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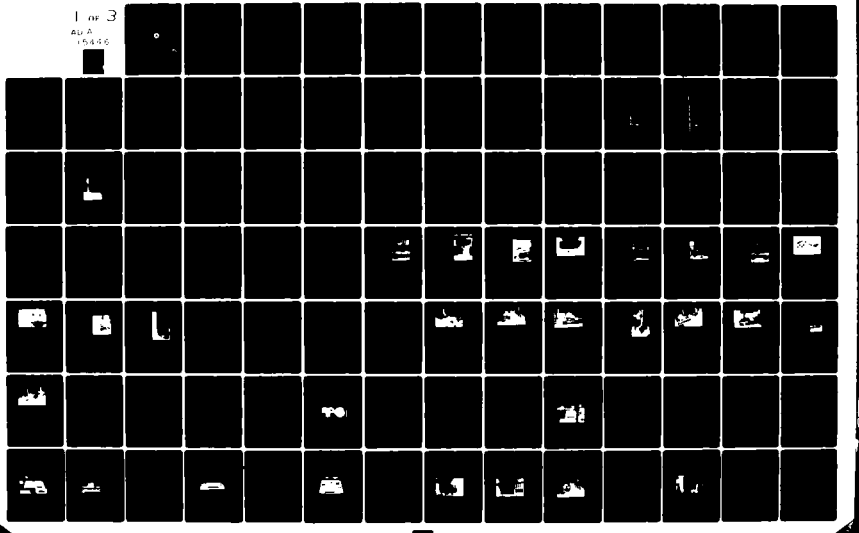

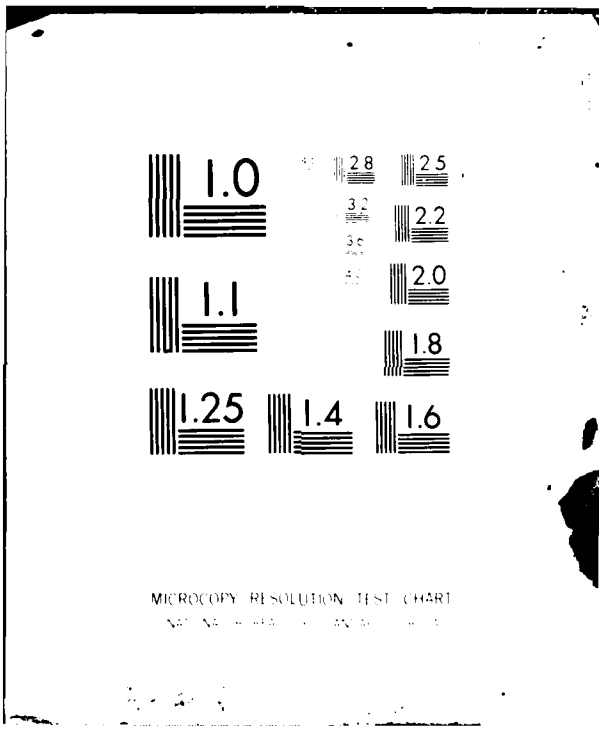
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REPORT NO. FAA-RD-81-42

ALBUQUERQUE AIR TRAFFIC CONTROL TOWER OPERATIONS ANALYSIS

M.Stephen Huntley Jr.
R.L. Mumford

U.S.DEPARTMENT OF TRANSPORTATION
Research and Special Programs Administration
Transportation Systems Center
Cambridge MA 02142

FINAL REPORT
AUGUST 1981

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16. Abstract

This report provides a description of the non-surveillance aspects of the FAA air traffic control facility operation at Albuquerque International Airport from the air traffic controller's point of view. It includes photographs of all controller consoles with all equipment and posted paper identified; descriptions of weather, NOTAM, flight data, and equipment status distribution systems; and controller requirements for this information. In addition the terminal airspace, major arrival and departure routes, aircraft mix, and hourly operation activity levels are briefly described.

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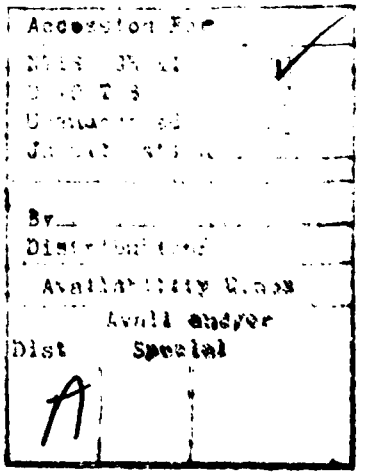
PREFACE

The weather, flight data, and equipment status aspects of controller operations at the Albuquerque Air Traffic Control Tower are described in this report. The description is based upon data collected through direct observation, photographs, and interviews with tower personnel. The study was sponsored by the FAA Systems Research and Development Service and was conducted in the Albuquerque Tower Cab and TRACON during February and March of 1980.

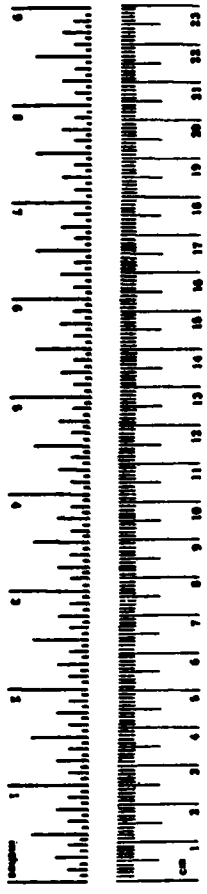
This work was completed with the cooperation of the Southwestern Region of the FAA, and the Air Traffic Service (AAT) Division of that region in particular. In addition special thanks are due to Donald Beswick, the Chief of the Albuquerque Tower, and to Robert Turner, the Tower Operations Officer, for their close and valuable support in the collection and interpretation of the information presented herein.



METRIC CONVERSION FACTORS

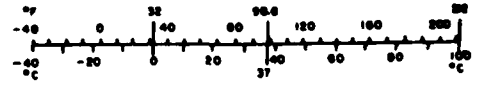
Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
in	inches	2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
		AREA		
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
		MASS (weight)		
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
		VOLUME		
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
		TEMPERATURE (exact)		
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C



Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
		AREA		
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
		MASS (weight)		
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
		VOLUME		
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
		TEMPERATURE (exact)		
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



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1. INTRODUCTION

The present report is the third of a series of 8 reports which document and describe the non-surveillance functions and duties of tower controllers at 8 selected air traffic control towers. The series includes two Level V towers: Boston and Atlanta; two Level IV towers: Minneapolis, and El Toro; and four Level III towers: Albuquerque, Buffalo, Dayton and Wichita.

The series of studies is conducted to provide operational information which must be considered in the design and local application of the Terminal Information Display System (TIDS), the Consolidated Cab Display (CCD) and the FAA/SRD's continuing work on Advanced Tower Design. TIDS is a computer-based system driving two independent display subsystems; the flight data display (FFD) and the consolidated cab display (CCD). The FDD equipment will replace flight strips and the ageing mechanical printers used to generate them. The CCD will consolidate much of the weather sensor data (e.g., runway visual range, centerfield wind), the equipment status indicators for airport NAVAIDs (e.g., instrument landing system, approach light system), and field lighting controls for the approach lighting and runway edge lights. Displays and controls for both subsystems will be provided for each control position in the cab and TRACON and will be designed and displayed according to the specific operational needs of the controllers at each position.

The present study series is designed to identify the operational requirements that the different towers have in common as well as the unique aspects of each tower that should be accommodated by the system. The study is not concerned with the engineering or operating aspects of tower and field equipment nor does it include a critique of current systems. Its main emphasis is how existing equipment is currently used.

Albuquerque ATCT was selected as one of the two Level III airports to be studied because it represents southwestern Class III towers and because a relatively large percentage of its operations are military. Furthermore, no important changes to the physical or operational aspects of the tower are anticipated in the near future.

The information for this report was obtained by (a) examining existing written material, (b) photographing controller work spaces, (c) observing controllers at work, and (d) interviewing journeyman controllers and tower management staff.

The written material examined in this study included Jeppesen Air Manuals, tower SOPs and Letters of Agreement, and a day's sample of tower flight strips. Where possible, the information in this material was verified through observations of controllers at work and interviews with tower personnel.

Photographs were taken of all controller consoles, posted notices and selected control panels. These photos were used as subject matter for the interviews and serve to document the physical aspects of the tower as it existed during the study. To avoid interfering in tower operations, all photographs of TRACON consoles were taken during the midshift. Photographs of Cab equipment and consoles were taken during the day to take advantage of natural light. A total of four controllers were interviewed for information on tower equipment, their informational needs, and tower operational procedures. Since different subject areas were discussed with different controllers, much of the information obtained was based upon the knowledge of a single controller, and so some errors are possible. However, when the interviewer identified information as inconsistent with tower SOPs or practices at other towers, it was verified in discussions with tower management personnel.

To supplement the controller interviews, the actions of controllers at work regarding their use of equipment and handling of flight strips was observed in the TRACON and Cab during peak and slack traffic periods. Over 30 hours of observation time was spent in these two work spaces for this study.

The results of the operations analysis are presented in Sections 2 through 6 of the report. An overview of the Albuquerque Terminal Area TRACON and Albuquerque Tower Cab operations is provided in Section 2. This section includes a map of the airport, a chart of the terminal area, the major runway configurations and approach and departure routes used, drawings of the Cab and TRACON floor plans, definition of control positions, and the location of each control position in the Cab and TRACON. In addition, a photograph of every controller work station is presented on which every display and control device is identified. The use of equipment providing information on weather and the status of field NAVAIDs and the control of field lighting to be incorporated in the CCD is presented in Section 3. A photograph, locations in the Cab and TRACON, users, and the condition of use are presented in this section for each device. The sources and controller requirements for information on operational status of tower and NAVAID equipment are presented in Section 4 with discussions of the use of NOTAMs and other procedures for determining and disseminating status information on this equipment and the means of controlling this dissemination. The operation of the current flight data system is presented in Section 5. The location of flight data equipment in the tower is shown on floor plans of the Cab and TRACON; the format and form of selected categories of printed and handwritten flight strips and hand notations used with these strips is presented and discussed and the flow and arrangement of flight strips from console to console throughout the Cab and TRACON is presented in this section. The tower weather information system is presented in Section 6. This presentation covers the types of weather information received and the formats of weather messages, sources of the information and the procedures and means by which weather information is disseminated from the tower.

2. ALBUQUERQUE AIR TRAFFIC CONTROL SYSTEM

An overview of the Albuquerque (ABQ) Air Traffic Control System is presented in this section and includes:

1) A description of the general tower setting focusing on factors which affect the air traffic control function such as the location and nature of the airport facility, regional terrain, land use and climate.

2) A description of the specific air traffic control environment including the runway and taxiway layout, tower airspace, and radar services provided the typical approach and departure profiles.

3) A quantitative and qualitative description of the aircraft operations handled by the Albuquerque tower.

4) A description of the Cab/TRACON layouts, positions, staffing and duties.

2.1 GENERAL SETTING

The Albuquerque air traffic control tower is located at Albuquerque International Airport, a major regional aviation center in the southwestern United States. The airport is located in the southeastern section of the city (Figure 2-1) and is situated on a plateau 5,352 feet (MSL) in elevation. The terrain to the west slopes down towards the Rio Grande (approximately three miles) and the more historical section of the city of Albuquerque. To the northeast and southeast there are mountain crests (Sandia Chain) which rise to approximately 10,600 feet (MSL) and 8,200 feet (MSL) respectively. To the north of the airport lies the more modern residential and commercial areas. The dense population in this area is a major determinant of the air traffic control noise abatement procedures at Albuquerque. To the direct south, the area is sparsely populated and is largely desert terrain. Several restricted military flying areas are located south of Albuquerque towards the White Sands area and Las Cruces.

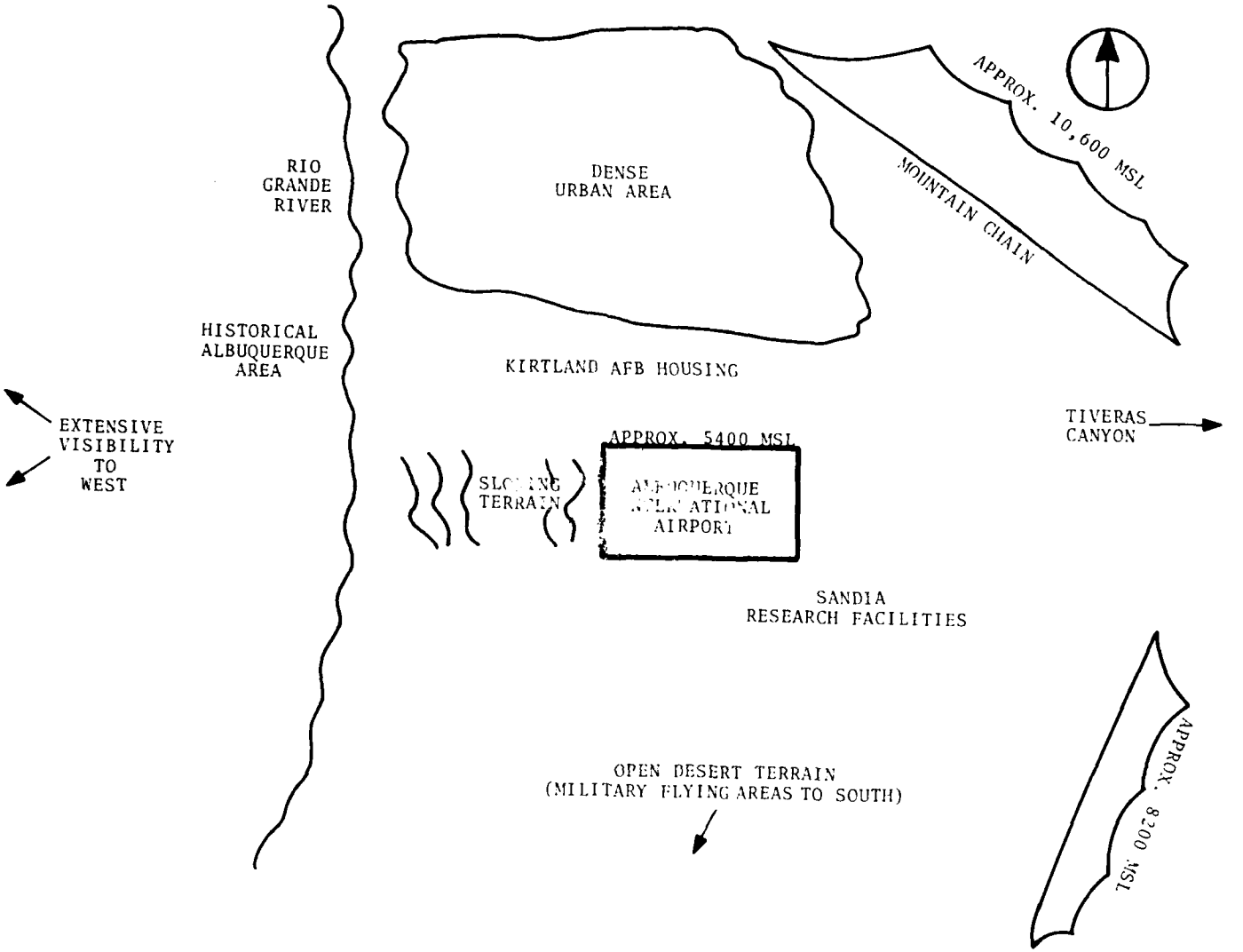


FIGURE 2-1. TERRAIN CHARACTERISTICS AT ALBUQUERQUE

The local climate is also a major influence on Albuquerque tower operations. The weather pattern is generally excellent relative to VFR conditions. Clear skies and the flat terrain to the south, west and northwest generally provide extensive visibility for both pilots and controllers. However, the local weather can adversely influence aircraft operations during periods of intense summer heat. High temperatures combine with the relatively high airfield elevation to decrease the thrust generation of many high performance and heavy aircraft.

Aircraft operations at Albuquerque are also influenced by the mix of users of the airport facility. The airport complex contains a main passenger terminal, a general aviation area and extensive military facilities for Kirtland Air Force Base, a ready operational jet fighter unit of the New Mexico Air National Guard, a helicopter training wing and transient military aircraft (Figure 2-2).

Furthermore, the aircraft operations at Albuquerque are occasionally influenced by weapons-related research and testing conducted at the adjacent Sandia Research Laboratory facilities. Actual testing, aircraft towing and convoy movements on the perimeter of the airport require coordination with the Albuquerque tower.

2.2 AIR TRAFFIC CONTROL ENVIRONMENT

2.2.1 Runways and Taxiways

The runway layout at Albuquerque (Figure 2-3) is centered on the primary east-west runway (08-26); there is also a north-south primary runway (17-35) and two criss-crossing secondary runways on northeast-southwest (03-21) and northwest-southeast (12-30) alignments respectively. The taxiway network is characterized by numerous runway crossings and several incomplete sections[1] which

[1] West side of runway 17, southside of runway 26 (east end) and limited secondary runway taxiways.

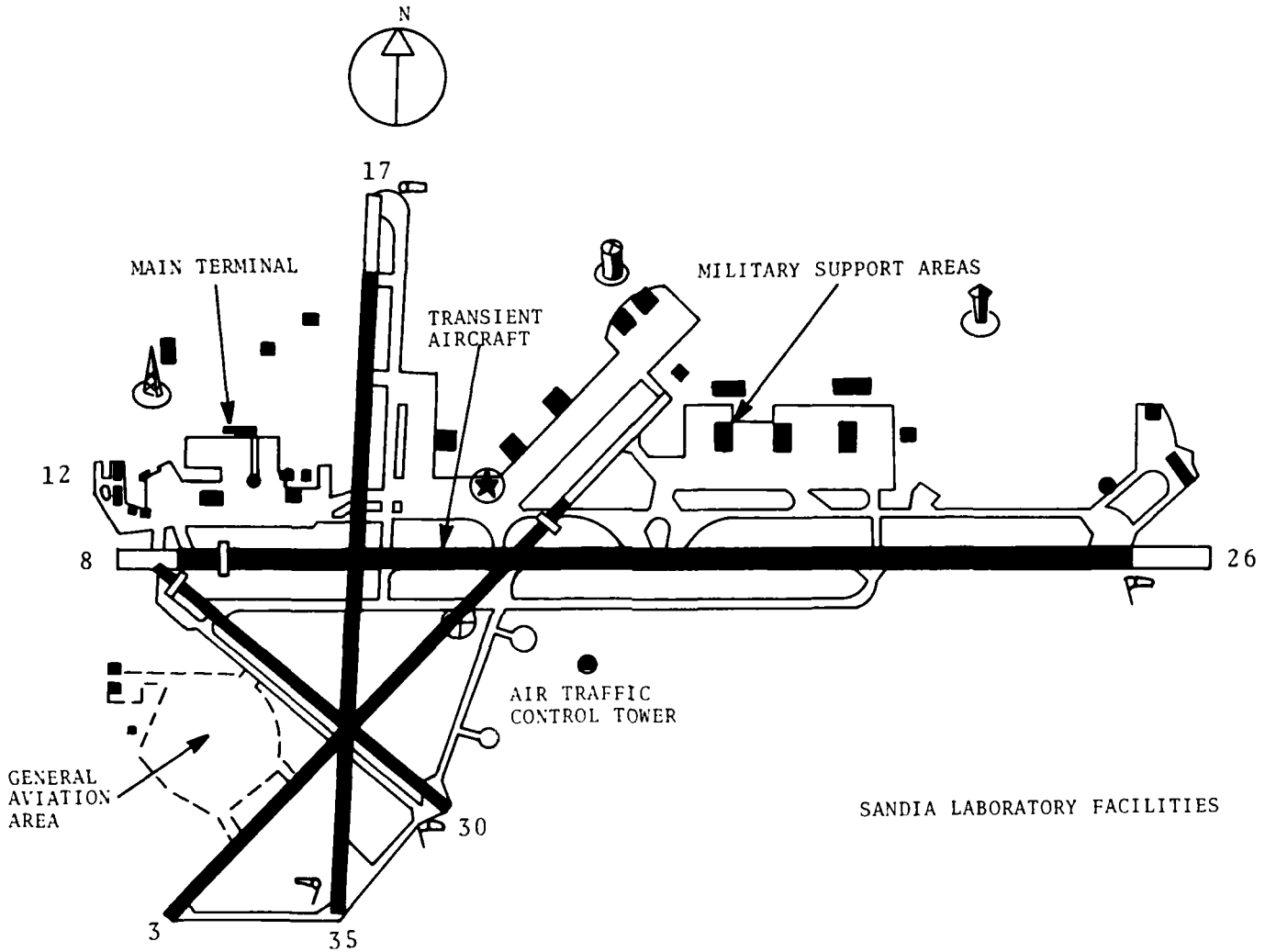


FIGURE 2-2. ALBUQUERQUE INTERNATIONAL AIRPORT FACILITIES

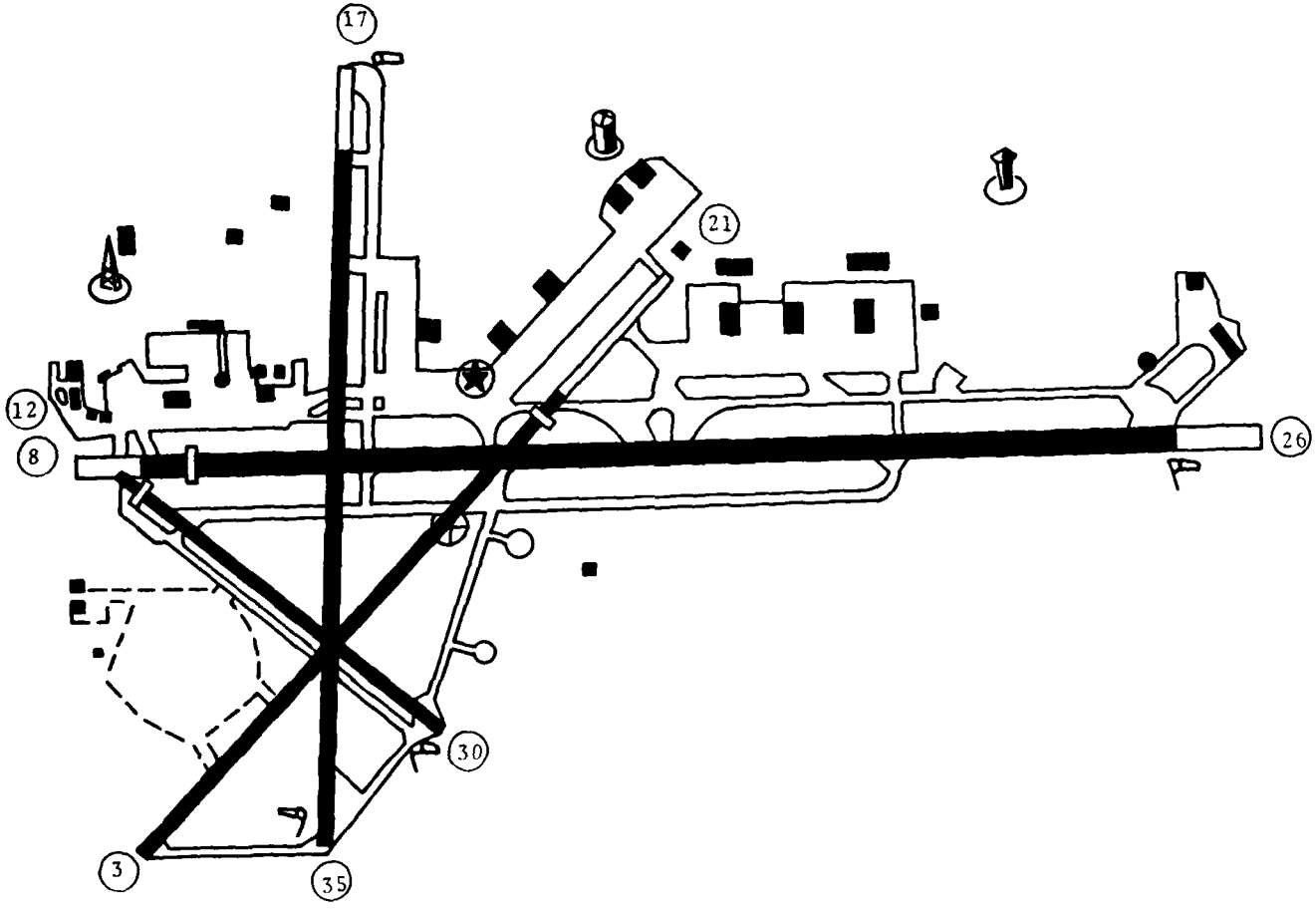


FIGURE 2-3. ALBUQUERQUE RUNWAY AND TAXIWAY MAP

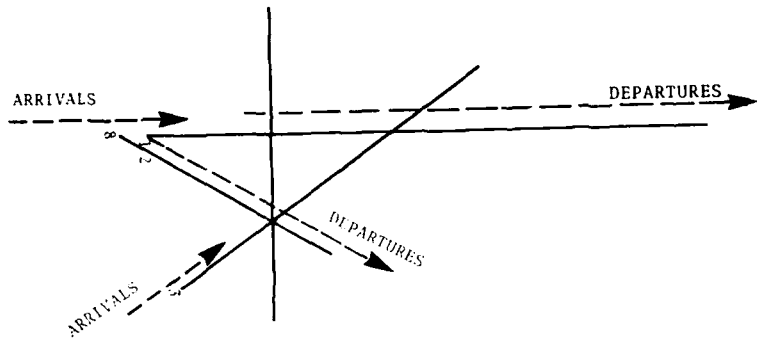
complicate aircraft operations to varying degrees depending upon the runway configuration in use. In general, the layout of the runways and taxiways at Albuquerque requires a high level of coordination among controllers to handle departing, landing, and taxiing aircraft.

