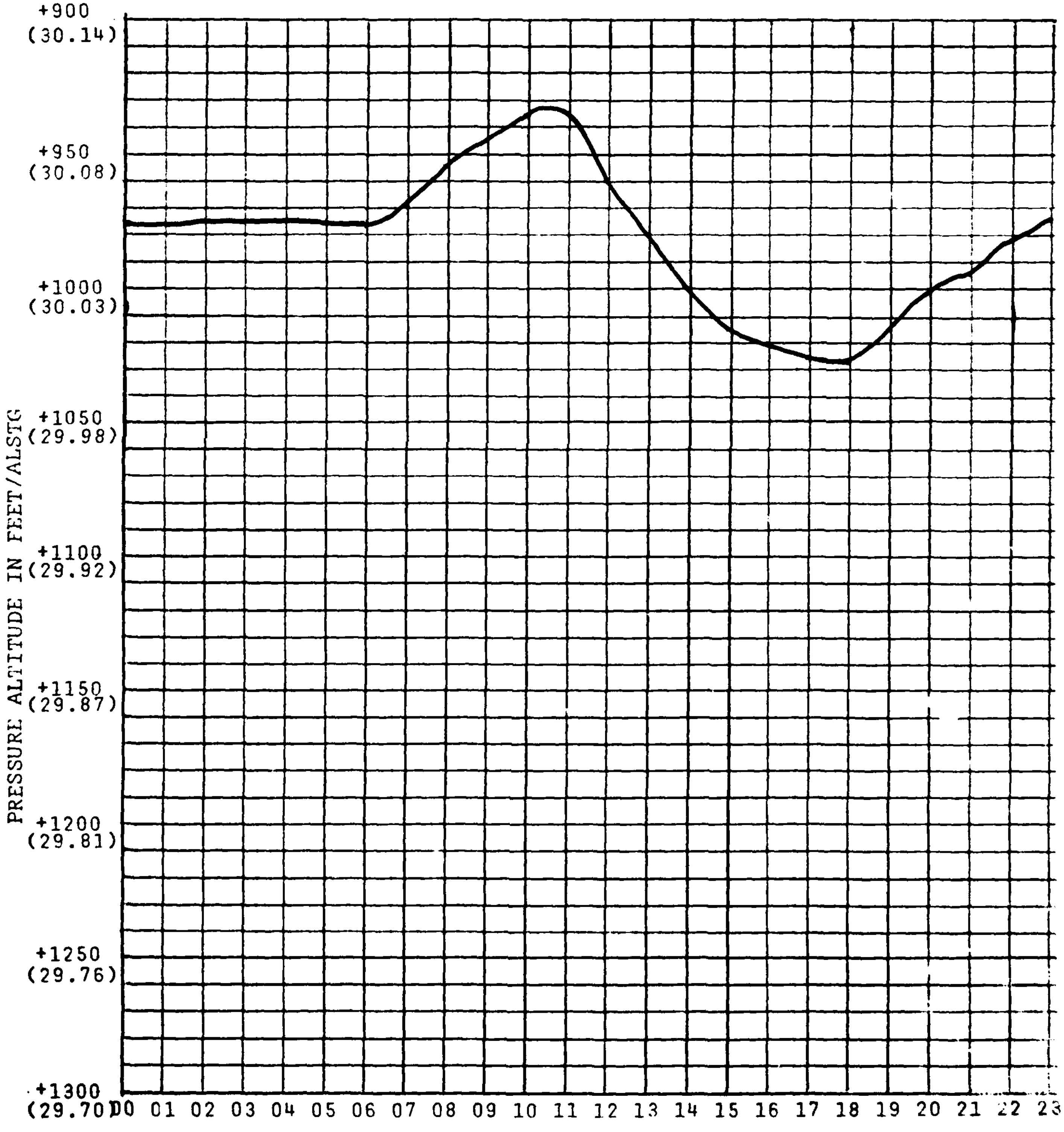


MEAN DIURNAL PRESSURE VARIATION FOR November



TIME (MST)

MEAN DIURNAL PRESSURE VARIATION FOR December.



Appendix 1

Operationally Significant Forecast Problems

Section 1: Luke AFB

Det 15, 25WS, Luke AFB, Arizona

30 April 1980

OPERATIONALLY SIGNIFICANT FORECAST PROBLEMS

1. Thunderstorms and Associated Blowing Dust.

Forecasting the occurrence of summer thunderstorms (normally late June to early September) and associated blowing dust is a significant problem for Det 15. The main problem is one of timing and the severity of the visibility restriction. Thunderstorms will normally occur in the late afternoon or late evening depending upon their point of origin and the prevailing flow. Exact time of arrival at Luke, however, is difficult to forecast and is basically dependent upon use of the radar to establish speed and direction of movement and consequent time of arrival. The problem is further complicated by the steering/deflecting effects produced by surrounding mountains. Suspected reasoning for the varying arrival times and mountain steering influences is discussed in Chapter 1 section 1-3. Blowing dust, when it occurs, is normally associated with the leading edge of the down-rush wind (the gust front). Therefore, the thunderstorm's proximity to Luke, the strength of the down-rush, and the distance by which the gust front precedes the storm are all variables that must be considered. Further complicating the problem are the local soil conditions (freshly plowed fields and/or moist vs dry soil) and the situation where a thunderstorm generated dust storm may strike Luke long after the generating thunderstorm has dissipated. Again, forecasting arrival of the dust storm is tenuous at best and dependent upon maintaining a close weather watch outside the station and a met watch of conditions at other valley reporting stations. These conditions too are discussed in Chapter 1 section 1-3. SPECIFIC PROBLEM: To forecast the occurrence and timing of summer thunderstorms which give blowing dust and restricted visibility to three miles or less at Luke AFB. Timing for the occurrence needs to be accurate to within one hour in advance. ACTION TAKEN TO RESOLVE THE PROBLEM: A local thunderstorm study is used daily during the summer months. Verification results for thunderstorm occurrence in the valley is good; however, the study does not give timing, nor does it do as well for thunderstroms in the immediate vicinity of Luke. As mentioned previously, radar, surface reports, and PIREPS are used to refine the timing and severity of thunderstorms and associated blowing dust.

Section 2: Gila Bend

AD-A098 445 WEATHER WING (5TH) LANGLEY AFB VA F/G 4/2
TERMINAL FORECAST REFERENCE NOTEBOOK (TFRN) FOR LUKE AFB, ARIZO--ETC(U)
JUN 80
UNCLASSIFIED 5WW/TFRN-80/002 SBIE-AD-E850 039 NL

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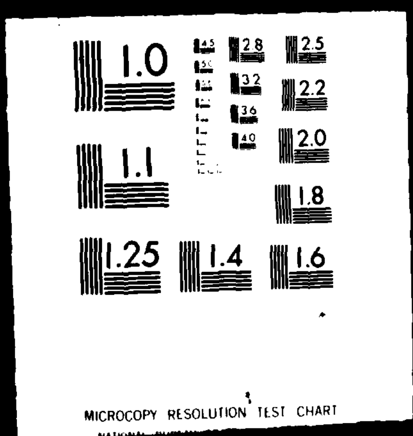

No Studies ar

Appendix 2

e currently approved for this Unit as of 1 May 1980

Appendix 3

RULES-OF-THUMB

:s-of-Thumb for this unit as of 1 May 1980

Appendix 4

Special synoptic studies and references