The three runway configurations used at Albuquerque and the approximate percentage of time each is used is presented in Figure 2-4. Configuration 1 is the most efficient. Departures are expedited by minimizing taxi time and distance to the primary (08) and secondary (12) runway. Arriving aircraft are also handled more efficiently from the west due to the absence of the mountainous terrain and the availability of navigation radio aids to assist the aircraft in its approach; the ABQ VORTAC is located 9.8 miles west of the airport and the ILS/DME equipment is located to serve runway 08.

When the primary runway is 26 (25 percent of the time), operations are less efficient due to more extensive aircraft taxiing and the necessity of controlling aircraft arrivals closer to the mountain chains. The north-south primary runway is only used when made necessary by wind conditions or runway repairs on 08-26. Use of this configuration eliminates the use of a secondary runway and requires many taxiing aircraft to cross the primary runway thus resulting in increased controller coordination.

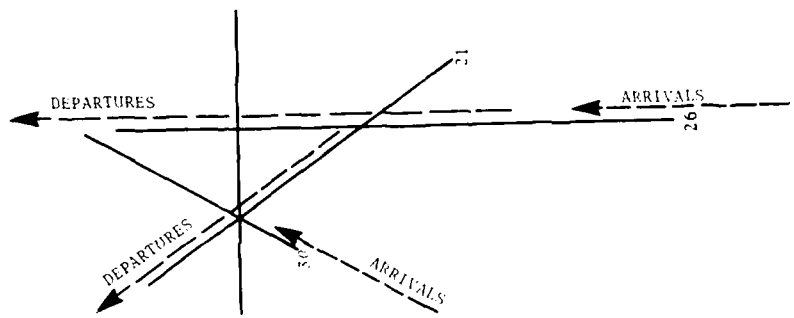
Increased controller coordination is also required to handle special military aircraft taxi requirements. Following a practice gunnery flight, the aircraft (A-7D) of the New Mexico Air National Guard are required to clear their firing chambers at a designated location south of the primary runway (08-26); this action requires these aircraft to subsequently cross the same runway to return to their squadron area.

Another complicating factor of the military for the air traffic controller is the overhead approach that they often make. In this maneuver, jet aircraft approach at high speed and fly the center line of the runway at 7,000 to 7,500 feet (MSL). At approximately the mid-runway point, the aircraft breaks off to reverse



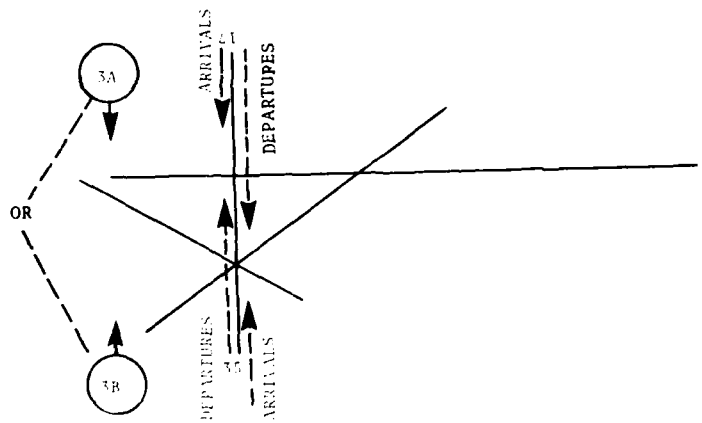
CONFIGURATION: 1
PERCENT USE: 70%

FLIGHTS	PRIMARY	SECONDARY
ARRIVALS	8	3
DEPARTURES	8	12



CONFIGURATION: 2
PERCENT USE: 25%

FLIGHTS	PRIMARY	SECONDARY
ARRIVALS	26	30
DEPARTURES	26	21



CONFIGURATION: 3A OR 3B
PERCENT USE: 5%

FLIGHTS	PRIMARY	SECONDARY
ARRIVALS	3A 17 3B 35	NONE
DEPARTURES	3A 17 3B 35	NONE

FIGURE 2-4. ALBUQUERQUE RUNWAY CONFIGURATIONS AND USAGE

direction and flies a downwind leg paralleling the runway. This is followed by a descending inward turn on to "base" and "final". These overhead approaches are attractive to the military in terms of both maintaining tradition and in efficiently landing formations of aircraft but are difficult to bring in mixed with the slower commercial traffic. Aircraft can break off one-by-one and land in sequence. However, the speed of descent and approach of these planes still makes sequencing difficult.

In spite of the problems posed by these approaches, ABQ controllers continue to service them. This cooperation is motivated by the desire to maintain goodwill with the military and, secondly, to attempt to land these aircraft in the most efficient manner. A formation flight has one ARTS data block; additional aircraft in the formation are required to fly within a certain distance of the flight leader. If a controller elects to break up a formation flight, he must then service each aircraft separately to the appropriate IFR or VFR Stage III standards.

2.2.2 Albuquerque Tower: Airspace and Radar Services

The Albuquerque air traffic control tower (Figure 2-5) is located just south of the primary east-west runway (Figure 2-2). The tower facility houses a TRACON with ARTS III equipment and a two level Cab with only the top level (an addition) equipped and used for air traffic control purposes. The airport surveillance radar (ASR) is located just south of the tower location.

The airspace serviced by the ABQ tower is presented in Figure 2-6 and is summarized in Table 2-1. There are five separate airspace areas, each designed to meet specific operational requirements.

The ABQ tower officially provides air traffic control service within the "Albuquerque Terminal Area". This area encompasses a 25 to 35 mile radius of the ASR at an altitude of 17,000 feet (MSL) and below. This area is established by Letter of Agreement with the Albuquerque Air Route Traffic Control Center (ARTCC). At the terminal area boundary, the ARTCC accepts and hands off IFR

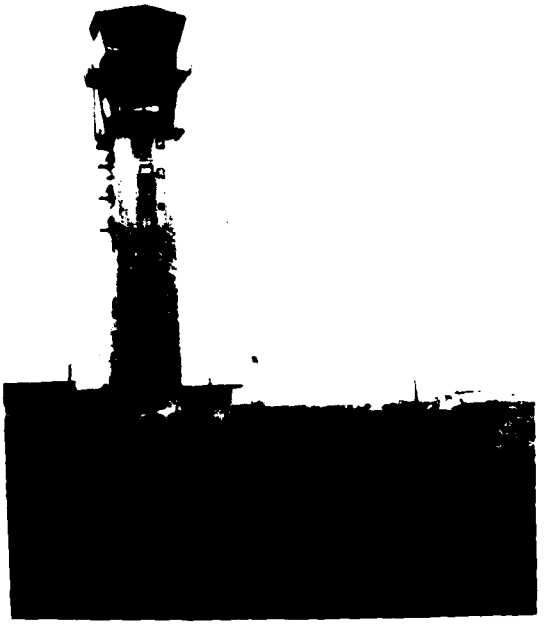


FIGURE 2-5. ALBUQUERQUE AIR TRAFFIC CONTROL TOWER

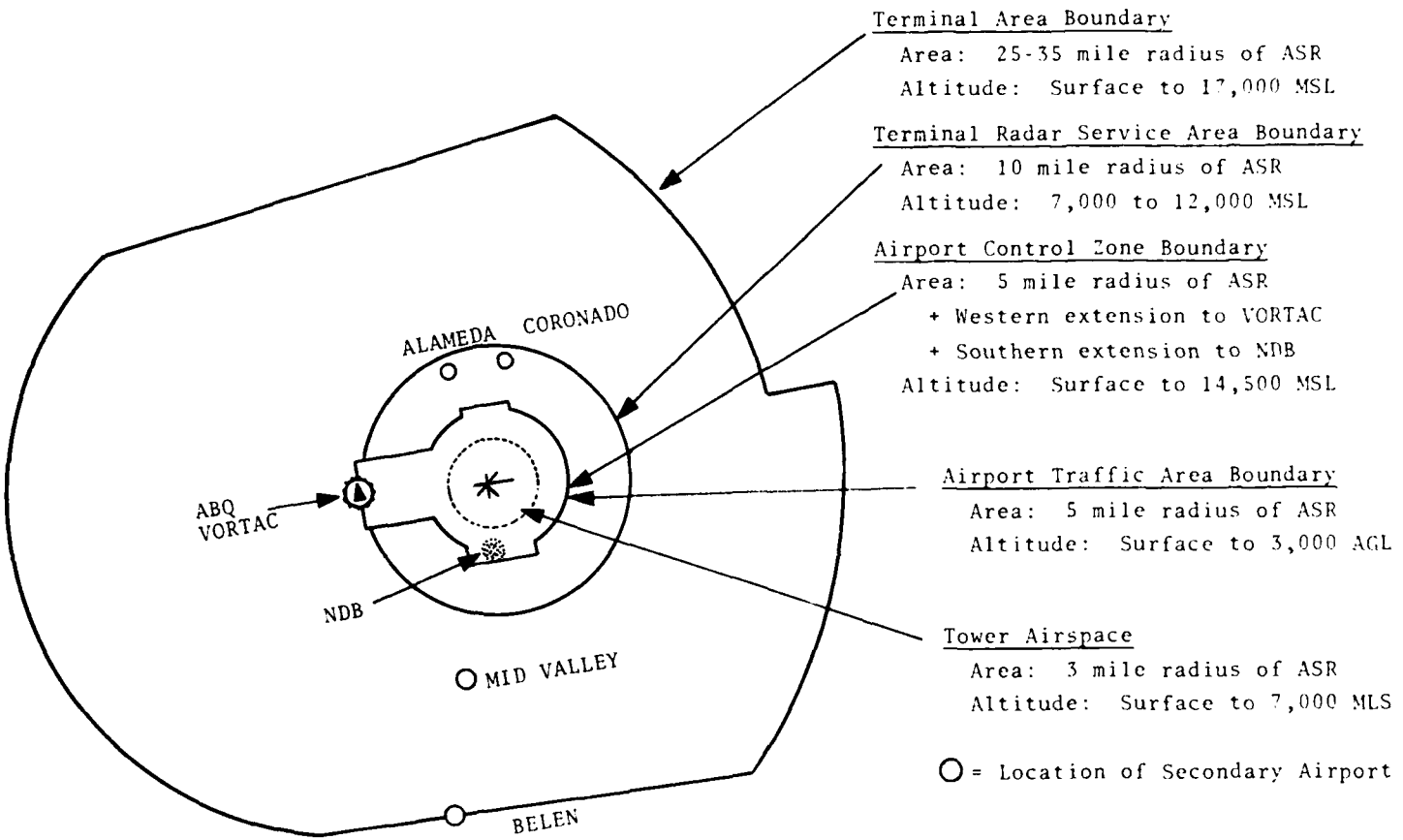


FIGURE 2-6. ALBUQUERQUE AIRSPACE AND SECONDARY AIRPORTS

TABLE 2-1. ALBUQUERQUE AIRSPACE AREAS

AIRSPACE AREA	AREA DIMENSION	ALTITUDE	USE
1. Terminal Area	25 to 35 mile radius of ASR	Surface to 17,000 MSL	Official area in which ABQ tower provides air traffic control service. Area defined for ABQ tower for controlling IFR traffic; at terminal area boundary the NRTCC accepts/hands off IFR traffic
2. Terminal Radar Service Area (TRSA)	10 mile radius of ASR	Varies by section (see Figure 2-6)	A defined positive control area for those aircraft who wish to participate in one of the three available radar service programs
3. Airport Control Zone	5 mile radius of ASR with a westerly extension to VORTAC and a southerly extension to NDB	Surface to 14,500 feet MSL	To provide a positive control zone for instrument approaches and departures
4. Airport Traffic Area	5 mile radius of ASR	Surface to 3000 AGL	Buffer area above airport in which aircraft must talk to tower
5. Tower Airspace	3 mile radius of ASR	Surface to 7000 feet MSL	Airspace within which the Local Controller in the Cab has responsibility for controlling aircraft

traffic to the ABQ tower. Within the terminal area, the ABQ tower provides IFR aircraft with radar separation in accordance with IFR standards.

The second largest airspace area is the "Terminal Radar Service Area" (TRSA). The TRSA encompasses a ten-mile radius of the ASR with the altitude varying by section (Figure 2-6), reflecting the influence of the airport control zone (discussed below) and the mountainous terrain to the northeast and southeast. The TRSA is a defined positive control area for those VFR aircraft who wish to participate in one of three terminal radar service programs available:

Stage I: Radar Service Advisory

ABQ tower radar control provides information on wind and runway in use and specifies time or place for pilot to contact Tower Cab; radar service terminated.

Stage II: Radar Service Advisory and Sequencing

ABQ tower radar control provides advisory information (as in Stage I) and provides standard VFR radar separation (minimum 1-1/2 miles and 500 feet) until aircraft is sequenced for landing or until the pilot sees the traffic he is to follow; radar service is terminated.

Stage III: Radar Service

ABQ tower radar control provides standard separation between all participating VFR and IFR aircraft operating within the TRSA. Pilot participation is urged but is not mandatory.

Time permitting, the ABQ radar control provides radar service to VFR Stage III aircraft outside the TRSA but within the terminal area.

The third airspace area is the "Airport Control Zone" which is a five-mile radius of the ASR from the surface to 14,500 feet (MSL) with a westerly extension to the ABQ VORTAC and a southerly extension to the non-directional beacon (NDB), a radio navigation aid. The pupose of the airport control zone is to provide a

positive control zone for instrument approaches and departures.

The fourth airspace area is the "Airport Traffic Area" which is also a five-mile radius of the ASR but extends only from the surface to 3,000 feet(AGL). The purpose of the airport traffic area is to provide a buffer area above the airport in which all aircraft must maintain contact with the tower.

The final airspace area is the "Tower Airspace" which is a three-mile radius of the ASR extending from the surface to 7,000 feet (MSL). The local controllers in the Tower Cab are responsible for providing separation to all aircraft under their control within this airspace.

2.2.3 Typical Approach and Departure Profiles (Runway 08)

An IFR turbojet arrival flight approaching Albuquerque will be vectored by the ARTCC to a "coordination fix" on or near the terminal area boundary (Figure 2-7). Per agreement with the Center almost all of these flights arrive at the fix at an altitude of 15,000 feet (MSL) and at a maximum indicated airspeed of 300 knots.[1]

The ARTCC and the ABQ tower will coordinate the transfer of control of the flight.[2] The radar controller in the ABQ TRACON will then provide approach vectors and radar separation to enable the aircraft to intercept the ILS glide slope on runway 08. After vectoring the aircraft into the airport control zone "box" the radar controller will normally clear the aircraft for a visual approach; prior to five miles from the runway, the TRACON transfers control of the flight to the Tower Cab. Typical approach routes to runway 08 are presented in Figure 2-8.

---

[1] Flights at the Curly fix approach the terminal area at 11,000 feet (MSL) altitude; the lower altitude at this fix is designed to accommodate the lower level flights from the Farmington area northwest of Albuquerque.

[2] Usually a silent ARTS handoff; discussed in Chapter 4 - Flight Data.

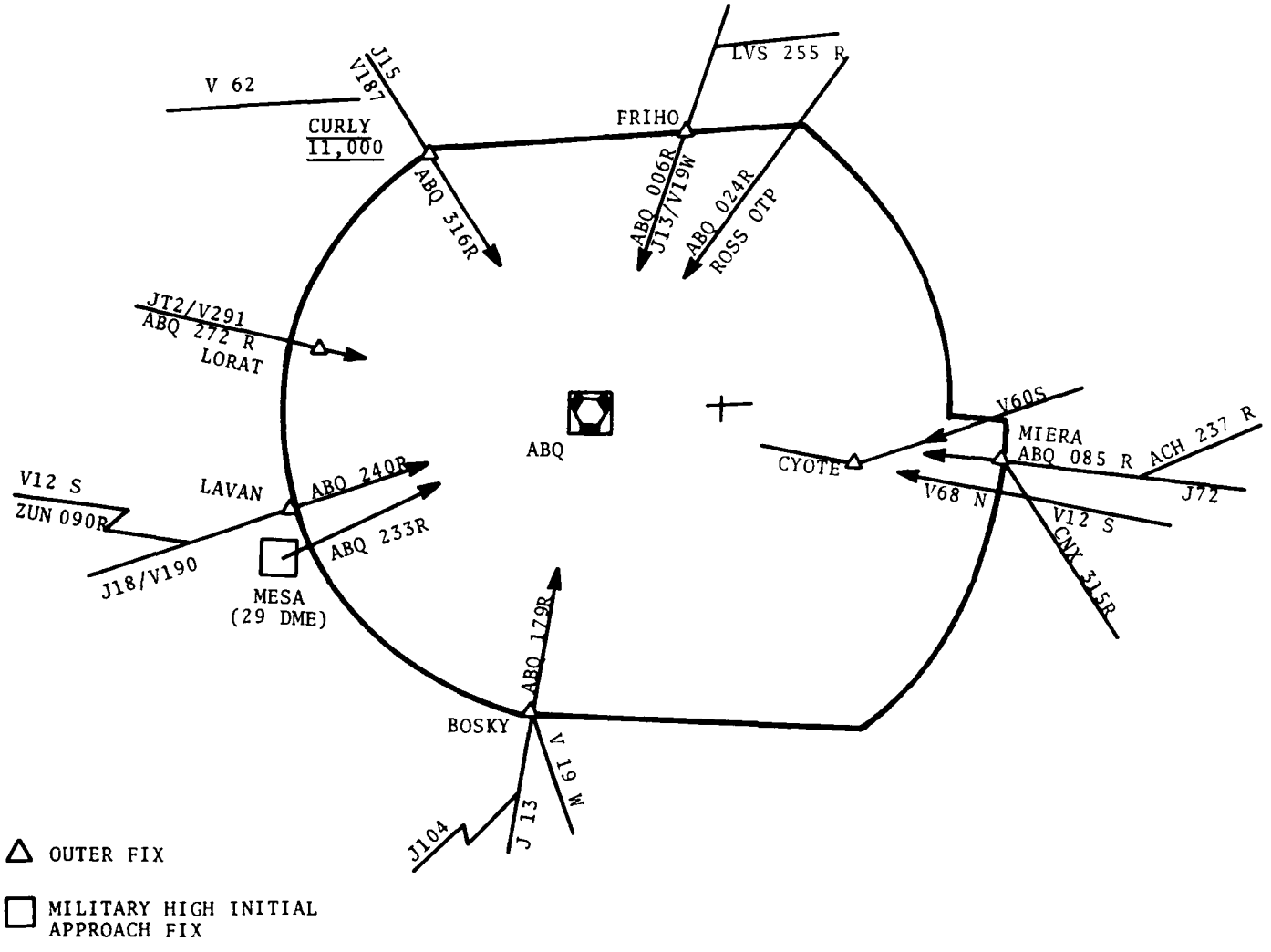


FIGURE 2-7. ALBUQUERQUE TERMINAL AREA ARRIVAL FIXES (RUNWAY 08-26)

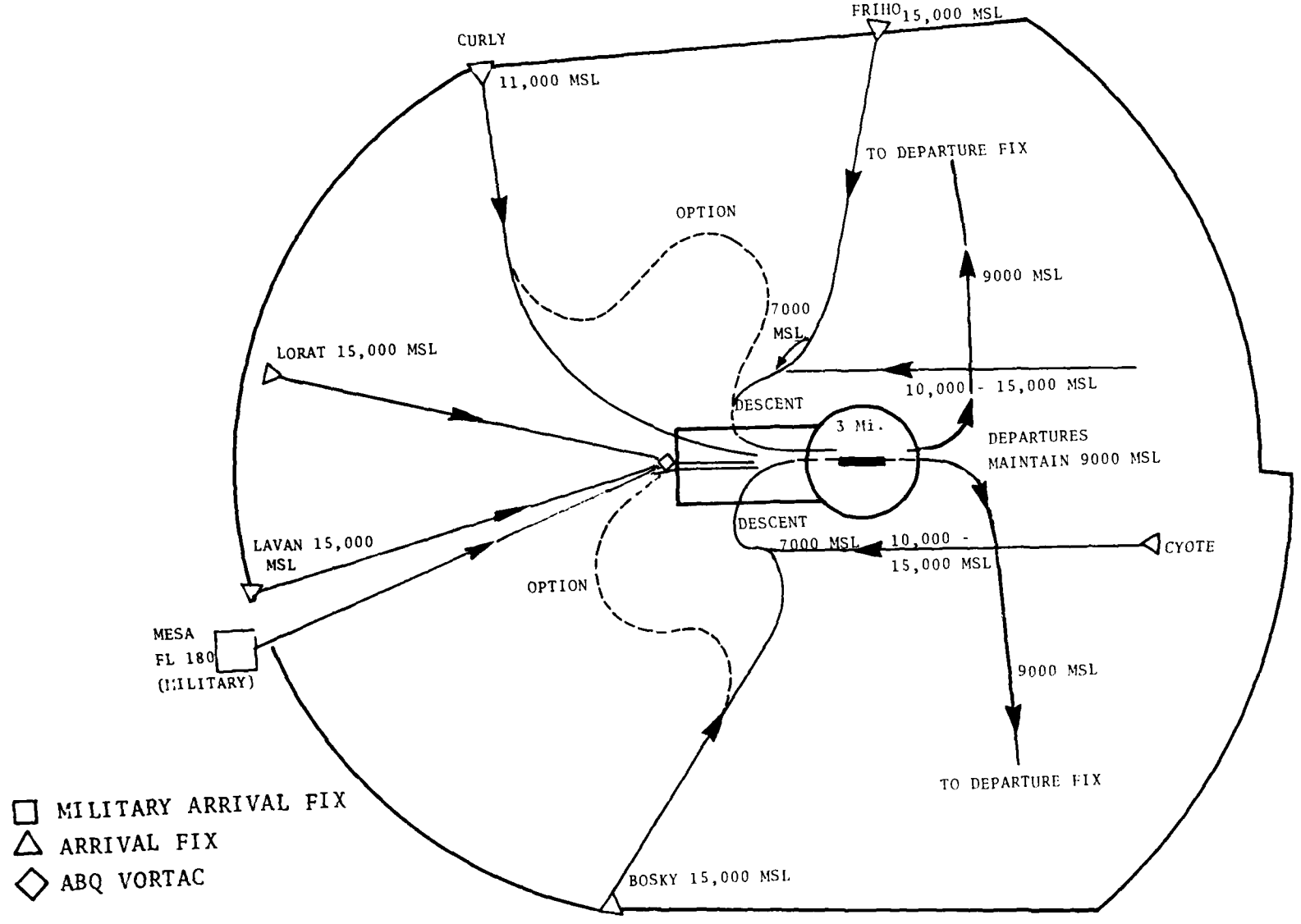


FIGURE 2-8. TYPICAL IFR ARRIVAL-DEPARTURE FLOWS AT ALBUQUERQUE (RUNWAY 08)

In the case of a military jet, the approach may differ in terms of a higher initial approach fix and a higher aircraft speed. An A-7D aircraft on a high level approach will cross the "Mesa" fix at flight level 18,000 feet and descend to 10,000 feet (MSL) by the ABQ VORTAC. The potential complication for the radar controller is the speed of entry since the approach can conflict with slower flying aircraft approaching from the Bosky and Lavan fixes. This type of situation places a premium on the anticipatory skills of the TRACON radar controller. IFR departure flights from Albuquerque also have a set of departure coordination fixes on or near the terminal area boundary which facilitate the transfer of control of the flight to the ARTCC (Figure 2-9). Departure flights maintain 9,000 feet (MSL) altitude at least until clear of inbound traffic; inbound flights maintain minimum 10,000 feet (MSL) until beyond the flight departure routes (Figure 2-8).

2.3 ALBUQUERQUE TOWER OPERATIONS

The most striking characteristic of the ABQ Tower is the mix of aircraft operations it serves. General aviation (GA) activity represents over half of all operations while military activity may represent approximately 20 percent of a day's activities (Table 2-2). Controller interviews indicated that GA activity should decrease marginally in the future as a result of the growing cost of aviation fuel; this same logic also indicated that air taxi operations should increase since they can more efficiently serve smaller market areas which are unprofitable for air carriers.

The data (Table 2-3) also indicate that almost all (96 percent) GA flights are instrument operations (stage III). In addition instrument operations are heavily concentrated on Albuquerque International with secondary airports representing a very small percent of total instrument operations.

The analysis of aircraft operations by day of week (Table 2-4) indicates that Thursday and Friday are the peak traffic days with the bulk of the traffic generated by itinerant general aviation.

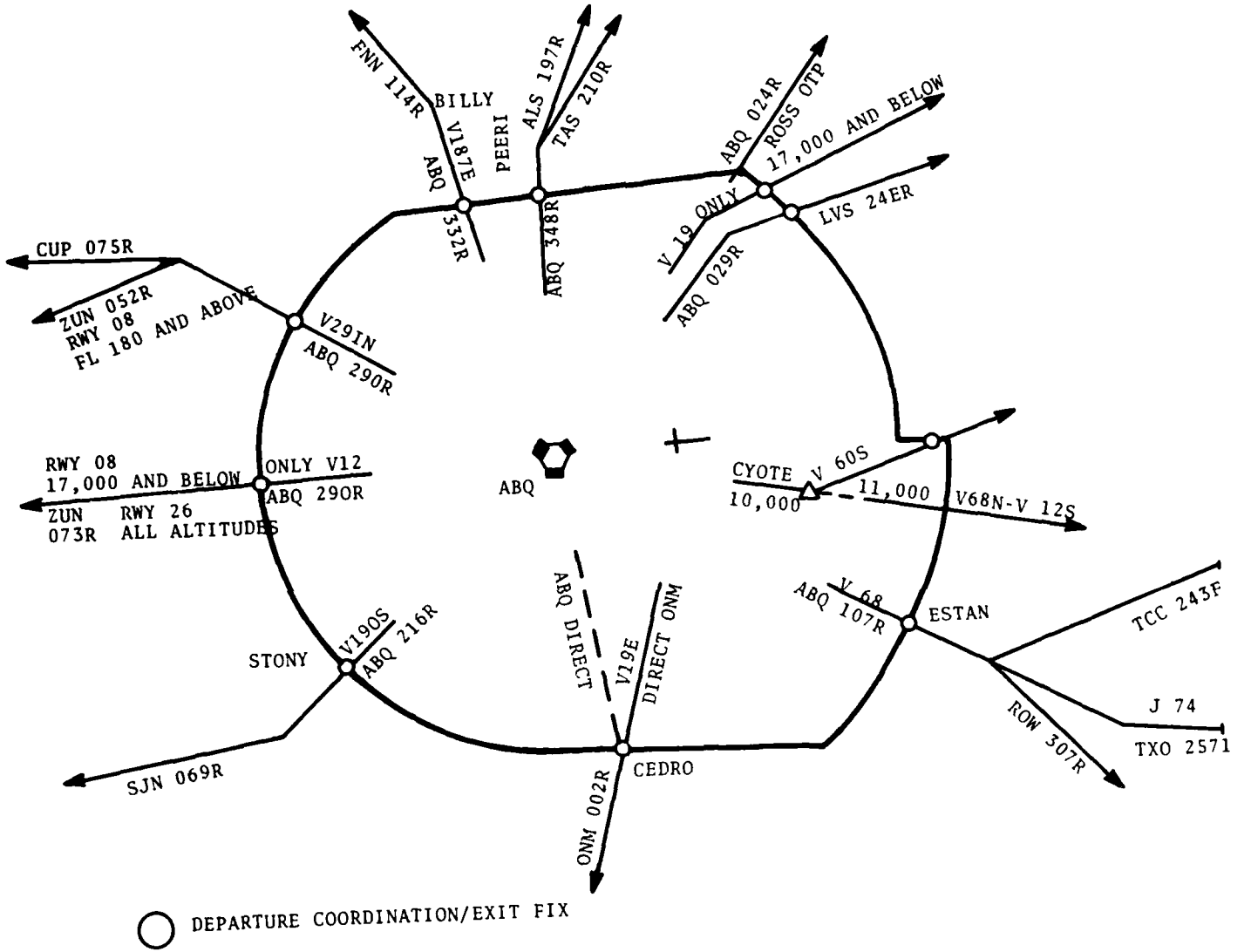


FIGURE 2-9. ALBUQUERQUE TERMINAL AREA DEPARTURE FIXES (RUNWAY 08-26)

TABLE 2-2. TOTAL ALBUQUERQUE TOWER OPERATIONS BY TIME OF DAY[1]

TIME	AIR CARRIER			AIR TAXI			GENERAL AVIATION			MILITARY			TOTALS BY TYPE			TOTAL OPERATIONS
	A*	D*	L*	A	D	L	A	D	L	A	D	L	A	D	L	
0000-0059							1						1			1
0100-0159	1						1						2			2
0200-0259								1						1		1
0300-0359		1					2						2	1		3
0400-0459								3			1			4		4
0500-0559																
0600-0659	3			4	3			3					7	6		13
0700-0759	2	4		3	2		3	7					8	13		21
0800-0859	6	6		4	5		3	16	4	1	11		14	38	4	56
0900-0959	4	6		1	1		8	8	6	2	8		15	23	6	44
1000-1059	5	4		4	1		8	6	6	5	6	8	22	17	14	53
1100-1159	5	5		2			12	16	2	15	5		34	26	2	62
1200-1259	3	3		1	4		13	12	8	5	5	2	22	24	10	56
1300-1359	7	4		1	1		12	10	4	4	7	2	24	22	6	52
1400-1459	5	5		1	3		17	12	10	9	10	10	32	30	20	82
1500-1559		3		3	1		7	13	6	6	5	14	16	22	20	58
1600-1659	2	2			1		16	19		5	1		23	23		46
1700-1759	5	3		3			15	11		4	2		27	16		43
1800-1859	6	4		2	3		13	6	8	1		6	22	13	14	49
1900-1959	4	6		5	2		6	8	12				15	16	12	43
2000-2059	5	5		1	4		8	3	12	1			15	12	12	39
2100-2159	3	3		2			2	2	6		1		7	6	6	19
2200-2259	2				3		1	1	2				3	4	2	9
2300-2359	2	2		2									4	2		6
Total by A/D/L	70	66	0	39	34	0	148	157	86	58	62	42	315	319	128	762
Total by Category	136			73			391			162			762			
Percent	18%			10%			51%			21%			100%			

*A: Arrival (itinerant)
*D: Departure (itinerant)
*L: Local

[1]Thursday, January 31, 1980

TABLE 2-3. ALBUQUERQUE AIRCRAFT OPERATIONS FY78[1]

TOTAL OPERATIONS AND INSTRUMENT OPERATIONS FY78

	AIR CARRIER	AIR TAXI	GENERAL AVIATION	MILITARY	TOTAL ANNUAL	NATIONAL RANK
AIRPORT OPERATIONS[2]	45,444	18,672	132,104	41,181	237,401	75th
INSTRUMENT OPERATIONS	45,651	18,853	126,261	32,754	223,519	56th
INSTRUMENT APPROACHES	518	163	433	114	1,228	340th

INSTRUMENT OPERATION BY OPERATION CATEGORY FY 78

	AIR CARRIER	AIR TAXI	GENERAL AVIATION	MILITARY	TOTAL ANNUAL	DAILY AVE
PRIMARY AIRPORT ALBUQUERQUE	45,646	18,766	103,594	30,614	198,620	544
SECONDARY AIRPORT[3]	0	4	1,041	2	1,047	3
ALAMEDA CORONADO VALLEY BELEN[4]						
OVERFLIGHTS	5	83	21,626	2,138	23,852	65
TOTAL NUMBER	45,651	18,853	126,261	32,754	223,519	612
PERCENT OF TOTAL ANNUAL	20%	8%	57%	15%	100%	

1. Derived from FAA Traffic Activity Reports of FY78
2. Does not include overflights or activities at secondary airports.
3. Secondary airports are nontowered. Alameda and Belen have VOR approaches
4. Recently added to airports served by Albuquerque

The analysis of aircraft operations by time of day (Figure 2-10) indicates that the ABQ tower is largely a 12 hour operation with the daily peak encountered in the mid-afternoon period. On Thursdays and Fridays, this mid-afternoon peak involves many transient military training aircraft (T-37, T-38, T-39) on cross country flights.

Discussions with the ABQ controllers revealed an important qualitative dimension to controlling military operations. The percentage of work-time controllers spend on handling military flights is far greater than the percentage these flights represent of total operations, because they involve fast approaches and sequencing problems, responding to pilot requests for touch-and-go landings, taxiing the aircraft to the appropriate staging area (base operations, transient area, etc.) and maintaining required log of military flights. In addition, certain military jet aircraft require the activation of runway arresting barriers[1] (BAK 14) when the temperature exceeds 84 degrees Farenheit. If a takeoff is aborted, a hook on the aircraft engages the barrier to stop the aircraft safely at the end of the runway. These arresting barriers are also used when a military jet arrival has experienced hydraulic failure thus losing braking capability.

The Albuquerque tower may also be required to coordinate military GCA's (ground controlled approaches) with a military radar controller located at Albuquerque.

2.4 ALBUQUERQUE TOWER CAB/TRACON

2.4.1 TRACON

The layout, staffing, operations, and working environment of the ABQ TRACON is presented in this section.

The ABQ TRACON has 8 operational positions, the functions of which are summarized in Table 2-5. Four of these are operational

[1]Discussed in later Sections.

TABLE 2-4. AVERAGE NUMBER OF ALBUQUERQUE AIRCRAFT OPERATIONS BY DAY OF WEEK

CATEGORY OF OPERATIONS	DAY OF WEEK SUN	MON.	TUES.	WED.	THURS.	FRI.	SAT.	Daily Average	Percent
Air Carrier	127	131	130	130	131	130	20	128	19.9%
Air Taxi	45	52	52	52	52	52	45	50	7.8%
General Aviation									
itinerant	255	270	281	315	346	341	283	299	
local	57	52	57	64	65	54	58	58	
	312	322	338	379	411	395	341	357	55.6%
Military									
itinerant	42	73	88	85	92	107	44	76	
local	9	40	41	37	42	39	12	31	
	51	113	129	122	134	146	56	107	16.7%
DAILY AVERAGE	535	618	649	683	728	723	562	642	100%

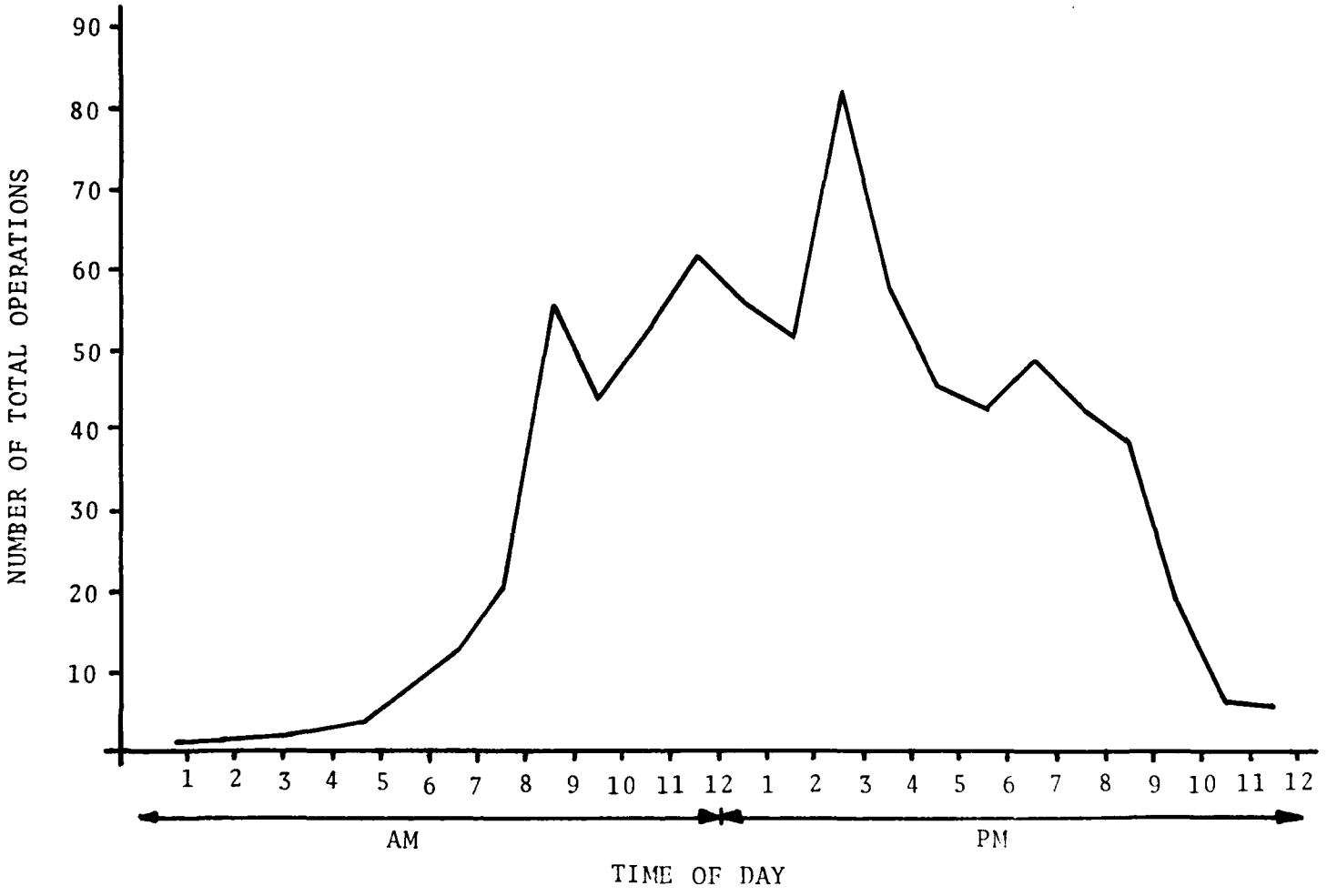


FIGURE 2-10. NUMBER OF OPERATIONS BY TIME OF DAY
(Thursday January 31, 1980)

radar scope positions:

High North Radar (NHR)

High South Radar (HSR)

Low North Radar (LNR)

Low South Radar (LSR)

These radar positions control the aircraft in the terminal area airspace represented in Figure 2-11.[1] The function of these positions is maintained through the 24-hour day, but through consolidation of certain functions the staffing of these positions varies. The six staffing consolidation configurations which are used are represented in Table 2-6. It is typical for four radar scopes to be staffed in the TRACON from approximately 7:30 a.m. to 7:30 p.m. During early morning and late evening hours, two radar scopes are normally worked. Configuration 3 is quite common during these times with the LSR position handling all north traffic and the HSR position handling all south traffic. All traffic during the midwatch shift (11:00 p.m. to 7:00 a.m.) is commonly handled with one controller at the LSR position.

The floor plan of the TRACON shown in Figure 2-12 illustrates the location of the controller positions in the room when all functions are staffed. The arrangement and identification of the equipment at those positions and some other supporting equipment is shown in Figures 13 through 23.

2.4.2 Tower Cab

The staffing, and duties of Cab positions are described in Table 2-7.

At Albuquerque, the Flight Data/Clearance Delivery positions are commonly combined into one position. The normal daily Cab

[1] Figure 2-11 is the airspace set up for primary runway 08; the airspace set up for primary runway 26 is only slightly different for the LSR position.

TABLE 2-5. ALBUQUERQUE TRACON POSITIONS: STAFFING AND DUTIES

POSITION TITLE	TYPICAL STAFFING TIME (LOCAL) FROM	TO	COMMENTS	SUMMARY OF PRIMARY DUTIES (RADAR DUTIES AND AIRSPACE JURISDICTIONS ARE BASED ON A RUNWAY 8 CONFIGURATION)
1. Low North Radar (LNR)	0730	1800		o Controls all IFR/VFR Stage III arrivals/departures between ABQ radials 255 and 020 from the surface to 7500 feet MSL and outside the tower control area.
2. Arrival/Departure Data (A/DD)	-	-	Position Seldom Staffed Duties Usually Performed by high south coordinator	o Receives and posts flight data on filed arrivals and departures o Position activated when FDEP outage occurs. Duties include coordinating flight path activities with cab and ARTCC and preparing large numbers of handwritten strips.
3. Low South Radar (LSR)	24 hours a day			o Controls all IFR/VFR Stage III arrivals/departures operating between the ABQ 255 and 140 radials from the surface to 7500 feet MSL and outside the tower control area. o Controls sequence to secondary runway.
4. High South Radar (HSR)	0730	1930		o Controls IFR/VFR Stage III arrivals/departures operating south of the ABQ 255/074 radials and at or above 8000 feet MSL to/from Handoff with local control-1. o Handsoff VFR/Stage III arrivals landing on other than primary runway to the low position. o Controls sequence to primary runway.
5. High South Coordinator (HSC)	1400	1600		o Coordinates all operations for the high radar positions including the planning and routing of arrival and departure services. o Assists the high positions in laying out flight strips to enable them to focus on vectoring aircraft. o Coordinates with the ARTCC.
6. High North Radar (HNR)	0730	1930		o Controls IFR/VFR Stage III arrivals/departures operating on and north of the ABQ 255/074 radials and at or above 8000 feet MSL to/from handoff with local control-1. o Handsoff VFR/Stage III arrivals landing on other than primary runway to the low position.
7. TRACON Coordinator (TC)	-	-	Position seldom staffed	o The main coordinator position prior to ARTS III. Now a secondary position only staffed when high south coordinator needs assistance due to heavy traffic. o Overhead equipment occasionally used by team supervisor.
8. TRACON Supervisor (TS)	0600	1100		o Directs the overall TRACON operation including changes in staffing and manning of positions. o Establishes the type of approach to be used after coordinating with the Cab supervisor; directs controllers accordingly. o Disseminates below basic VFR weather information from Cab Supervisor to all operational TRACON positions. o Coordinates the activities of all radar positions during runway change periods.

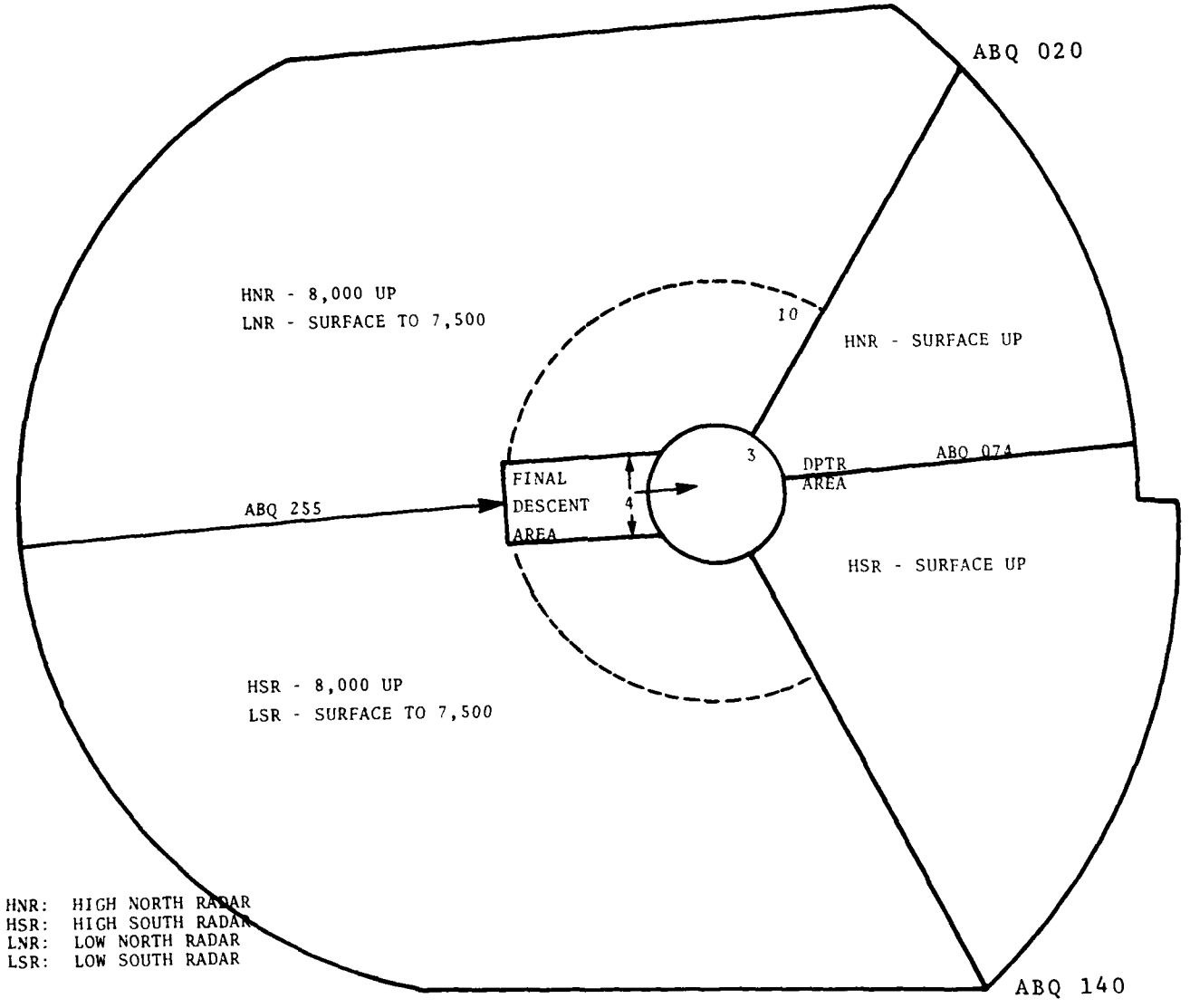


FIGURE 2-11. TERMINAL AIRSPACE SERVICED BY TRACON POSITIONS (RUNWAY 08)

TABLE 2-6. TRACON CONTROLLER POSITION CONSOLIDATION CONFIGURATIONS

# CONFIGURATION	PRIMARY RUNWAY	RADAR POSITIONS STAFFED LNR	LSR	HSR	HNR	TIME (LOCAL) TYPICALLY USED
1*	8/26	All traffic between ABQ Radials 255 and 020 below 7500' MSL	All traffic between ABQ Radials 255, and 140 below 7500' MSL	All south traffic not handled by LSR	All north traffic not handled by LNR	0730-1930
2	17/35			All arrivals	All deps. All overs.	Rare
3	8/26		All north traffic	All south traffic		0600-0730 1930-2300
4	17/35		All deps. All overs.	All arrivals		Rare
5*	26 VFR Daylight only	All traffic between ABQ Radials 235 and 020 below 7500' MSL	All traffic between ABQ Radials 255 and 140 below 7500' MSL	All south traffic not handled by LSR	All north traffic not handled by LNR	As needed
Single Scope			All traffic			2300-0700 Midwatch

*Refer to Table 2-5 and Figure 2-11.
**Same as Cfg. #1 with 7-mile MSAW inhibit area on runway 26.

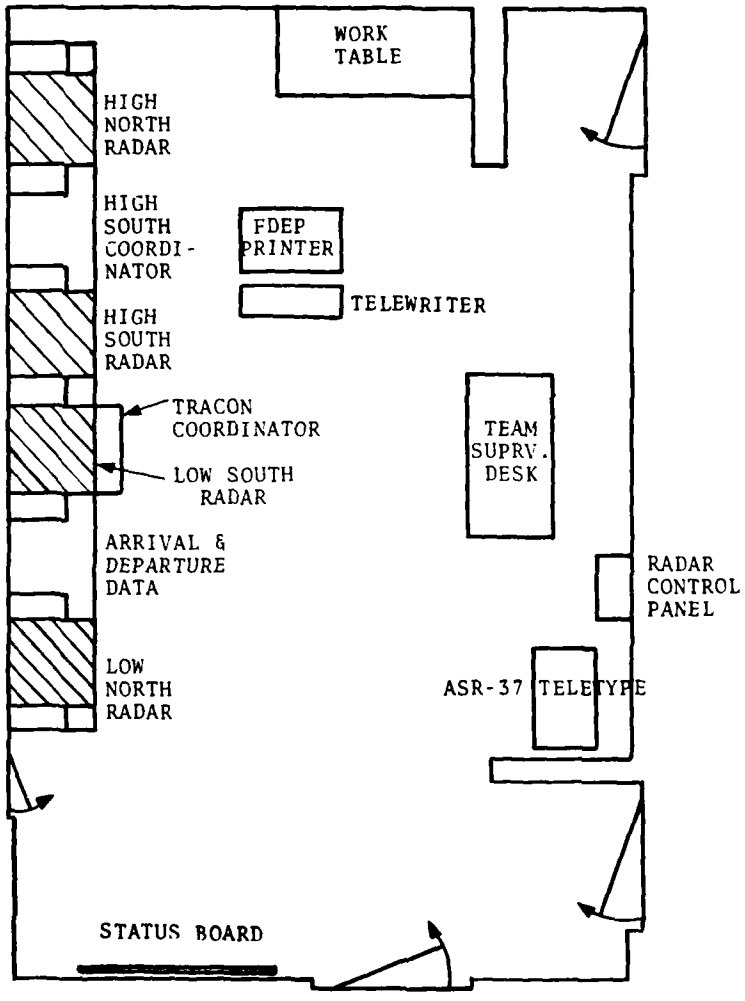
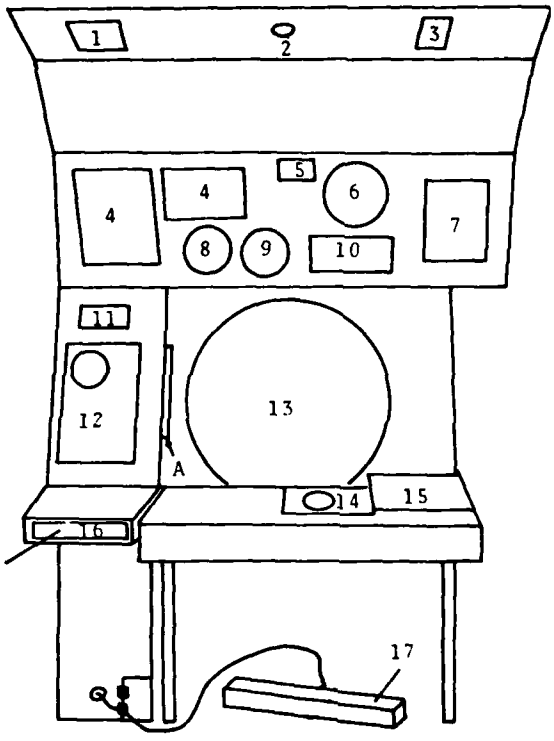
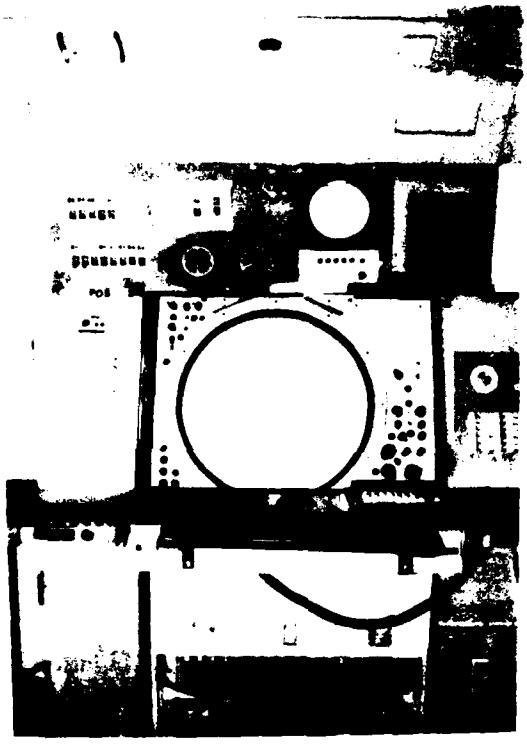


FIGURE 2-12. ABQ TRACON FLOOR PLAN SHOWING CONTROLLER POSITIONS





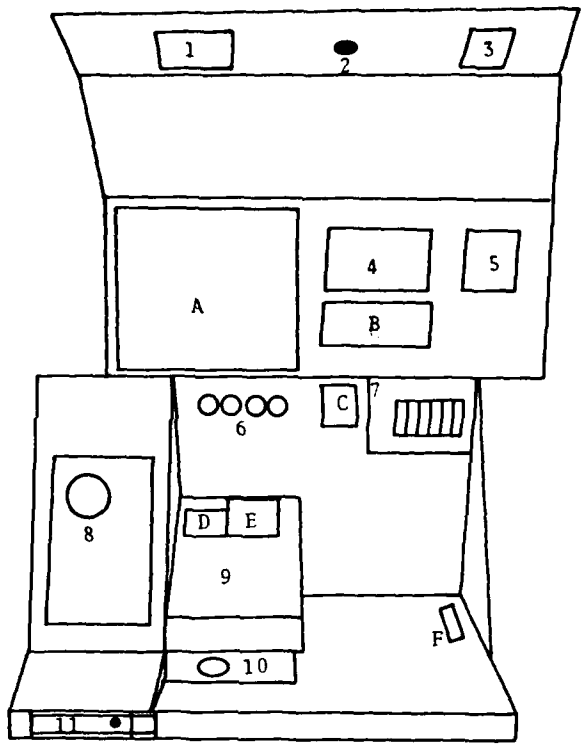
DEVICES

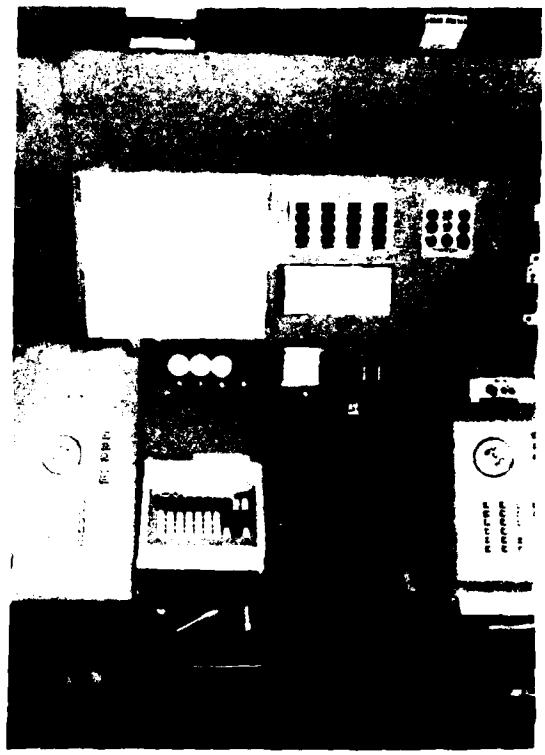
1. TELCO SPEAKER
2. OVERHEAD LIGHT
3. LIGHT SWITCH
4. FAA COMMUNICATIONS PANELS
5. DIGITAL CLOCK
6. ANALOG ALTIMETER
7. RADAR BEACON CONTROL PANEL
8. WIND DIRECTION INDICATOR
9. WIND SPEED INDICATOR
10. VIDEO MAP SELECTOR PANEL
11. FAA RADIO JACK
12. TELCO DIAL AND KEYPACK
13. RADAR DISPLAY/CONTROLS
14. ARTS TRACKBALL
15. ALPHANUMERIC KEYBOARD
16. TELCO JACKS
17. FOOT SWITCH FOR FAA RADIO

PAPER

A. POSITION LOG & POSITION RELIEF BRIEFING GUIDE

FIGURE 2-13. LOW NORTH RADAR





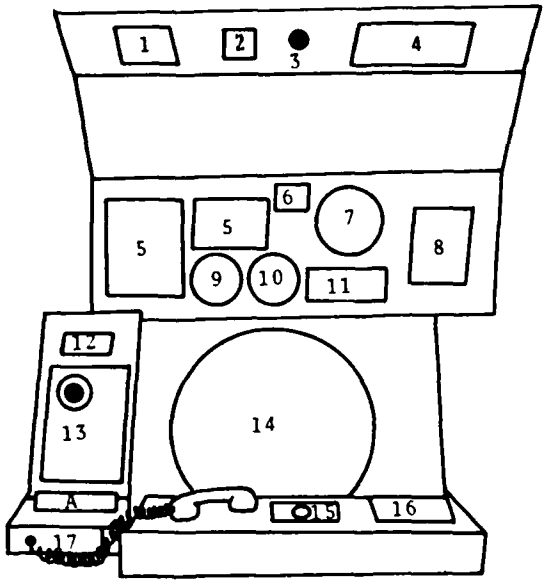
DEVICES

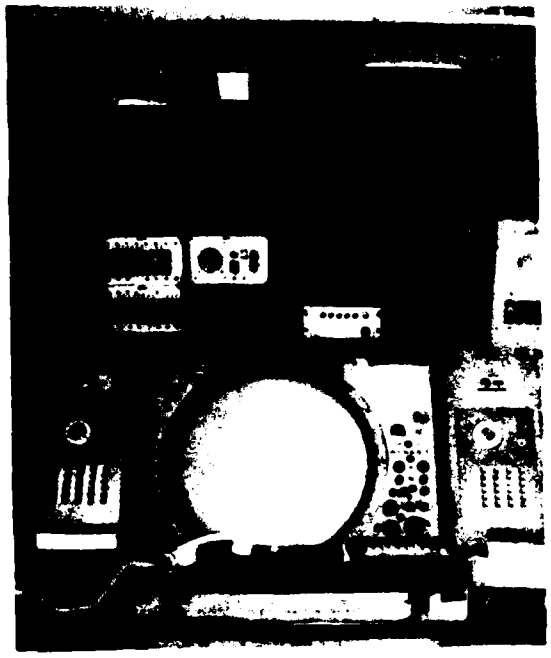
1. TELCO SPEAKER
2. OVERHEAD LIGHT
3. LIGHT SWITCH
4. STANDBY SELECTOR PANEL FOR FAA FREQUENCIES
5. RADIO COMMUNICATIONS RECORDER STATUS PANEL
6. LIGHT RHEOSTATS
7. FLIGHT STRIP BIN
8. TELCO DIAL AND KEYPACK
9. ALPHANUMERIC KEYBOARD
10. ARTS TRACKBALL
11. TELCO JACKS

PAPER

A. ABQ TERMINAL AREA CHART
B. FAA FREQUENCY ASSIGNMENTS
C. STANDBY SELECTOR PANEL INSTRUCTIONS
D. CONTROLLER POSITION CONSOLIDATION CODES
E. POSITION LOG
F. FLIGHT STRIP

FIGURE 2-14. ARRIVAL/DEPARTURE DATA





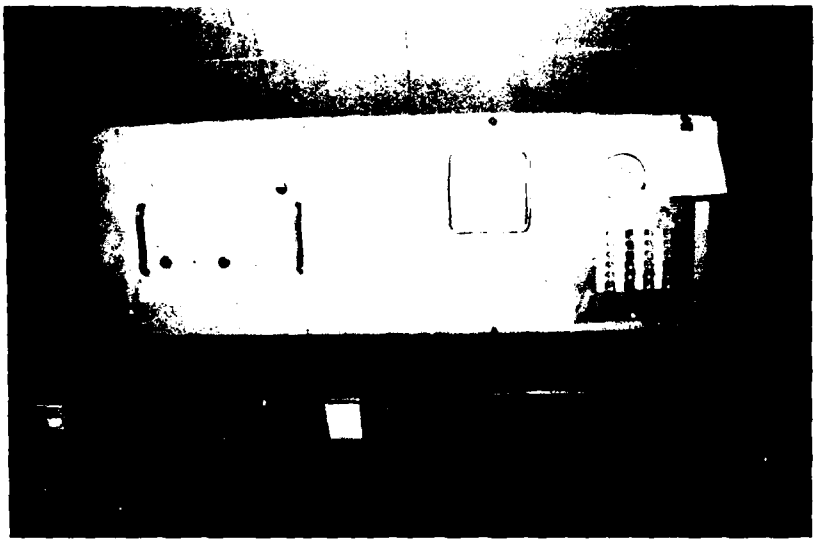
DEVICES

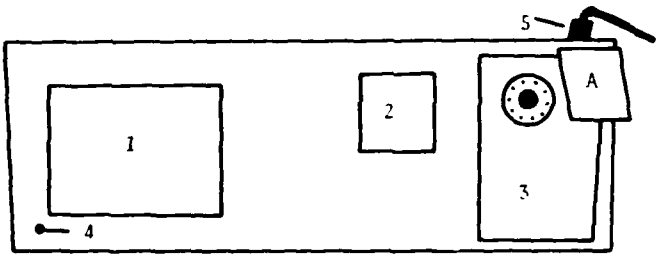
1. TELCO SPEAKER
2. LIGHT SWITCH
3. OVERHEAD LIGHT
4. RVR PANEL
5. FAA COMMUNICATIONS PANELS
6. DIGITAL CLOCK
7. ANALOG ALTIMETER
8. RADAR BEACON CONTROL PANEL
9. WIND DIRECTION INDICATOR
10. WIND SPEED INDICATOR
11. VIDEO MAP SELECTOR PANEL
12. FAA RADIO JACK
13. TELCO DIAL AND KEYPACK
14. RADAR DISPLAY/CONTROLS
15. ARTS TRACKBALL
16. ALPHANUMERIC KEYBOARD
17. TELCO JACKS

PAPER

A. FLIGHT STRIP

FIGURE 2-15. LOW SOUTH RADAR





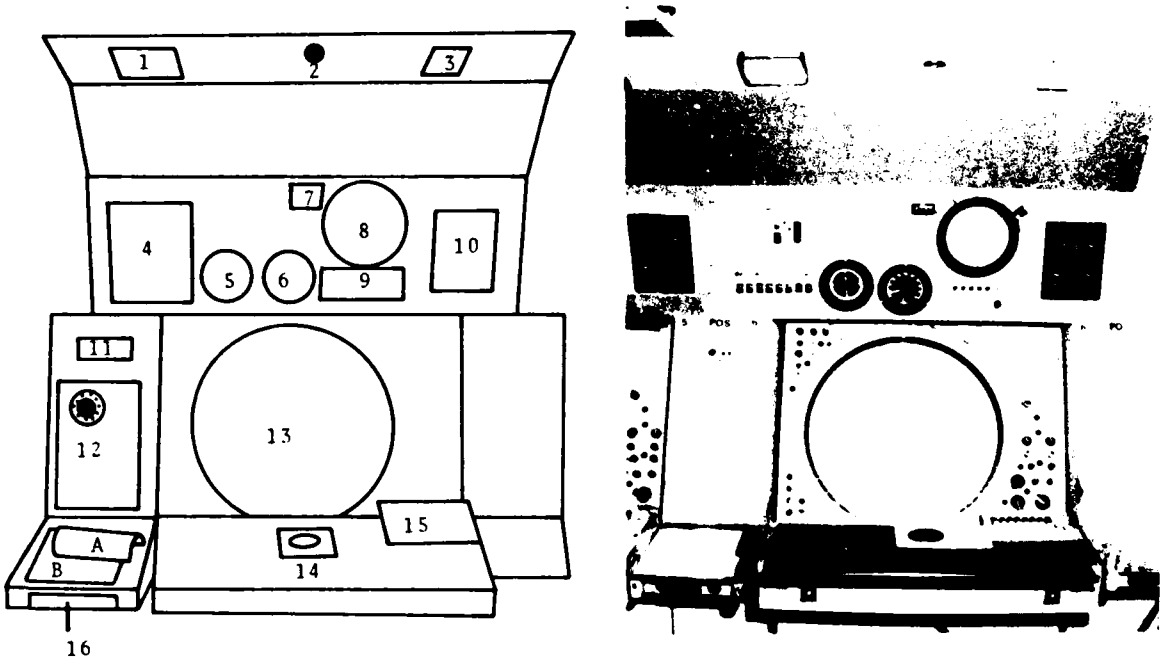
DEVICES

1. AURAL ALARM CONTROL PANEL
2. TELCO SPEAKER
3. TELCO DIAL AND KEYPACK
4. CALL BUTTON
5. BOOM FOR TELEPHONE CORD

PAPER

A. POSITION LOG

FIGURE 2-16. TRACON COORDINATOR



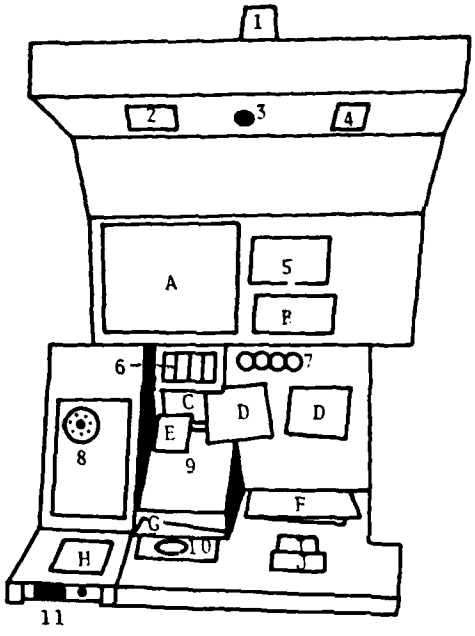
DEVICES

1. TELCO SPEAKER
2. OVERHEAD LIGHT
3. LIGHT SWITCH
4. FAA COMMUNICATIONS PANEL
5. WIND DIRECTION INDICATOR
6. WIND SPEED INDICATOR
7. DIGITAL CLOCK
8. ANALOG ALTIMETER
9. VIDEO MAP SELECTOR PANEL
10. RADAR BEACON CONTROL PANEL
11. FAA RADIO JACK
12. TELCO DIAL AND KEYPACK
13. RADAR DISPLAY/CONTROLS
14. ARTS TRACKBALL
15. ALPHANUMERIC KEYBOARD
16. TELCO JACKS

PAPER

A. ELECTROWRITER MESSAGE
B. RADAR MINIMUM VECTOR CHART

FIGURE 2-17. HIGH SOUTH RADAR



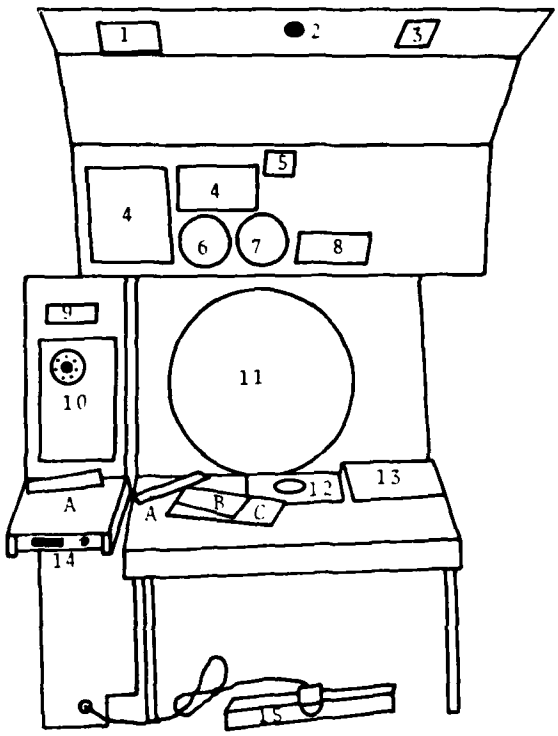
DEVICES

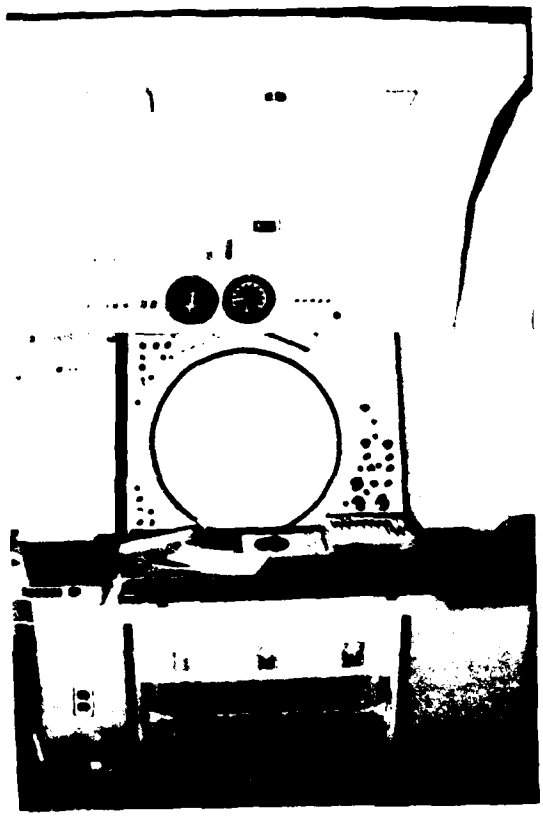
1. LIGHT SHIELD
2. TELCO SPEAKER
3. OVERHEAD LIGHT
4. LIGHT SWITCH
5. STANDBY SELECTOR PANEL FOR FAA FREQUENCIES
6. FLIGHT STRIP BIN
7. LIGHT RHEOSTATS
8. TELCO DIAL AND KEYPACK
9. ALPHANUMERIC KEYBOARD
10. ARTS TRACKBALL
11. TELCO JACKS

PAPER

A. ABQ TERMINAL AREA CHART
B. FREQUENCY ASSIGNMENTS
C. CONTROLLER POSITION CONSOLIDATION CODES
D. ELECTROWRITER MESSAGE
E. POSITION LOG
F. CHART FROM LETTER OF AGREEMENT
G. FLIGHT STRIPS
H. LOST AIRCRAFT PROCEDURES
I. POSITION LOG
J. POSITION RELIEF BRIEFING GUIDE

FIGURE 2-18. HIGH SOUTH COORDINATOR





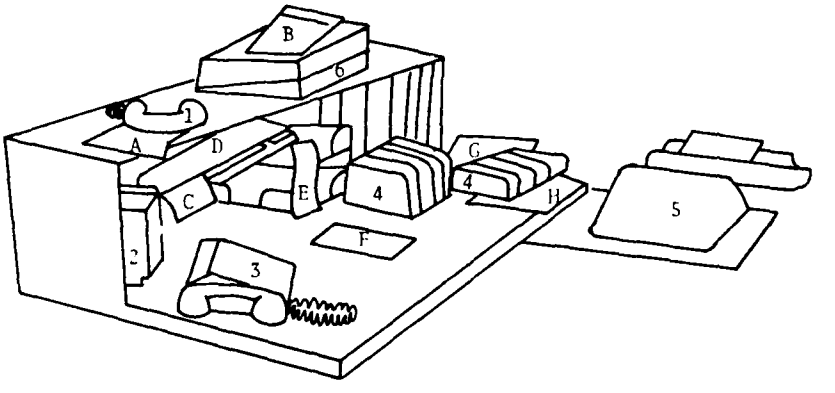
DEVICES

1. TELCO SPEAKER
2. OVERHEAD LIGHT
3. LIGHT SWITCH
4. FAA COMMUNICATIONS PANELS
5. DIGITAL CLOCK
6. WIND DIRECTION INDICATOR
7. WIND SPEED INDICATOR
8. VIDEO MAP SELECTOR PANEL
9. FAA RADIO JACK
10. TELCO DIAL AND KEYPACK
11. RADAR DISPLAY/CONTROLS
12. ARTS TRACKBALL
13. ALPHANUMERIC KEYBOARD
14. TELCO JACKS
15. FOOT SWITCH FOR FAA RADIO

PAPER

A. FLIGHT STRIPS
B. POSITION LOG
C. POSITION RELIEF BRIEFING GUIDE

FIGURE 2-19. HIGH NORTH RADAR



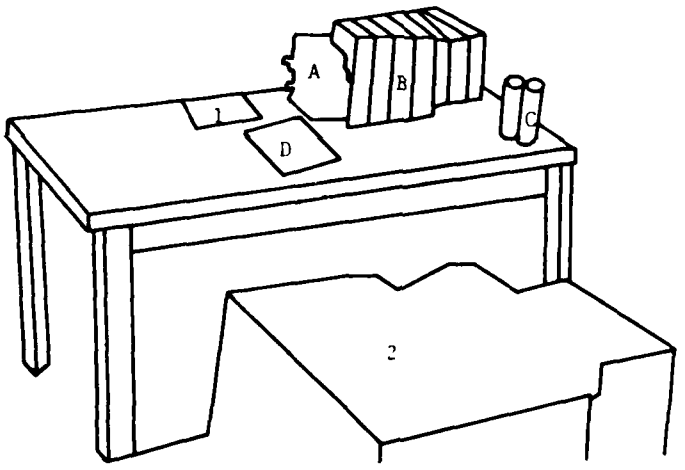
DEVICES

1. TELEPHONE HANDSET
2. DIGITAL CLOCK
3. DESK TELEPHONE
4. FLIGHT STRIP BINS
5. TYPEWRITER
6. EMERGENCY TRANSCEIVER

PAPER

A. PAPER TOWELS
B. CURRENCY LOG
C. NOTICE
D. FLIGHT STRIPS
E. MEMO FROM SECRETARY
F. POSITION LOG & POSITION RELIEF BRIEFING GUIDE
G. DAILY TRAFFIC LOG
H. SCRATCH PAD

FIGURE 2-20. TEAM SUPERVISOR DESK



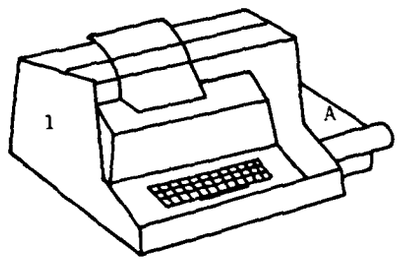
DEVICES

1. HEADSET POUCH
2. FDEP

PAPER

A. APPROACH PLATE BOOKS
B. REFERENCES FOR CONTROLLER DUTIES
C. ELECTROWRITER REFILLS
D. PROJECTED ANNUAL LEAVE SCHEDULE

FIGURE 2-21. WORK TABLE



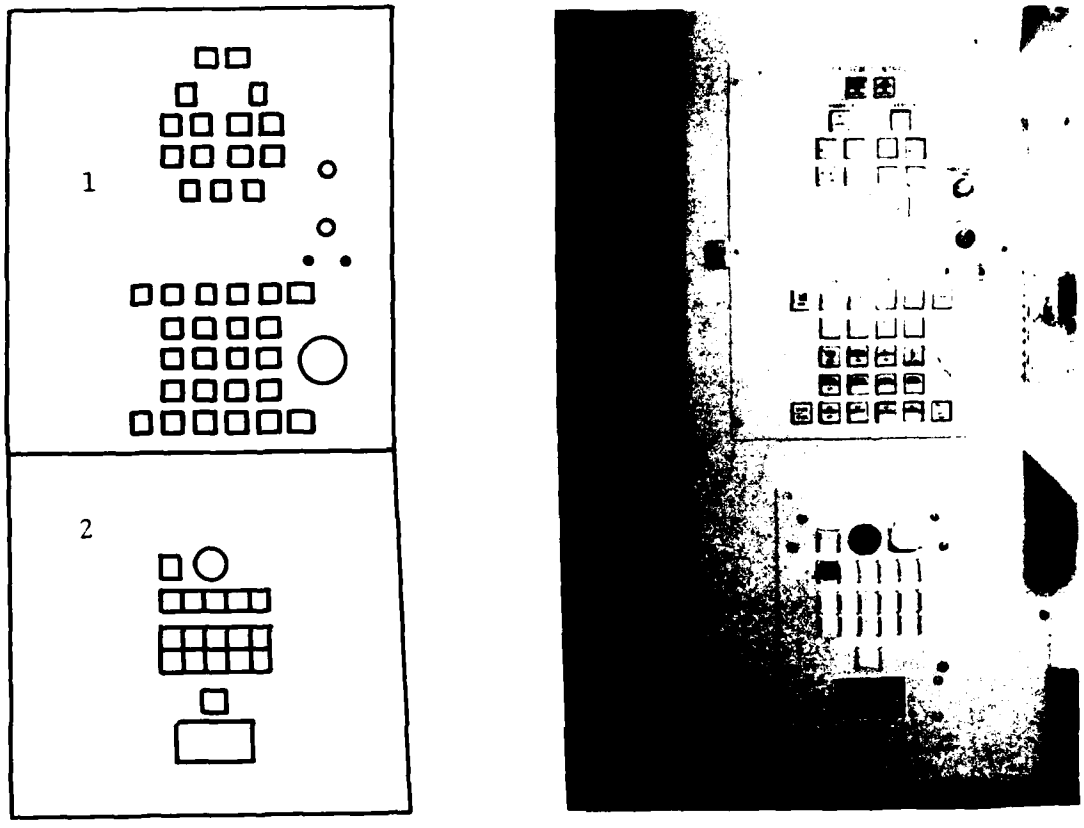
DEVICES

1. TELETYPE TERMINAL (ASR-37)

PAPER

A. TELETYPE OUTPUT

FIGURE 2-22. ASR-37 TELETYPE



DEVICES

1. ASR-8 PRIMARY RADAR CONTROLS
2. SECONDARY (BEACON) RADAR CONTROLS

FIGURE 2-23. RADAR CONTROL PANEL

TABLE 2-7. ALBUQUERQUE TOWER CAB POSITIONS· STAFFING AND DUTIES

POSITION TITLE	TYPICAL STAFFING TIME (LOCAL) FROM	TO	COMMENTS	SUMMARY OF PRIMARY DUTIES
1. Flight Data/ Clearance Delivery (FD/CD)	0700	2100	Commonly a combined position	o Receives, posts and forwards flight data on IFR filed departures. o Issues clearance to IFR filed departures. o Assigns beacon code and departure control frequency to Stage III departures as appropriate. o Records and updates the ATIS messages as required; maintains system data on current altimeter, runway and approach. o Monitors electrowriter.
2. Ground Control (GC)	0600	2300		o Controls aircraft and ground vehicles on taxiways and assigns runway crossing intersections for configuration in use. o Coordinates other runway requests with the appropriate local control o Prepares flight progress strips for non-Stage III departures as workload permits.
3. Local Control-1 (LC-1)	24 hours a day		Always manned	o Provides separation to all aircraft within the tower airspace (3 mile radius of ASR up to 7000 MSL). o Services arrivals and departures on primary runway (8, 26, 17). o Coordinates landing sequence with TRACON as required. o Calls off departing aircraft to appropriate TRACON controller as required. o Maintains log of arrivals and departures on primary runway.
4. Local Control-2 (LC-2)	0730	2100		o Services arrivals and departures on secondary runway (3,21,12,30). o Coordinates touch-and-goes with LC-1. o Maintains log of arrivals and departures on secondary runway. o Controls all helicopters.
5. Cab Coordinator (CC)	0730	2100	Manned when LC-2 position not manned	o Effects coordination, as appropriate, between all tower cab positions in operation. o Accepts handoffs/pointouts from the TRACON and advises appropriate local controllers. o Advises the appropriate radar position of departing traffic/ missed approaches. o Assists all tower cab control positions in scanning arrival/ departure movement areas. o Maintains military arrival/departure log and ensures dissemination to base operations.
6. Cab Supervisor (CS)	0700	2100	Often assumes coordinator's responsibilities	o Directs overall tower operation. o Provides front line supervision. o Determines the type of approach, runways to be used and flow intervals after coordination with the TRACON supervisor. o Combines/decombines positions and so informs the TRACON supervisor.

staffing includes:

Flight Data/Clearance Delivery (FD/CD)

Ground Control (GC)

Local Control - 1 (LC-1)

A Cab Coordinator (CC) or a Local Control - 2 (LC-2)

Cab Supervisor (CS)

Staffing during non-peak periods varies from one to four controllers depending upon the time of day (Table 2-8).

2.4.3 Typical Controller Work Schedules

An air traffic controller at ABQ belongs to a "team" which is usually scheduled to work as a group under the control of a Team Supervisor. A typical work week for an ABQ controller involves five, eight-hour shifts with three in the TRACON and two in the Cab. Since the shifts are strictly eight hours, lunch breaks are unscheduled and not guaranteed. Controllers are rotated to new positions at least every two hours. Tower management personnel set work schedules in accordance with FAA directives.

The floor plan of the Cab shown in Figure 2-24 illustrates the location of the controller positions when all functions are staffed. The arrangement and identification of the equipment at these positions are shown in Figures 2-25 through 2-32.

2.5 SUMMARY

Important characteristics of the ABQ tower setting are the high airfield elevation [5,352 feet (MSL)], the existence of mountainous terrain to the northeast and southeast, and the generally excellent weather pattern.

The official airspace environment of the ABQ tower is also noteworthy. IFR aircraft are provided with air traffic control service within the ABQ Terminal Area (a 25- to 35-mile radius of the ASR); there is no Terminal Control Area (TCA) established for the ABQ Tower. VFR aircraft are provided with a choice of Stage

TABLE 2-8. TYPICAL STAFFING OF TOWER CAB POSITIONS BY TIME OF DAY

TIME (LOCAL)	CAB POSITIONS					
	FD/CD	CG	LC1	CC	LC2	CS
2310-0600			X			
0601-0700	X	X	X			
0701-0730	X	X	X			X
0731-2100	X	X	X	X ← or →	X	X
2101-2309		X	X			

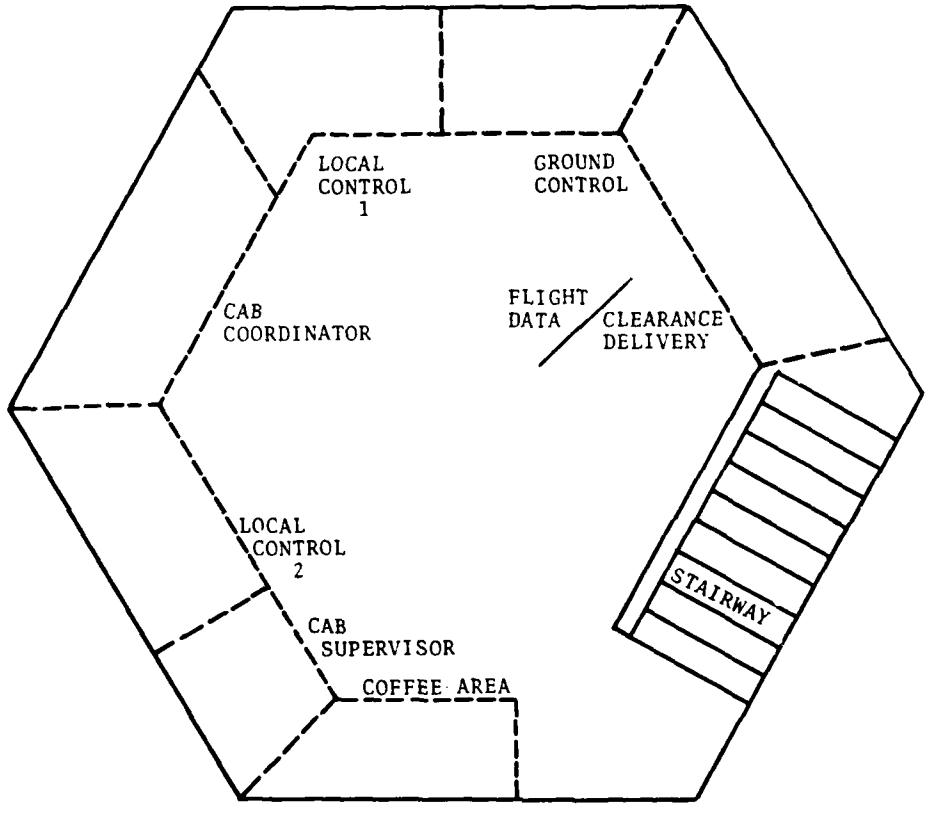
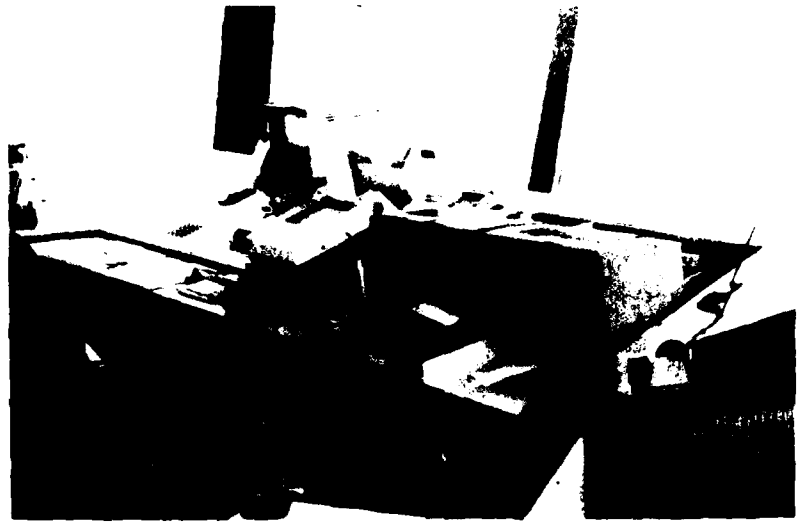
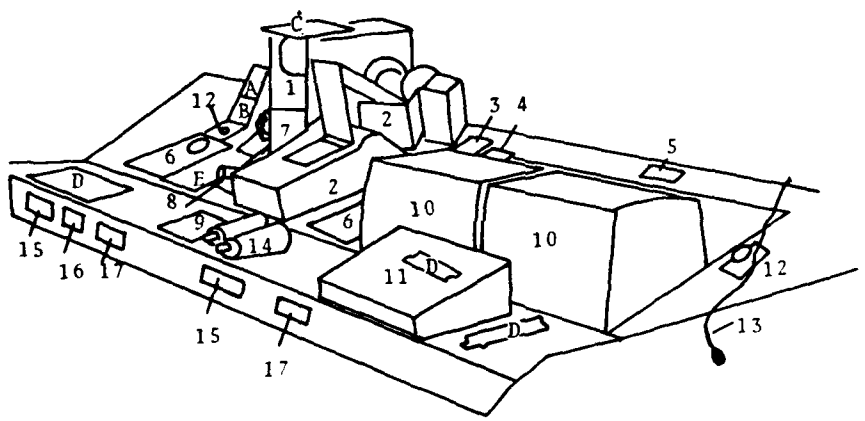


FIGURE 2-24. ABQ TOWER CAB FLOOR PLAN SHOWING CONTROLLER POSITIONS





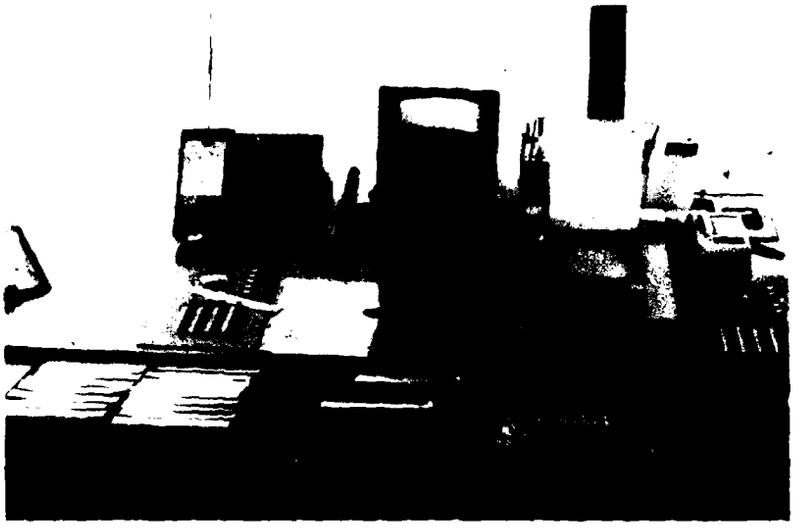
DEVICES

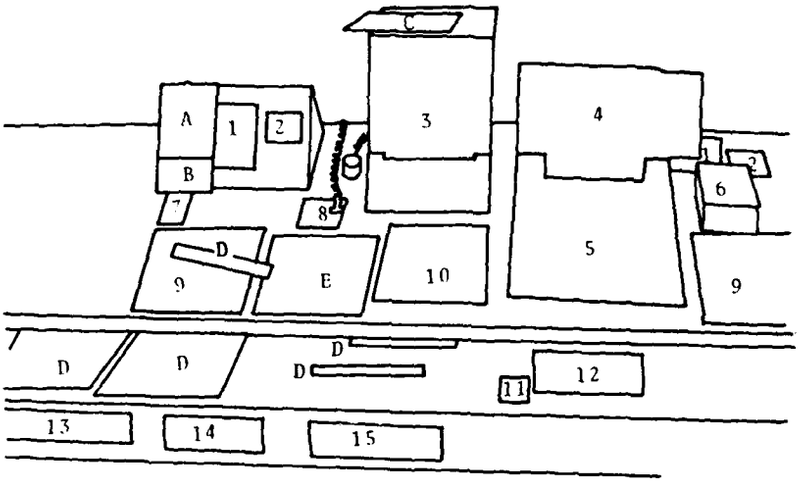
1. CONRAC MONITOR
2. ELECTROWRITER & PAPER TAKE-UP
3. TELCO SPEAKER
4. DIGITAL CLOCK
5. FDEP SELECTOR SWITCH
6. TELCO DIAL AND KEYPACK
7. ATIS RECORDING CONTROLS
8. FAA COMMUNICATIONS PANEL
9. ALPHANUMERIC KEYBOARD
10. FDEP PRINTERS
11. FDEP KEYBOARD
12. LIGHT RHEOSTAT
13. SHADE CORD
14. BINOCULARS
15. TELCO JACKS
16. FAA RADIO JACK
17. FLIGHT STRIP BIN

PAPER

A. POSITION LOG
B. POSITION RELIEF BRIEFING GUIDE
C. ATIS RECORDING FORMAT
D. FLIGHT STRIPS
E. OUTBOUND & INBOUND ROUTING CHART

FIGURE 2-25. FLIGHT DATA/CLEARANCE DELIVERY (EMPHASIS ON FLIGHT DATA)





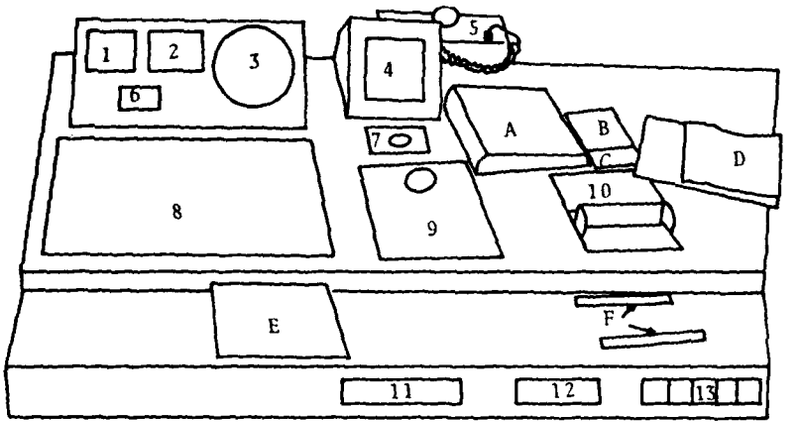
DEVICES

1. TELCO SPEAKER
2. DIGITAL CLOCK
3. CONRAC MONITOR
4. ELECTROWRITER PAPER TAKE-UP
5. ELECTROWRITER
6. ELECTROWRITER SELECTOR SWITCHES
7. LIGHT RHEOSTAT
8. ATIS RECORDING CONTROLS
9. TELCO DIAL & KEYPACK
10. FAA COMMUNICATIONS PANEL
11. ARTS ENTER BUTTON,PEM STICK
12. ALPHANUMERIC KEYBOARD
13. TELCO JACKS
14. FAA RADIO JACK
15. FLIGHT STRIP BIN

PAPER

A. POSITION LOG
B. POSITION RELIEF BRIEFING GUIDE
C. ATIS RECORDING FORMAT
D. FLIGHT STRIPS
E. OUTBOUND & INBOUND ROUTING CHART

FIGURE 2-26. FLIGHT DATA/CLEARANCE DELIVERY (EMPHASIS ON CLEARANCE DELIVERY)



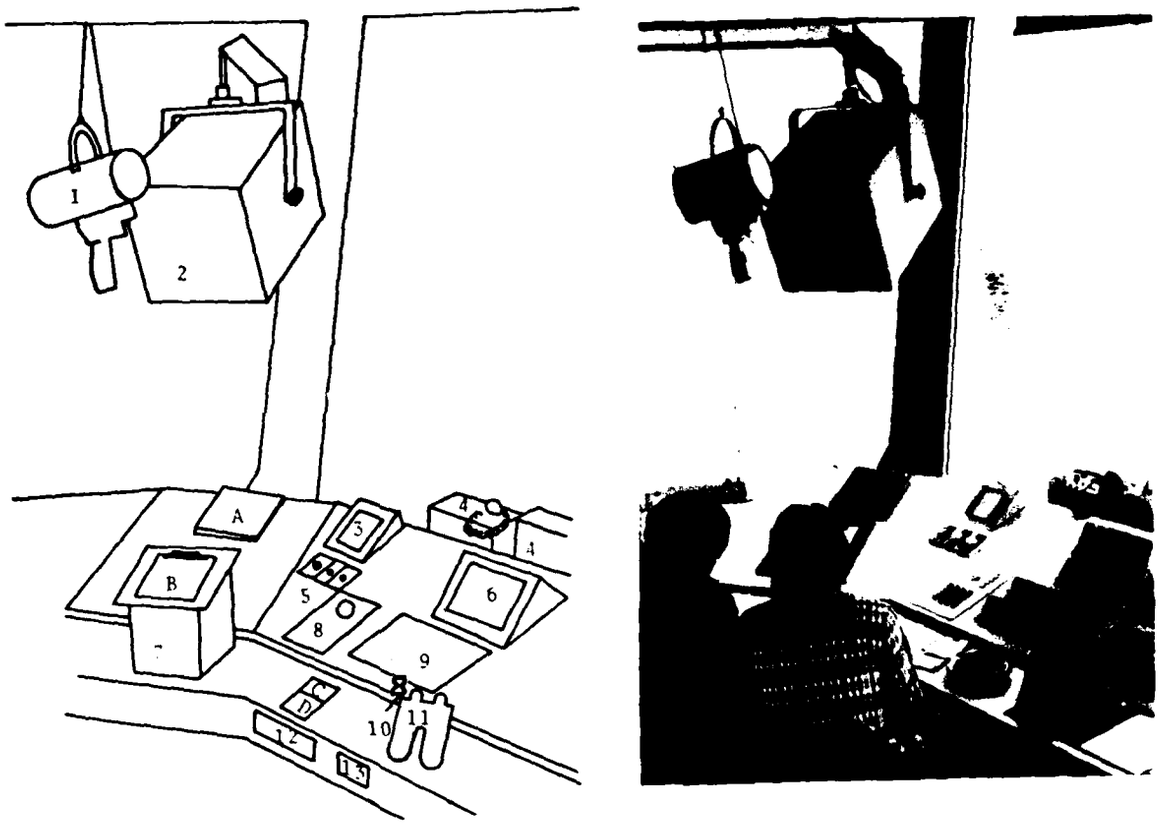
DEVICES

1. WIND DIRECTION INDICATOR
2. WIND SPEED INDICATOR
3. ANALOG ALTIMETER
4. TELCO SPEAKER
5. BACKUP VHF TRANSCEIVER
6. DIGITAL CLOCK
7. LIGHT RHEOSTAT
8. FIELD LIGHTING CONTROL PANEL
9. TELCO DIAL AND KEYPACK
10. FAA COMMUNICATIONS PANEL
11. TELCO JACKS
12. FAA RADIO JACK
13. FLIGHT STRIP BIN

PAPER

A. GROUND CONTROL POSITION BINDER
B. POSITION LOG
C. POSITION RELIEF BRIEFING GUIDE
D. AIR TRAFFIC CONTROL HANDBOOK
E. SCRATCH PAD
F. FLIGHT STRIPS

FIGURE 2-27. GROUND CONTROL



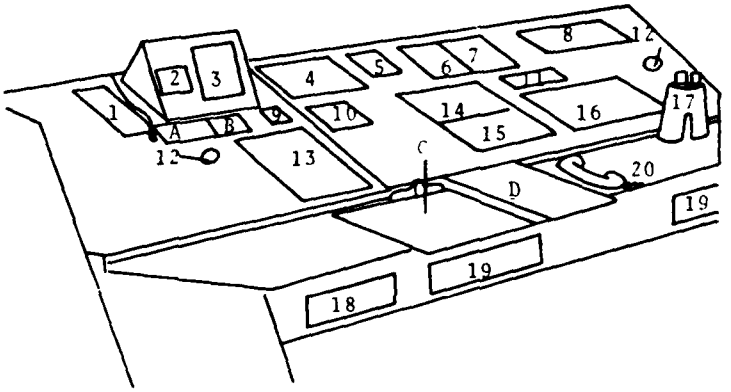
DEVICES

1. SIGNAL LIGHT
2. BRITE RADAR DISPLAY
3. TELCO SPEAKER
4. BACKUP VHF TRANSCEIVERS
5. LIGHT RHEOSTATS
6. RVR PANEL
7. PODIUM
8. TELCO DIAL & KEYPACK
9. FAA COMMUNICATIONS PANEL
10. THREE-MINUTE TIMER
11. BINOCULARS
12. TELCO JACKS
13. FAA RADIO JACK

PAPER

A. REFERENCE NOTEBOOK
B. HOURLY TRAFFIC COUNT
C. POSITION LOG
D. POSITION RELIEF BRIEFING GUIDE

FIGURE 2-28. LOCAL CONTROL 1



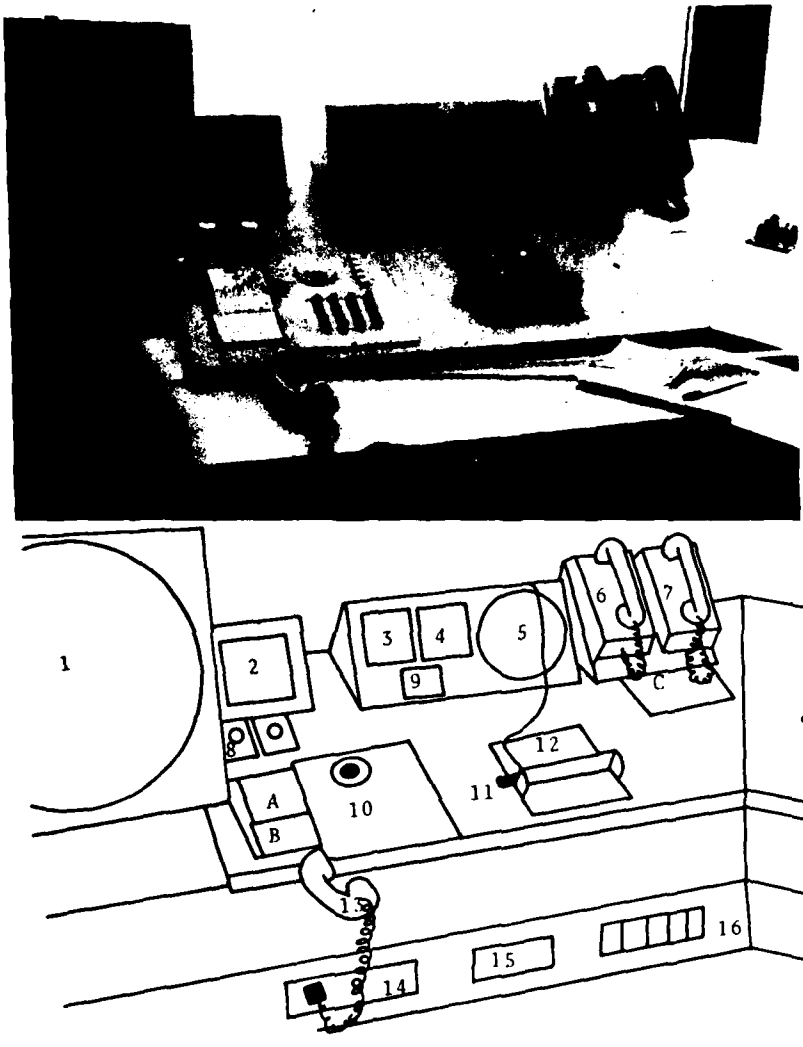
DEVICES

1. STANDBY SELECTOR PANEL FOR FAA FREQUENCIES
2. DIGITAL CLOCK
3. TELCO SPEAKER
4. AURAL ALARM CONTROL PANEL
5. ILS MONITOR PANEL
6. VASI MONITOR PANEL
7. VASI CONTROL PANEL
8. BAK-14 ARRESTING SYSTEM CONTROL PANEL
9. LIGHT RHEOSTAT
10. ILS-DME MONITOR PANEL
11. VIDEO MAP SELECTOR PANEL
12. DROP TUBE ACCESS
13. TELCO DIAL & KEY PACK
14. BRITE RADAR CONTROL PANEL
15. ALPHANUMERIC CONTROL PANEL
16. MALSR CONTROL PANEL
17. BINOCULARS
18. TELCO JACKS
19. FLIGHT STRIP BIN
20. TELEPHONE HANDSET

PAPER

A. POSITION LOG
B. POSITION RELIEF BRIEFING GUIDE
C. MILITARY ARRIVAL/DEPARTURE LOG
D. AIRMAN'S INFORMATION MANUAL

FIGURE 2-29. CAB COORDINATOR



DEVICES

1. BRITE RADAR DISPLAY
2. TELCO SPEAKER
3. WIND DIRECTION INDICATOR
4. WIND SPEED INDICATOR
5. ANALOG ALTIMETER
6. EMERGENCY TELEPHONE
7. KIRTLAND RESCUE TELEPHONE
8. LIGHT RHEOSTATS
9. DIGITAL CLOCK
10. TELCO DIAL AND KEYPACK
11. SHADE CORD
12. FAA COMMUNICATIONS PANEL
13. TELEPHONE HANDSET
14. TELCO JACKS
15. FAA RADIO JACK
16. FLIGHT STRIP BIN
17. RADIO COMMUNICATIONS RECORDER STATUS PANEL (CC POSITION)

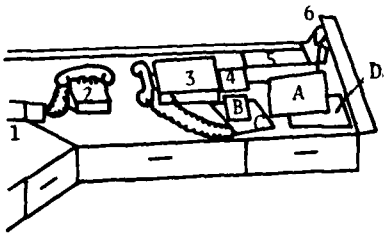
PAPER

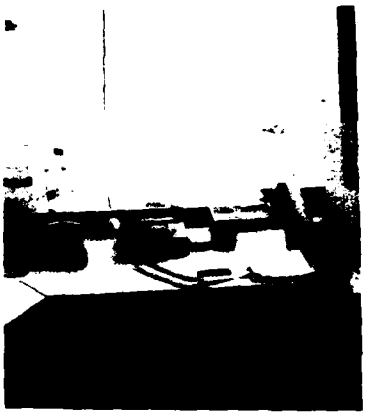
A. POSITION LOG

B. POSITION RELIEF BRIEFING GUIDE.

C. EMERGENCY RESPONSE TIME LOGGING INSTRUCTIONS

FIGURE 2-30. LOCAL CONTROL 2





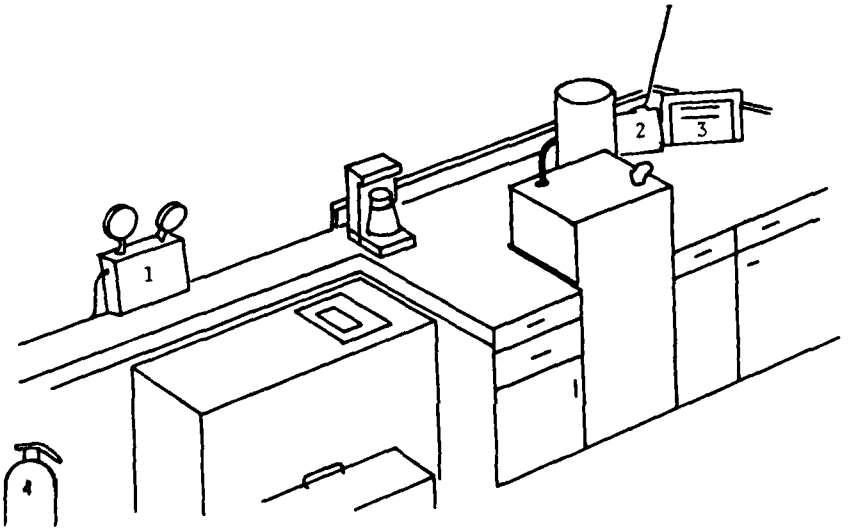
DEVICES

1. HEADSET POUCH
2. CITY SECURITY RADIO
3. DESK TELEPHONE
4. TELEPHONE INDEX
5. INTERCOM SET
6. TAPE DISPENSER

PAPER

A. HOURLY TRAFFIC COUNT
B. INSTRUMENT APPROACH PROCEDURES REFERENCE
C. TRAINING EVALUATION SHEET
D. TOWER STATUS SHEET

FIGURE 2-31. CAB SUPERVISOR



DEVICES

1. BATTERY POWERED LIGHTS
2. PORTABLE FIRE & RESCUE RADIO
3. DIGITAL CLOCK
4. FIRE EXTINGUISHER

FIGURE 2-32. COFFEE AREA

I, II, or III radar service within a Terminal Radar Service Area (TRSA) which extends to a 10-mile radius from the ASR.

Aircraft operations feature a diversified mix of air carrier, air taxi, general aviation and military flights. The high percentage of general aviation (over 50 percent) and military (approximately 20 percent) operations provides a strong qualitative dimension to the aircraft operations for Albuquerque. A large percentage of controller time is expended on servicing the special needs of military operations and in providing civilian VFR aircraft with Stage III radar service.

Daily Tower traffic at ABQ is concentrated between 7:30 a.m. and 7:30 p.m. with the peak hours occurring in the mid-afternoon period. General Aviation and military flights make Thursday and Friday the busiest days of the week.

Secondary airport operations represent a very small percentage of ABQ tower work load; four non-towered airports are located within the Terminal Area and primarily serve local general aviation activity.

3. EQUIPMENT

Equipment in the Tower Cab and TRACON is described in this section from the controller's point of view. The tower locations, users, manner of use, and a picture are presented for each type of equipment.

3.1 TIME AND WEATHER INFORMATION

The locations in the Cab and TRACON of the equipment described in this section are shown in Figures 3-1 and 3-2, respectively.

3.1.1 Time: Console Clock (Figure 3-3), Radar Display

a) Locations (Figures 3-1, 3-2)

Console Clock	Radar Display
Local Control 2 (LC-2)	Local Control 2
Cab Coordinator (CC)	Local Control 1
Ground Control (GC)	Flight Data/Clearance Delivery
Flight Data/Clearance	Low North Radar
Delivery (FD/CD)	Low South Radar
Cab Supervisor (CS)	High South Radar
	High North Radar
Low North Radar (LNR)	
Low South Radar (LSR)	
High South Radar (HSR)	
High North Radar (HNR)	
TRACON Supervisor (TS)	

b) Users and Sources

Time is used by the controllers to reference events for the record, coordinate traffic flow and to give pilots time checks. The CC records the time on the Facility Operation Log (see Flight Data Section, Figure 5-4) whenever a military aircraft arrives or departs. He obtains the time from the console clock at his position or from the BRITE display at LC-1. LC-1 and LC-2 provide time

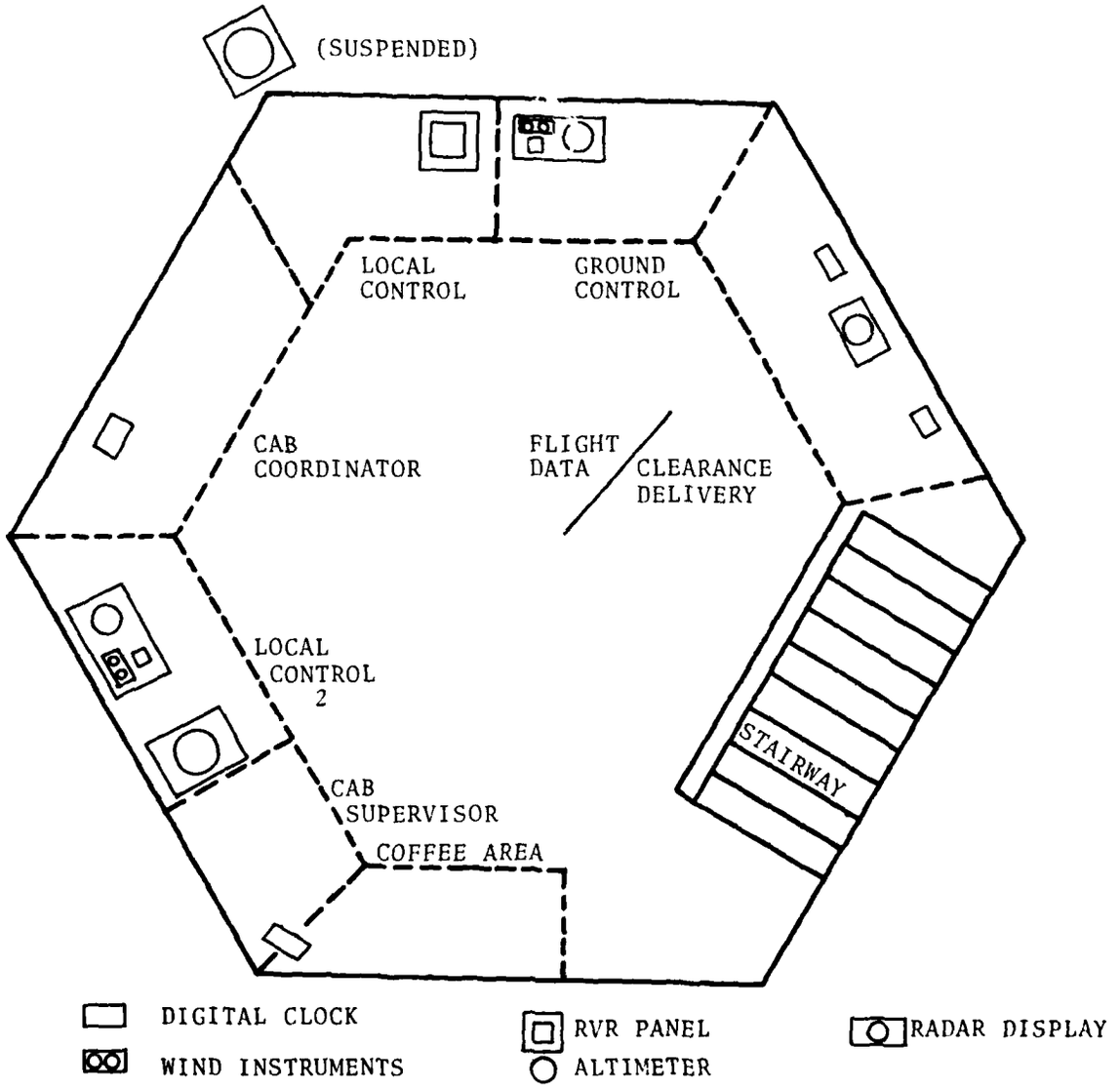


FIGURE 3-1. LOCATION OF WEATHER EQUIPMENT AND CLOCKS IN CAB

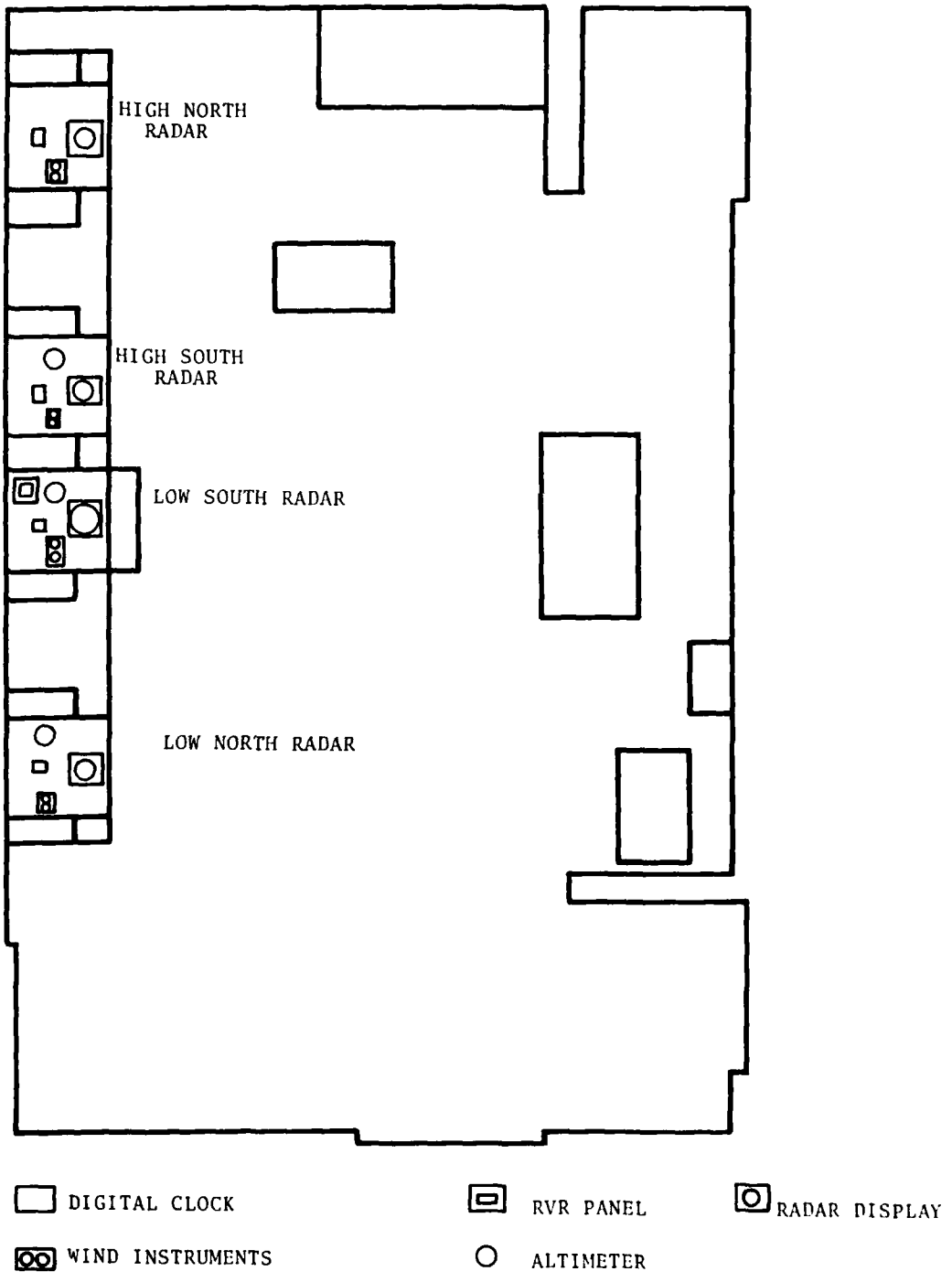


FIGURE 3-2. LOCATION OF WEATHER EQUIPMENT AND CLOCKS IN TRACON

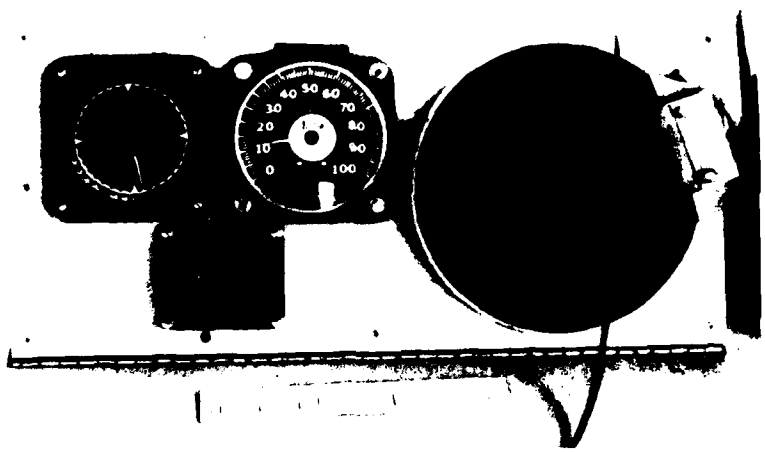


FIGURE 3-3. WEATHER INSTRUMENTS AND CLOCK AT THE LOCAL CONTROL 2 POSITION

to pilots at their request and record time on each hour on their Hourly Traffic Count forms. LC-1 has ready access to the clock at GC as well as the BRITE display and LC-2 has a console clock and BRITE display. GC uses the console clock for time checks with pilots and to relay hold times if there is an unusual delay for a taxiing aircraft. FD/CD uses either the clock to the left of the CONRAC monitor or the monitor itself to give pilot time checks and to relay engine start times and gate hold times to pilots. He also checks the time to determine when to update the hourly ATIS message. Between the CS and the coffee area there is a digital clock that gives local time. It is used primarily by the CS in determining shift and break times. In the TRACON, the controllers use time when giving information concerning navigation and to tell pilots when to expect instructions from the tower if they are in a holding pattern. The radar controllers as well as High South Coordinator (HSC) and Arrival/Departure Data (A/DD) can obtain the time from either the ARTS display or the console clock at the adjacent radar positions. The clock at the Team Supervisor Desk is used when logging entries on the Daily Record of Facility Operation (Form 7230-4) and for scheduling purposes.

c) Discussion

The console clocks in the Cab and TRACON are all driven and set independently. According to ATC procedures, time information must be provided to the pilots with 15-second accuracy. For this reason, many of the controllers prefer to obtain time from the radar displays, as these are all set from one location in the TRACON and are driven by the ARTS computer. However, the console clocks in the Cab are considered to be a time saver, since they are visible from several feet away and are not as susceptible to glare as are the radar screens. In the TRACON, virtually all the time readings are made from the ARTS (because of its accuracy as well as its accessibility) except during the mid-shift when the system is down for maintenance.

3.1.2 Barometric Pressure: Analog Altimeter, Radar Display, (Figure 3-3)

a) Locations (Figures 3-1, 3-2)

Analog Altimeter	Radar Display
LC-2	LC-2
GC	LC-1
LNR	FD/CD
LSR	LNR
HSR	LSR
	HSR
	HNR

b) Users and Sources

All controllers except the coordinator positions and the A/DD Position issue altimeter information to pilots. FD/CD uses the analog altimeter at GC on the hour to determine the reading for the ATIS message and the ARTS display. The other controller positions give altimeter information to pilots at their request, when a pilot does not give the ATIS code, and when significant fluctuations (0.01 inches or more) have occurred since the last ATIS recording. The LNR and LSR positions issue actual altimeter readings more often than the High Radar positions because the former work with more student pilots, who request the information more often and require more precise readings. HNR does not have an analog altimeter and so must use the ARTS-III value, or ask HSR for the latest reading.

c) Discussion

Controllers prefer to take the altimeter readings from the radar displays, although they may be up to an hour old, because they are consistent with the ATIS message that the pilots hear. Furthermore, care must be taken when getting a reading from the analog altimeters because the indicators sometimes stick and must be tapped lightly before a reliable reading can be taken. When significant pressure changes do occur within the hour, the current reading will be given from an analog altimeter.

3.1.3 Wind Direction/Velocity: Analog Displays (Figure 3-3)

a) Locations (Figures 3-1, 3-2)

LC-2
GC
HNR
HSR
LSR
LNR

b) Users and Sources

FD/CD uses the wind instruments located at the GC position every hour for direction and velocity information to update the ATIS recording. GC issues wind information to departing pilots when they do not have the ATIS code, when there is a significant deviation between the ATIS and the current readings, and when a pilot requests it. LC-1 uses the instruments at the GC position to obtain wind information prior to giving arrival or departure clearances for runways under his control. LC-2 issues the current wind information whenever he gives arrival or departure clearance to aircraft using the secondary runways. The TRACON radar controllers issue the wind information to arriving aircraft upon initial contact when a significant difference between the ATIS and current readings exists and at a pilot's request.

c) Discussion

The wind instruments provide analog velocity and direction information from a single anemometer located southwest of the intersection of runways 7 and 35. The instruments at times seem to give information different from that of the five wind socks located on the field at various locations.

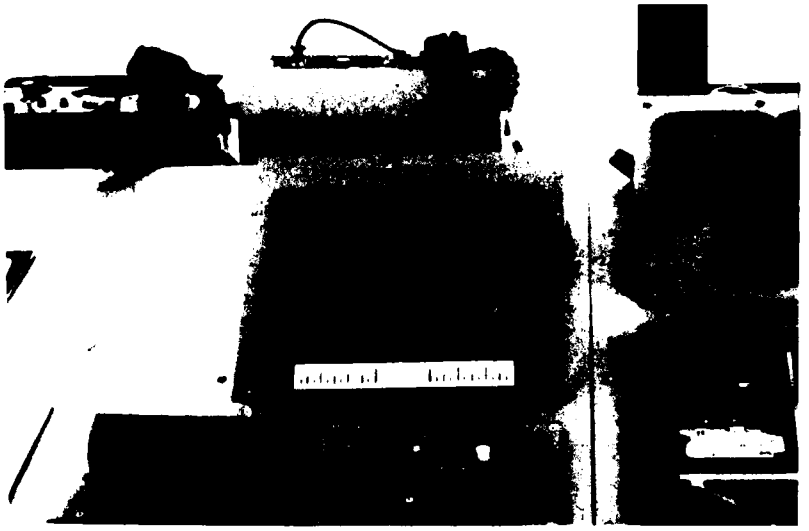


FIGURE 3-4. RVR PANEL LOCATED AT THE LOCAL CONTROL I POSITION

3.1.4 Runway Visibility: Runway Visual Range (RVR) (Figure 3-4)

a) Locations (Ref. Figure 3-1, 3-2)

LC-1
LSR

b) Users and Sources

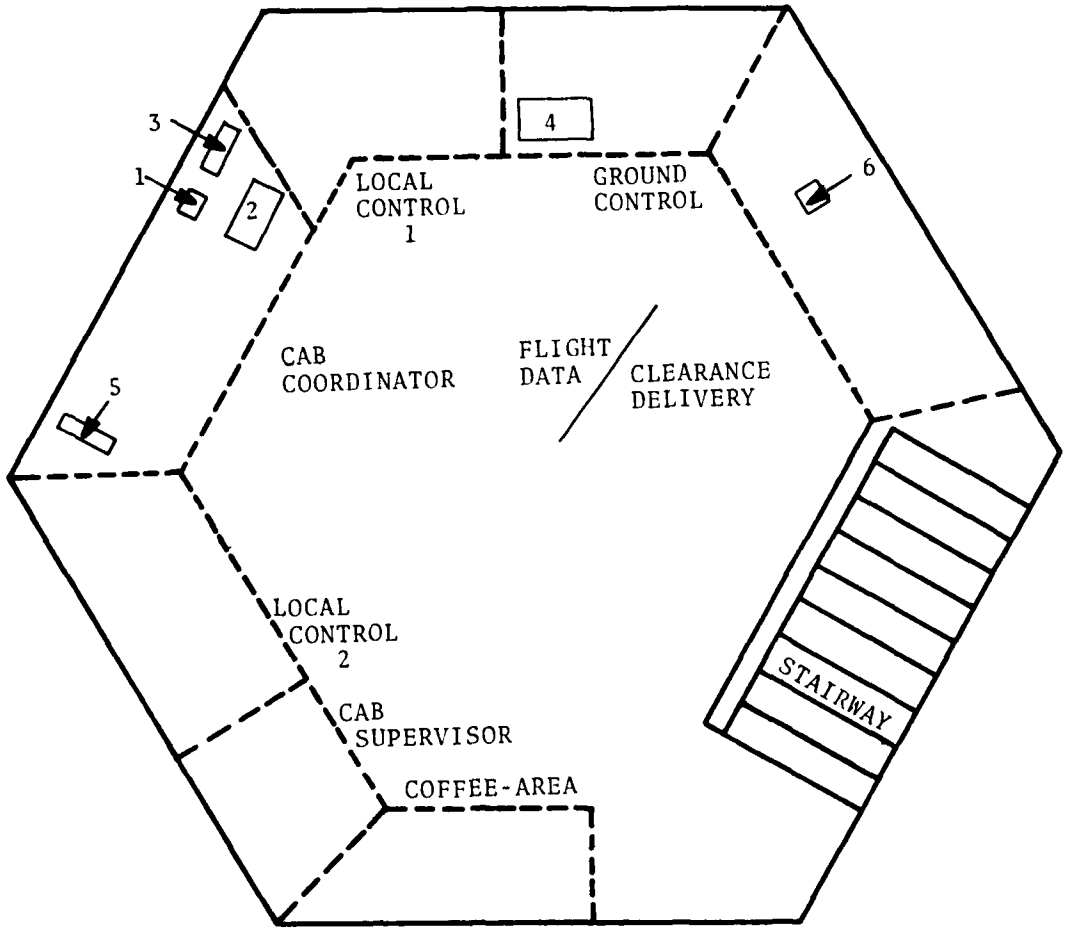
The runway visual range information is used by controllers to inform pilots of the visibility at the runway surface, whenever the the RVR reading is 6,000 feet or less. During marginal conditions, LC-1 reads the RVR approximately once every minute, and reports the information to pilots prior to arrival or departure. GC also takes the RVR reading to keep taxiing aircraft informed of visibility conditions. In the TRACON, the radar positions issue the RVR readings during marginal conditions to each approaching IFR aircraft. The Low Radar positions control primarily General Aviation aircraft during VFR conditions so these controllers do not need RVR readings often. Therefore, when momentary visibility information is critical, HNR will move to the LSR console (Figure 3-2), where the panel is located. The HSR controller can see the RVR panel from his position.

c) Discussion

The single transmissometer at the airport is located at the beginning of runway 8. The unit is always on. The controllers using the equipment make adjustments for the alarm threshholds using the control panels. However, such adjustments are rarely made. They usually leave the setting at 3000 feet because of the high level of local landing minimums at Albuquerque. The alarm is activated when visibility reaches that level, or goes below it.

3.2 CONTROL PANELS

The location of the Cab and TRACON control panels described in this section are shown in Figures 3-5 and 3-6, respectively.



1. VASI CONTROL PANEL
2. MALSR CONTROL PANEL
3. BAK-14 ARRESTING SYSTEM CONTROL PANEL
4. FIELD LIGHTING CONTROL PANEL
5. STANDBY SELECTOR PANEL FOR FAA FREQUENCIES
6. ATIS RECORDING CONTROLS

FIGURE 3-5. LOCATION OF CONTROL PANELS IN CAB

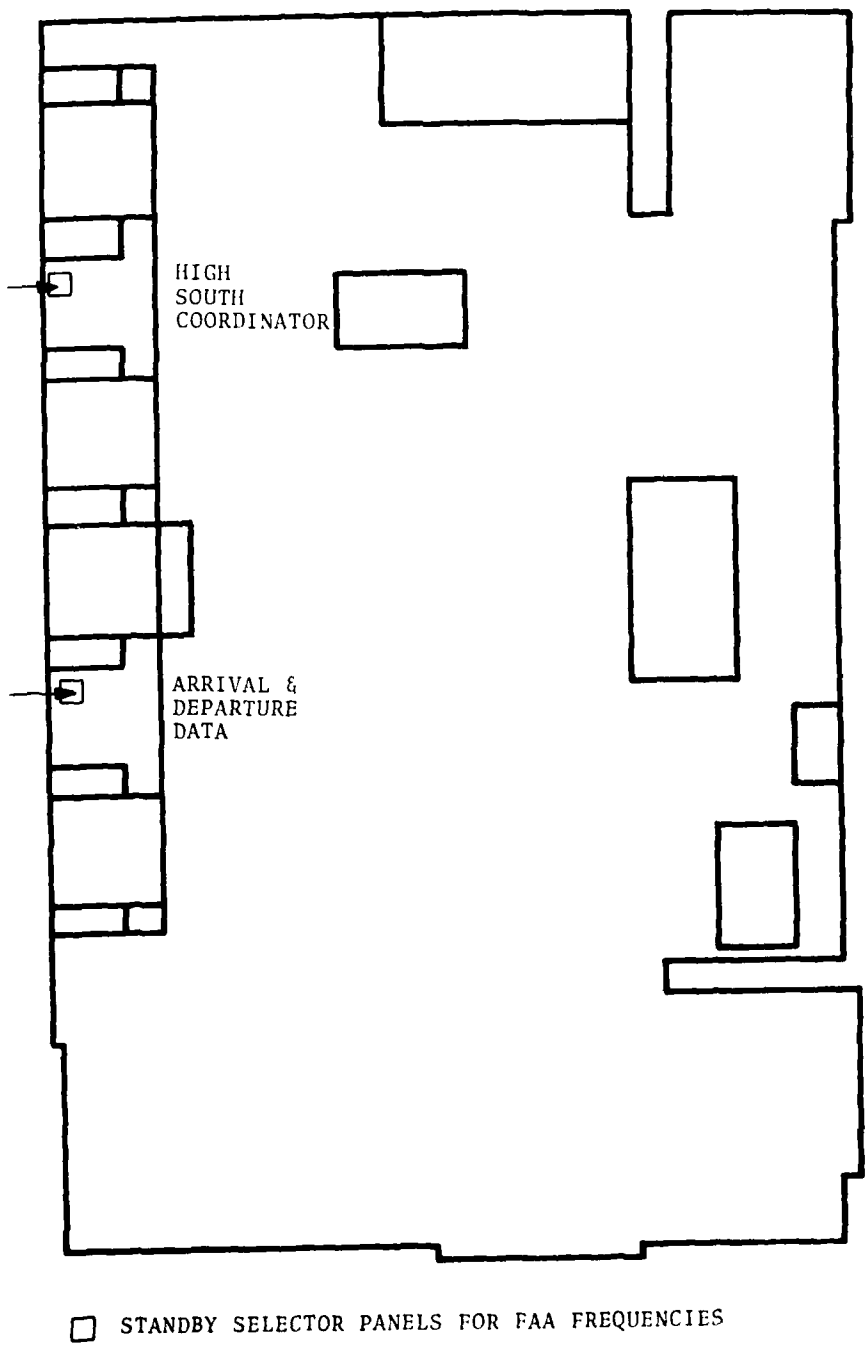


FIGURE 3-6. LOCATION OF CONTROL PANELS IN TRACON

3.2.1 Visual Approach Slope Indicator (VASI) Control Panel (Figure 3-7)

a) Location (Figure 3-5)

CC

b) Description

The VASI panel provides the means to control the 2 bar VASI on runway 8 and to monitor its operation. Using this panel the controllers can turn the system on and off, adjust the intensity of the field lights to any of three levels of brightness, test the operation of the aural alarm, and vary the alarm volume and the intensity of the panel indicator lights.

There are no monitor panels for the VASI systems on runways 26 and 35. These are equipped with light sensors that vary the intensity of the field lights automatically. The controllers must rely on field or pilot observation to determine their operational status.

c) Users

LC-1 or the CC turn the VASI on or off whenever there is a configuration change involving runway 8. Either controller sets the light intensity according to the weather and time of day. Further changes are made at dusk and dawn (medium intensity), at daylight (high intensity), at night (low intensity), and as weather changes and pilots requests require. LC-1 usually receives the pilot requests for intensity changes. Since the response must be rapid and he is close to the panel, he makes the change.

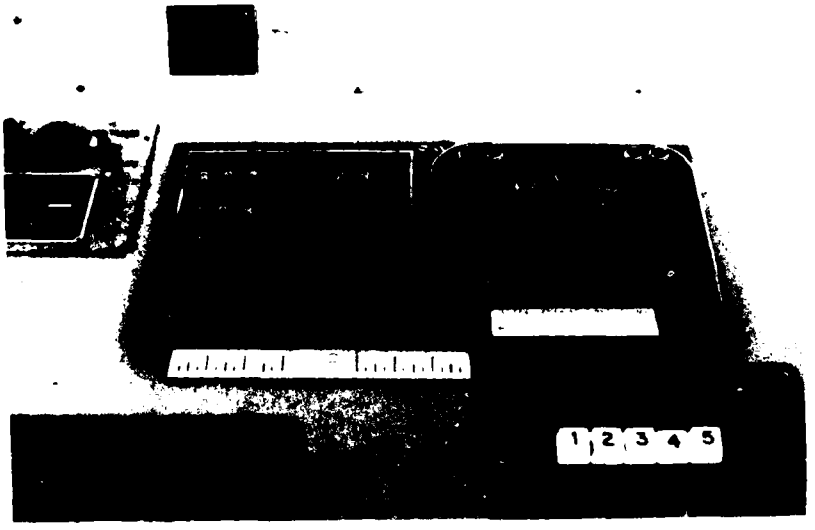
3.2.2 MALSR Control Panel (Figure 3-8)

a) Location (Figure 3-5)

CC

b) Description

This panel controls the Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR) on runway 8. The changes in settings are transmitted by radio signal to a receiver on the field.



[illegible] CAB COORDINATOR POSITION

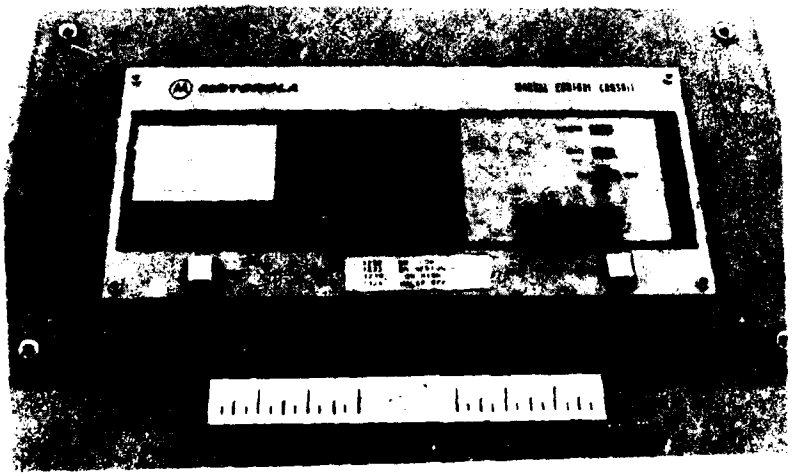


FIGURE 3-8. MALSR CONTROL PANEL AT THE CAB COORDINATOR POSITION

The panel includes an on/off switch, four sets of four selector switches, power and transmit indicator lights, and two send buttons. A four digit sequence is required for selecting the desired light intensity for the approach lights (low, medium, high, or off). The operator selects the desired code and pushes the two send buttons simultaneously to transmit the signal to the receiver. The transmit light indicates the message is being sent.

c) Users

The CC and LC-1 use this equipment. Either position turns the unit on whenever the runway edge lights are on. Changes are made as weather and daylight require and upon pilot requests. As with the VASI, pilot requests require immediate response, so are made by LC-1.

3.2.3 BAK-14 Arresting System Control Panel (Figure 3-9)

a) Location

CC (Figure 3-5)

b) Description

This panel is used to raise and lower the arresting cables that may be used to stop certain military aricraft arriving on runway 35 and departing on 17. There are similar barriers on runways 1, 7, 8, and 26. They are always in the upright position and require no control panels.

The BAK-14 control panel includes monitor lights that indicate whether the unit is on and the position of the cables, and it has switches to raise and lower the cables.

c) Users

LC-1 is the primary user of this control panel. The system is usually in the lowered position and is raised only at the request of a military pilot in what may or may not be an emergency situation. This request is made by military aircraft departing runway 17, as a precaution in case the aircraft is unable to takeoff. The barrier is raised and lowered once a day to check the equipment but is rarely required to stop aircraft.

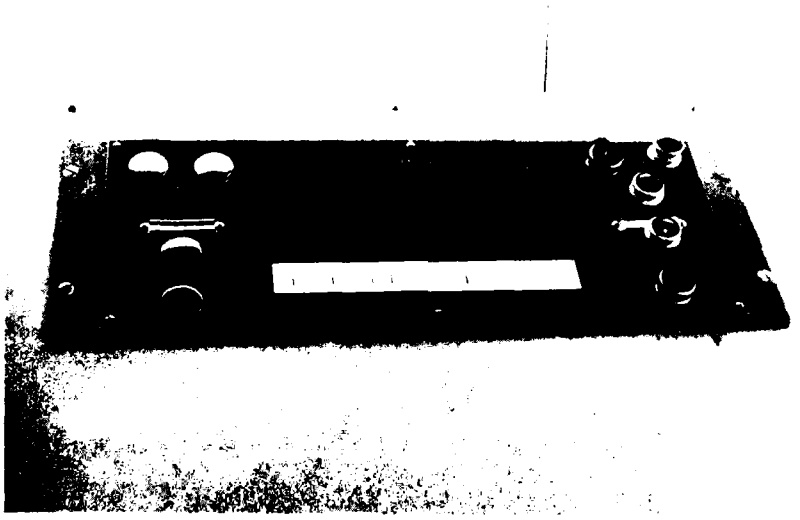


FIGURE 3-9. BAK-14 ARRESTING SYSTEM CONTROL PANEL AT THE CAB COORDINATOR POSITION

3.2.4 Field Lighting Control Panel (Figure 3-10)

a) Location (Figure 3-5)

GC

b) Description

The runway and taxiway layout is delineated on the control panel. The color coded and illuminated switches for the taxiway lights are mounted next to the taxiways that they affect. The power switch for the control panel, the on/off switches for the edge lights of the eight runways, and the intensity controls for these lights are located together in the lower left corner of the panel. Runways 8-26 and 17-35 have switches for five intensity levels and runways 12-30 and 3-21 can only be set at the three lower intensities. The brightness of the illuminated buttons and the intensity of the panel backlighting are controlled by the two knobs in the upper right corner of the panel.

c) Users

GC is the principal user of this control panel. Normally, the panel is turned on at night or whenever conditions are below VFR. Usually, the proper lights are turned on and the panel is not used again unless light or weather conditions change, or a different runway configuration is used. Infrequently, the city asks that certain lights be turned on for maintenance purposes during VFR conditions. These requests are received by the CS, who carries them out himself. Occasionally, the Local Controllers receive pilot requests to flash particular runway lights as a signal to show him where to land. LC-1 then reaches over to the panel and does this himself. Since LC-2 is located away from the panel, he relays such messages to GC who flashes the proper lights. LC-2 however, receives very few requests of this sort, since he operates primarily in VFR weather.

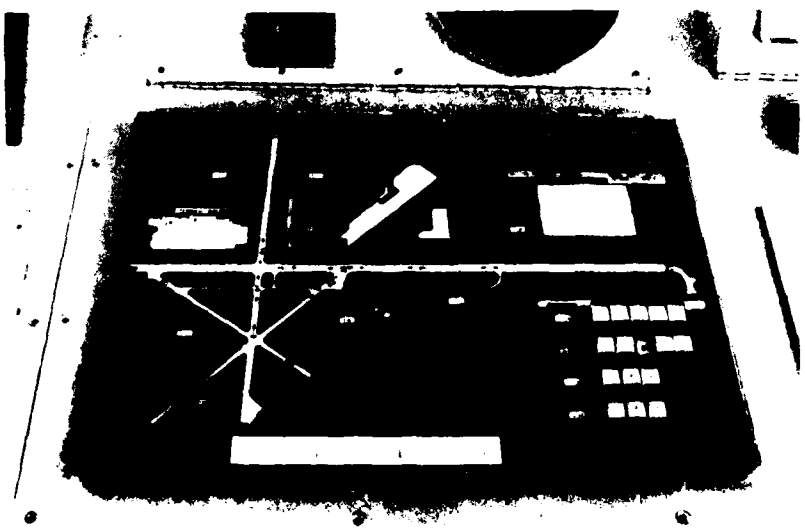


FIGURE 3-10. FIELD LIGHTING CONTROL PANEL AT THE GROUND CONTROL POSITION

3.2.5 Standby Selector Panels for FAA Frequencies

a) Locations (Figures 3-5-3-6)

CC
A/DD (Figure 3-11)
HSC (Figure 3-12)

b) Description

The panels are used to select backup transmission and receiving channels for the FAA radio frequencies used in air-ground communications by the controllers. Backup channels are used when communications over the normal channels are difficult to understand and when requested by Airway Facilities (AF). The panel in the Cab covers the frequencies used by the Cab controllers and two panels in the TRACON cover the frequencies used by the radar controllers.

c) Users

Panels tend to be operated by the controllers in whose consoles they are mounted, but may be used by any controller near the panel at the time of need. Usually the controller with a radio communications problems asks a free controller, supervisor or coordinator near the panel to make the selection. The panel in the Cab is used by the CC and Local Control positions. The operation of the panels in the TRACON is also shared: the A/DD's with the Low Radar controllers and the HSC's with the High Radar controllers.

3.2.6 ATIS Recording Controls (Figure 3-13)

a) Location

FD/CD

b) Description

The ATIS control panel is used to record and monitor the operation of the Automatic Terminal Information Service (ATIS) recordings. The panel includes a microphone for making the recordings, function selector switches, and indicator lights which

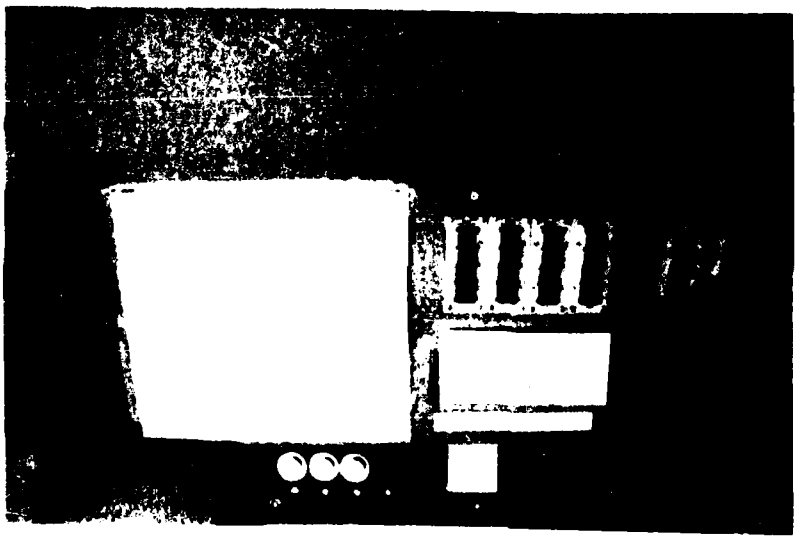


FIGURE 3-11. STANDBY SELECTOR PANEL FOR FAA FREQUENCIES AT THE ARRIVAL/DEPARTURE DATA POSITION

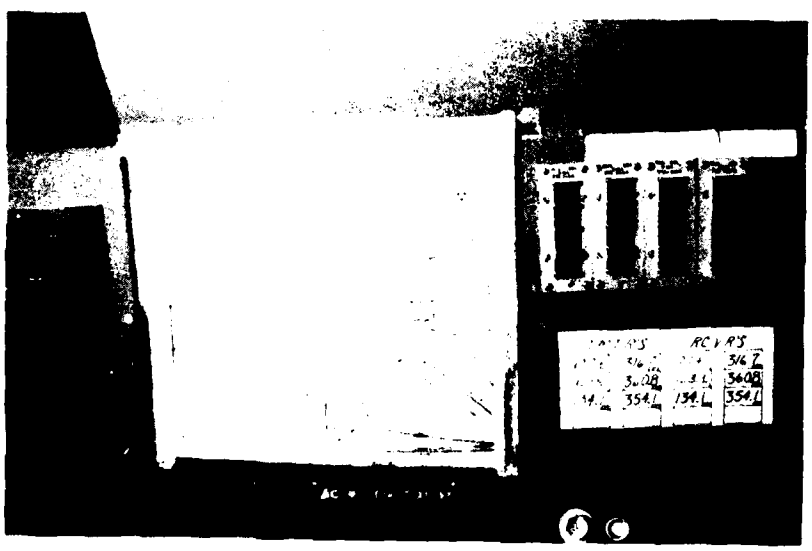


FIGURE 3-12. STANDBY SELECTOR PANEL FOR FAA FREQUENCIES AT THE HIGH SOUTH COORDINATOR POSITION

FIGURE 3-13. ATIS RECORDING CONTROLS AT THE FLIGHT DATA/CLEARANCE DELIVERY POSITION

show when the unit is on, recording, out of tape, or malfunctioning. At Albuquerque, the same message is used for arriving and departing aircraft.

c) Users

FD/CD records the ATIS message hourly unless unusual conditions require an interim message or light traffic conditions allow the use of an abbreviated format. An interim message is required if the Weather Service Forecast Office (WSFO) issues a Special Surface Aviation Weather Report (indicating significant weather changes from the previous report), the altimeter reading changes ±0.01 inches, runway configuration changes, the approach in use changes, the status of equipment in use changes, or relevant NOTAMs are cancelled or initiated. The abbreviated format may be used between midnight and dawn. It gives the ATIS code and approach in use and advises that current weather, altimeter and runway assignment will be issued by approach control or the tower. This format reduces recording time, as the same message may be used for several hours.

Before recording the ATIS message, FD/CD writes the necessary information with a grease pencil on a plexiglass covered sheet called the "ATIS Format" (Figure 3-14). This provides an easy reference for the Cab controllers and ensures all the necessary information will be recorded.

Information for the ATIS is obtained as follows: The ATIS code letter is derived alphabetically, choosing the subsequent letter whenever a new message is recorded. Time on the ATIS message is on the hour, unless a special recording is necessary. Wind and altimeter readings are taken directly by FD/CD from the instruments at GC. Other weather information is taken from the WSFO Surface Aviation Weather Reports (SA's) received hourly on the electrowriter. A density altitude caution is recorded if the temperature is over 70°F. The approach and runways in use are obtained from the CS. NOTAMs that are recorded on the ATIS are received from the Flight Service Station (FSS) over the electrowriter or from the CS (in situations in which they apply to

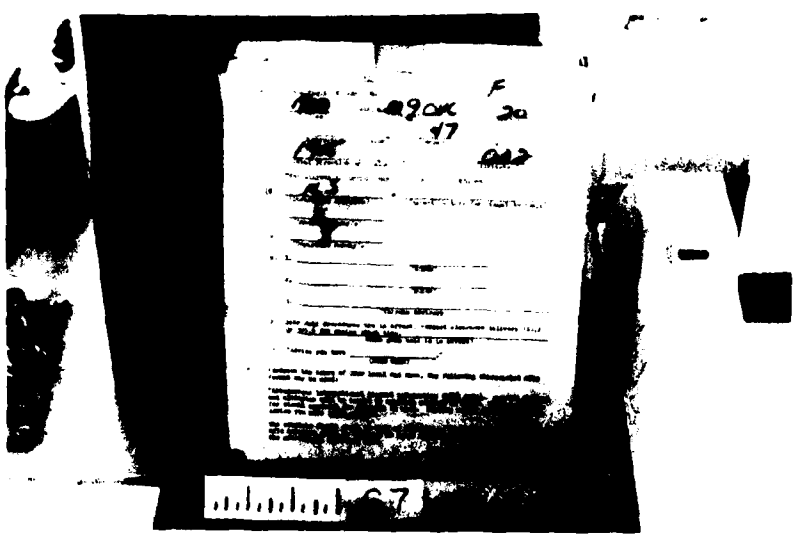


FIGURE 3-14. ATIS FORMAT AT THE FLIGHT DATA/ CLEARANCE DELIVERY POSITION

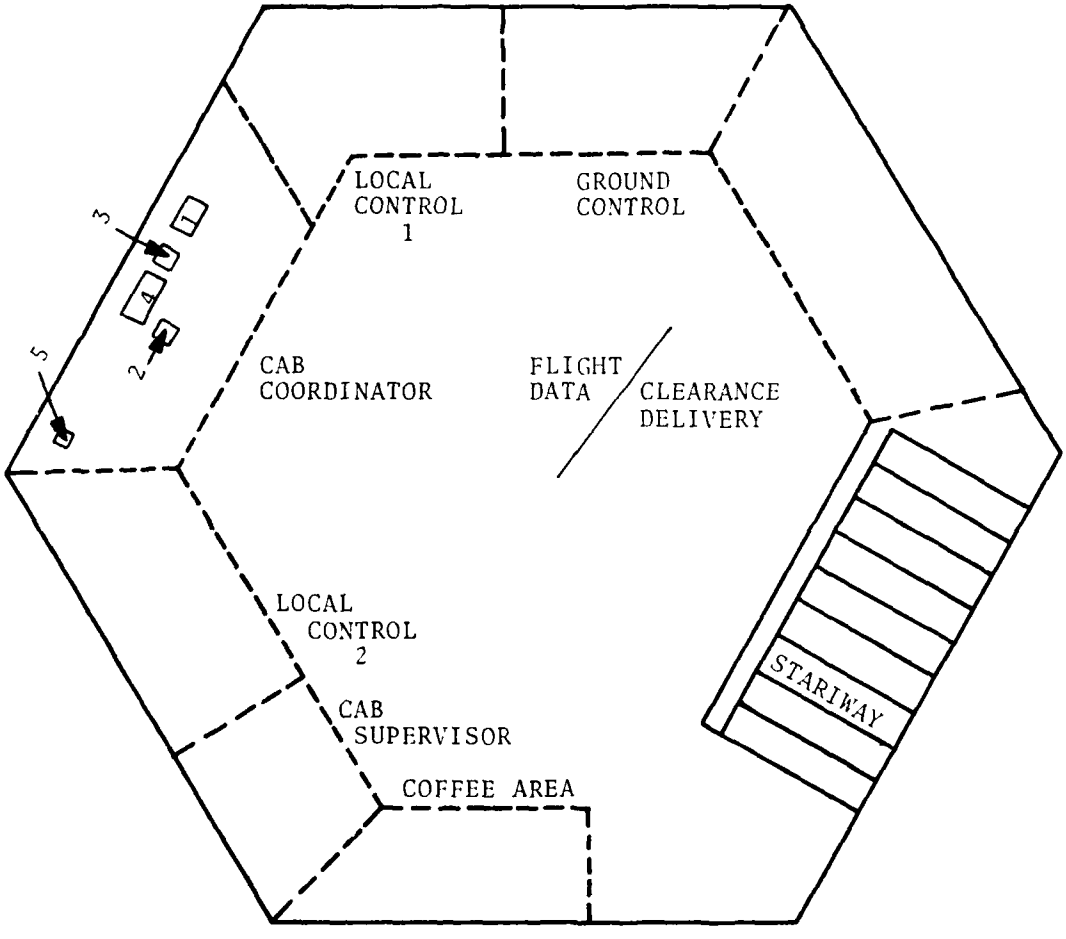
Albuquerque but have not yet been disseminated by the FSS.

After recording the ATIS message, FD/CD types the information onto the FDEP so it can be sent to the ARTCC and TRACON. HSC removes the flight strip containing the ATIS information and leaves it at his position, where it can be referenced by the controllers or TRACON Supervisor (TS). In the Cab, it is left on the FDEP keyboard.

The Local Controllers, FD/CD, and the TRACON radar controllers need the ATIS code letter to verify pilot acknowledgements on initial contact. They also need to know what significant deviations exist between the ATIS and actual conditions so they can provide pilots with updated information. Controllers become aware of differences by direct communication with FD/CD, by listening to the message over the TELCO system, reading the ATIS flight strip, or the Cab controllers can read the ATIS Format which is posted at FD/CD. ATIS information shown on the ARTS displays include the ATIS code, altimeter reading, approach and runways in use. All controllers have access to the radar displays and can compare this ATIS information with more timely data.

3.3 MONITOR PANELS

The following panels are used to monitor some of the critical equipment used at Albuquerque. These are located at the coordinator positions in the Cab and TRACON, and also at the A/DD position in TRACON as shown in Figure 3-15 and 3-16. This section gives a brief description of the equipment and how each is used. The steps taken when a malfunction is indicated are also described. These usually include informing the supervisor, who notifies the other supervisor, then they inform the affected controllers and the TS reports the failure to the responsible organization (usually AF) and logs the outage on the Daily Record of Facility Operation (Form 7230-4). An "E" is placed in the margin beside any equipment failure entry. Once the equipment failure is logged "out-of-service" (OTS) it is not used again until it is "restored to service" (RTS) by the responsible organization. This is also

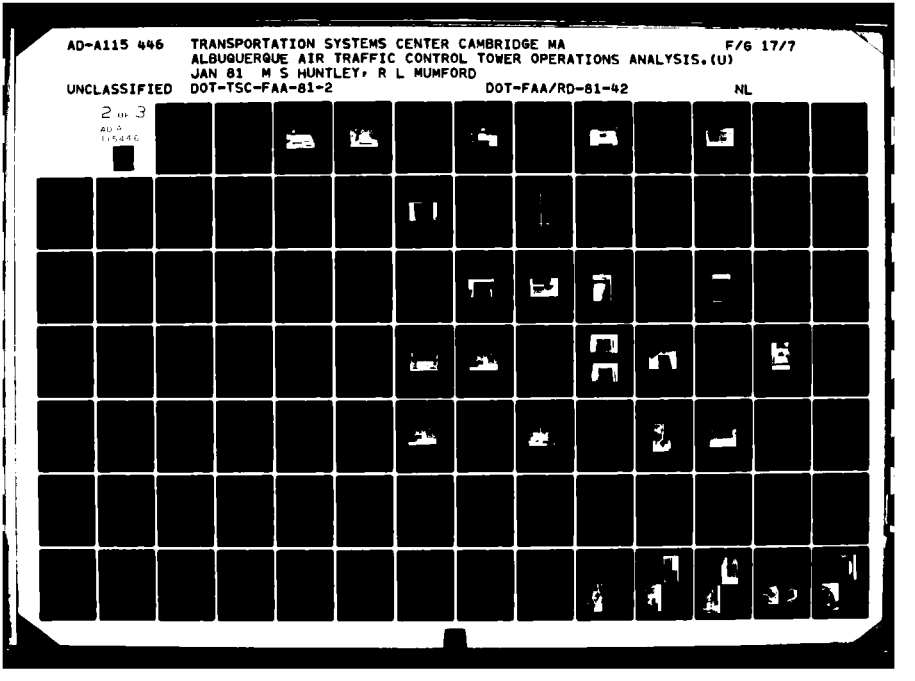


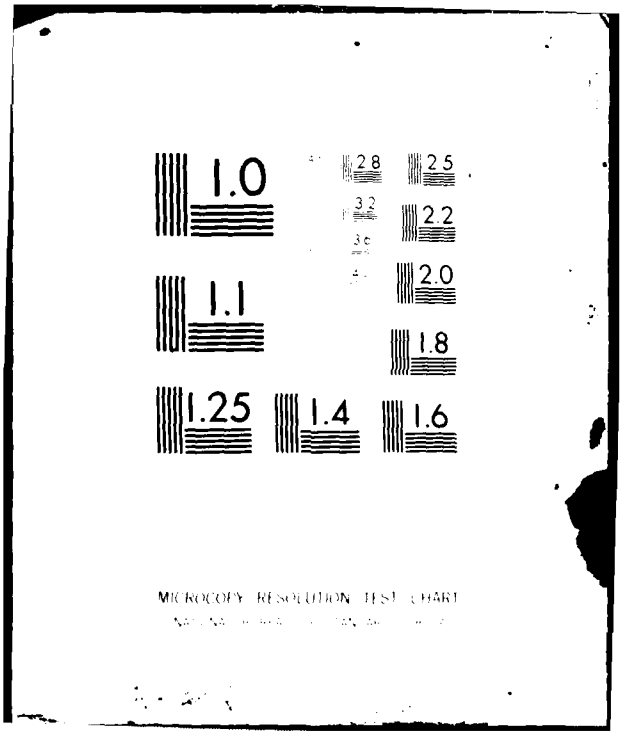
1. VASI MONITOR PANEL
2. ILS-DME MONITOR PANEL
3. ILS MONITOR PANEL
4. AURAL ALARM CONTROL PANEL
5. RADIO COMMUNICATIONS RECORDER STATUS PANEL

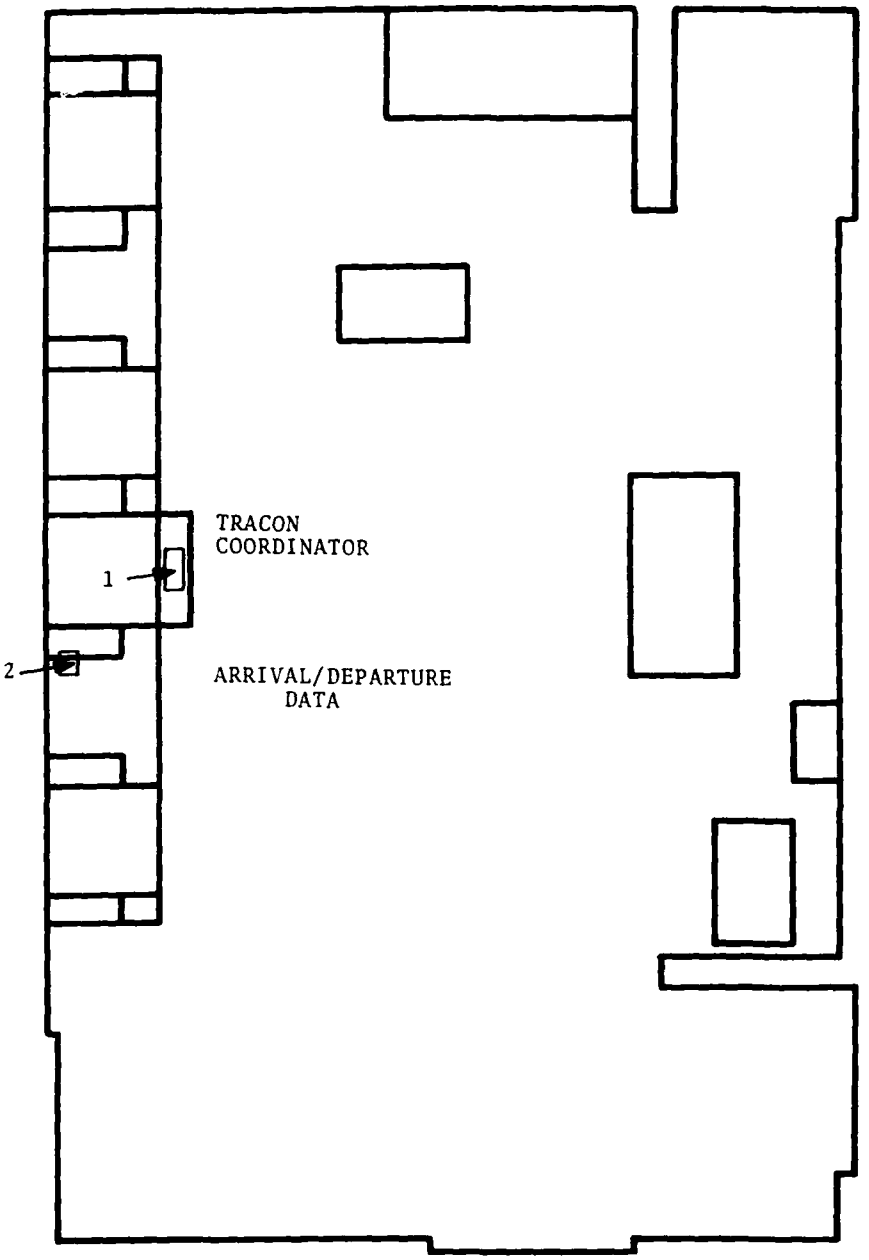
FIGURE 3-15. LOCATION OF MONITOR PANELS IN CAB

AD-A115 446 TRANSPORTATION SYSTEMS CENTER CAMBRIDGE MA F/G 17/7
ALBUQUERQUE AIR TRAFFIC CONTROL TOWER OPERATIONS ANALYSIS.(U)
JAN 81 M S HUNTLEY, R L MUMFORD
UNCLASSIFIED DOT-TSC-FAA-81-2 DOT-FAA/RD-81-42 NL

2 OF 3
AD A 115446




1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
MICROCOPY RESOLUTION TEST CHART



1. AURAL ALARM CONTROL PANEL
2. RADIO COMMUNICATIONS RECORDER STATUS PANEL

FIGURE 3-16. LOCATION OF MONITOR PANELS IN TRACON

logged and an "E" is placed in the margin. In some cases, maintenance personnel initial the entries beside the "E".

3.3.1 VASI Monitor Panel (Figure 3-17)

a) Location (Figure 3-15)

CC

b) Description

This status panel contains 12 indicator lights and a test switch. Each indicator light corresponds to a light bulb on the 2 bar VASI on runway 8. When any VASI bulbs go out on the field, the corresponding panel indicator lights come on. The panel is on whenever the VASI is turned on. This is verified and the panel lights are tested by depressing the test switch.

c) Users

The panel is monitored by the CC and LC-1 whenever runway 8 is in use. These controllers observe the status panel whenever the runway 8 VASI is turned on or intensity levels are changed. When a bulb fails, the CC or LC-1 inform the CS, who notifes AF. Problems such as these are usually not logged. If the problem is greater, such as an entire bar or side failing, the CS notifies the TS, who notifies AF and logs the outage as previously described. In the latter case, the CC, LC-1, FD/CD and all the TRACON radar controllers are notified.

3.3.2 ILS-DME Monitor Panel (Figure 3-18)

a) Location (Figure 3-15)

CC

b) Description

This panel is used to indicate the status of the Distance Measuring Equipment (DME) portion of the ILS with aural and visual alarms. A green light indicates normal operation, yellow means it is malfunctioning and red means the system is shutdown. The aural alarm is activated whenever the yellow or red lights go on. There

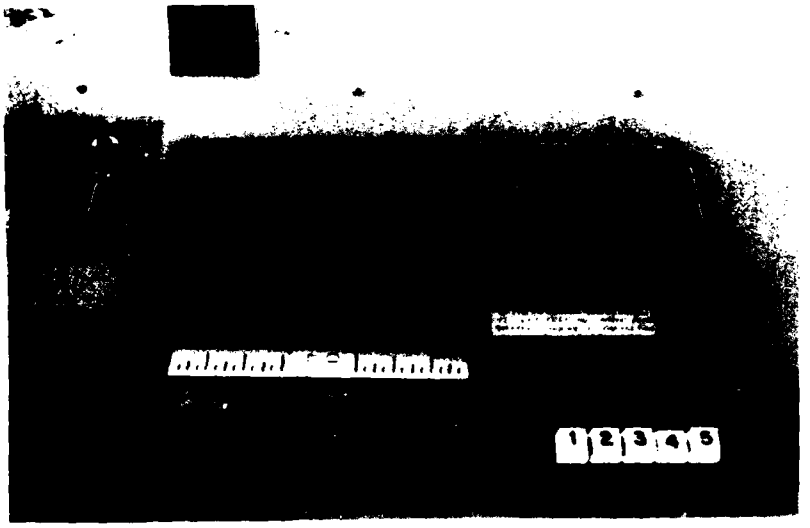


FIGURE 3-17. VASI MONITOR PANEL AT THE CAB COORDINATOR POSITION

FIGURE 3-18. ILS-DME MONITOR PANEL AT THE CAB COORDINATOR POSITION

are controls for adjusting the aural alarm volume and for turning it off.

The DME system has an automatic resetting feature. If a malfunction occurs, the system shuts off for 30 seconds, then attempts to reset. If it does not return to normal operation, the second time it will go down for a longer period, then attempts to reset once more. If it is unsuccessful this time, it shuts down entirely.

c) Users

This status panel is monitored by the CC and, less frequently, by LC-1. No operation is required unless the aural alarm is activated. When this occurs, the alarm is silenced, usually by the CC, and the Cab Supervisor is informed. He calls the TS, who notifies AF and logs it Out of Service (OTS) on the Daily Record of Facility Operation (Form 7230-4). If the unit resets and indicates normal operation, the same personnel are notified but AF still checks the system before it is used. In this case, the CC, LC-1, FD/CD and all the TRACON controllers except the Low Radar positions are notified.

3.3.3 ILS Monitor Panel (Figure 3-19)

a) Location (Figure 3-15)

CC

b) Description

The panel displays the status of the localizer (LOC) and glide slope (GS) portions of the ILS by means of an aural alarm and indicator lights. Each part of this system has a red and a green light, to show when it is "in alarm" or operating properly, respectively. The system's aural alarm is controlled by a volume knob and silence switch.

The panel is on unless the ILS is out of service due to a malfunction or maintenance. This system has a resetting feature similar to that of the ILS-DME.

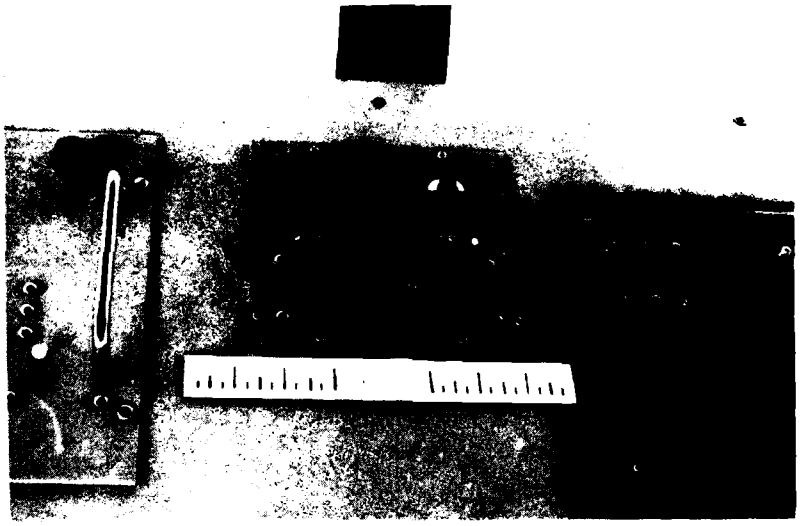


FIGURE 3-19. ILS MONITOR PANEL AT THE CAB COORDINATOR POSITION

c) Users

This panel is monitored by CC and LC-1. When the Glide Slope malfunctions, landing minimums are raised substantially. When the Localizer fails, the ILS approach is cancelled. When the alarm is activated, either the CC or LC-1 observe the panel to identify which portion of the ILS is malfunctioning, then the alarm is silenced. The CS is notified by either of the controllers.

The Cab Supervisor informs CC, LC-1, FD/CD and the TS. The latter notifies the High Radar controllers. Then he calls AF and logs the outage. The equipment remains out of service until AF notifies the tower. Since the Glide Slope and Localizer are critical parts of the ILS, the panel is monitored continuously by the CC and LC-1.

3.3.4 Aural Alarm Control Panel (Figure 3-20)

a) Locations (Figures 3-15, 3-16)

CC

TC

b) Description

The Aural Alarm Control Panel for the Conflict Alert/Low Altitude Alert System indicates when separation and altitude minimums of aircraft within the terminal area are violated. The alarm provides a warning before a potential collision or low altitude problem occurs. Flashing data blocks on the radar display call attention to the aircraft concerned.

The green indicator light shows the system is on and operating properly and the red light indicates a malfunction. The volume control knob and a test button are for the alarm itself and the on/off switch controls power to the panel. The switch is left on unless there is a continuous alarm caused by the malfunction.

c) Users

The Cab and TRACON Coordinator positions are the only actual users of the panel. They are responsible for seeing that the unit remains on and for setting the volume control to the desired level.

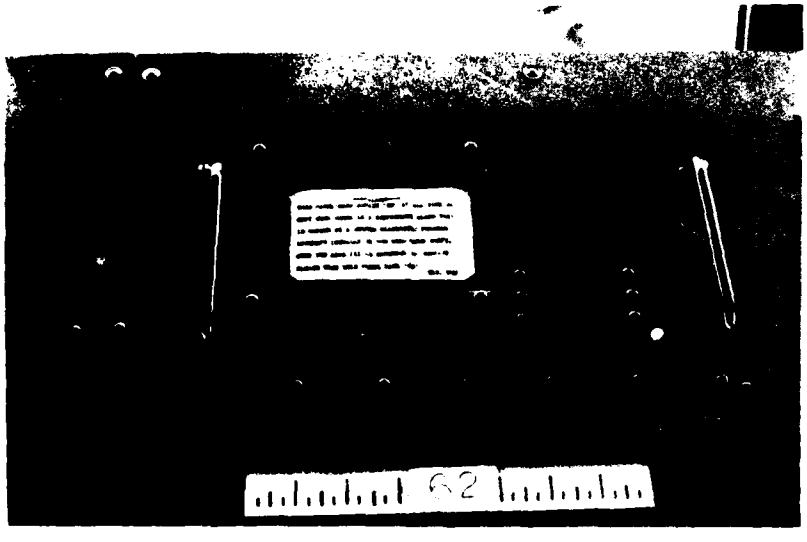


FIGURE 3-20. AURAL ALARM CONTROL PANEL AT THE CAB COORDINATOR POSITION

When the alarm sounds, the TRACON radar controllers and the Local Controllers check the radar displays to see which aircraft are affected. The controller responsible for the aircraft assesses the validity of the alarm and, if not a false alarm, alerts the pilot of the situation and advises him of appropriate corrective action if necessary.

3.3.5 Radio Communication Recorder Status Panel (Figure 3-21)

a) Locations (Figure 3-16)

CC
A/DD

b) Description

This panel is used to monitor the radio communications recorder in the equipment room. The panel has an aural alarm, an alarm silence switch, reset buttons, and indicator lights.

c) Users

The Recorder Status Panel in the Cab is nonfunctional. A/DD (usually manned by the TS) observes the TRACON panel periodically to make sure it is operating properly. When the alarm sounds to indicate one of the tapes has runout, the controller writes the time on a flight strip and the alarm is turned off. The TS sees that the tape is changed. Meanwhile, a second tape engages so recordings continue.

When the tape is changed by the TS or AF (the main recorders are in the equipment room), the event is logged on a form located with the recorders.

3.4 SUMMARY

The contents of this chapter on equipment are summarized in Tables 3-1 and 3-2 which illustrate the distribution of tower equipment among the controller positions in the Cab and TRACON respectively and the access of controllers to this equipment. Equipment provided with automatic status monitoring is also indicated.

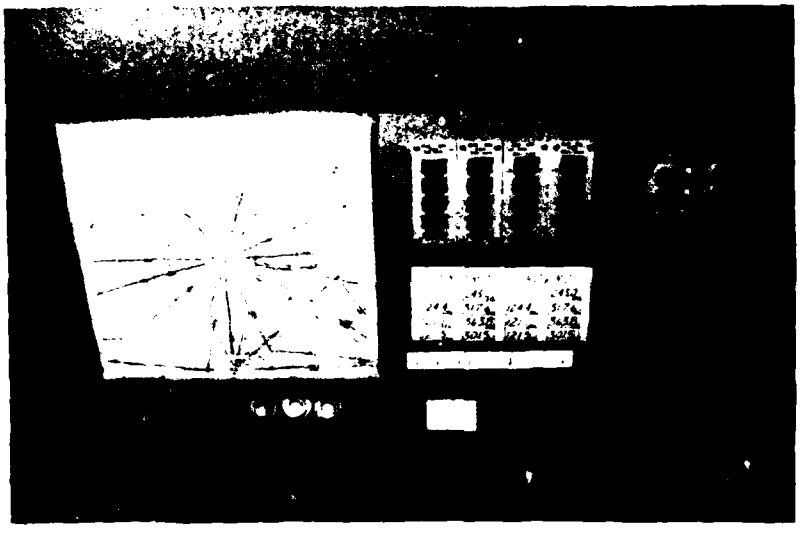


FIGURE 3-21. RADIO COMMUNICATIONS RECORDER STATUS PANEL AT THE ARRIVAL/DEPARTURE DATA POSITION

TABLE 3-1. CAB EQUIPMENT DISTRIBUTION AND CONTROLLER ACCESS

ITEMS	CS	LC-2	CC	LC-1	GC	FD/CD
Operational Display Info						
Console Clock	⊗	⊗	⊗	x	⊗	⊗
Analog Altimeter		⊗		x	⊗	O
Wind Instruments		⊗		x	⊗	O
✓ RVR				⊗	x	
Control Panels						
✓ VASI, Runway 8			⊗	x		
MALSR, Runway 8			⊗	x		
BAK-14 Arresing System, Rwy. 35			⊗	x		
Field Lighting				x	⊗	
Standby Selector Panel for FAA Frequencies		x	⊗	x		
ATIS Recording Controls						⊗
Monitor Panels						
✓ VASI, Runway 8			⊗	x		
✓ ILS-DME, Runway 8			⊗	x		
✓ ILS (Glide Slope, Localizer), Runway 8			⊗	x		
✓ Aural Alarm			⊗			
Radio Communications Recorder Status Panel			O			

O Location
X User
✓ Automatic Monitoring
⊗ Denotes Shared Equipment

TABLE 3-2. TRACON EQUIPMENT DISTRIBUTION AND CONTROLLER ACCESS

ITEMS	TS	TC	LNR	A/DD	LSR	HSR	HSC	NHR
Operational Display Info								
Console Clock	⊠		⊠	x	⊠	⊠	x	⊠
Analog Altimeter			⊠		⊠	⊠		
Wind Instruments			⊠		⊠	⊠		⊠
✓ RVR					O	x		x
Control Panels								
Standby Selector Panel for FAA Frequencies			x	⊠	x	x	⊠	x
Monitor Panels								
✓ Aural Alarm		⊠						
✓ Radio Communications Recorder Status Panel				⊠				

O Location
x User
✓ Automatic Monitoring
⌐¬ Denotes Shared Equipment

For the most part, the Albuquerque tower has a standard complement of equipment for a Level III tower, and it is distributed among the controllers with regard to the most frequent users. Almost all of the control and monitoring panels are in the Cab, and they are located at the CC position where they are also accessible to LC-1 who is responsible for the primary runway and most arriving and departing IFR traffic. In both the Cab and TRACON, critical weather instruments are located in or near the consoles of controllers working the aircraft, except for the RVR and the lack of a console altimeter at the HNR position.

The BAK-14 Arresting System Control Panel and the Field Lighting Control Panel are the most unique pieces of equipment in the tower. The BAK-14 reflects the extent and nature of the military operations supported by the tower and indicates an area of additional responsibility for the controllers. The location of the taxiway-light control switches on the runway-taxiway map delineated on the face of the control panel provides the controllers with a quick and efficient aid in selecting particular control switches.

4. STATUS INFORMATION

The sources and controller requirements for information on operational status are presented in this section with a discussion of NOTAMs and other procedures for determining and disseminating such information on equipment in the following categories:

- o Weather Equipment and Clocks
- o Visual NAVAIDs
- o Instrument Landing System
- o Terminal Area Radio NAVAIDs

The equipment in the tower is checked by means of aural and visual alarms, visual inspection, and comparison with other equipment. These checks are formally made three times a day by the supervisors (or the Controller-in-Charge, who is an acting supervisor during the midshift) when completing the Watch Check and at other times by controllers using and monitoring the equipment.

The status of the equipment in the Cab and TRACON is determined during the Watch Check which is conducted by the supervisor during each shift. The equipment checked includes the following: all clocks, wind instruments and altimeters; the RVR panels; the aural alarm, VASI and BAK-14 arresting system control panels; and the ILS, ILS-DME and VASI monitor panels. Equipment not checked as part of this procedure includes the standby selector panel for FAA frequencies, the MALSR control panel and the Field Lighting Control Panel. The latter are usually checked at least once a day, normally when they are used. In the Cab, when a piece of equipment is determined to be malfunctioning, the status is usually reported by the Cab Supervisor (CS) to the TRACON Supervisor (TS). The latter then takes the appropriate action, notifying Airway Facilities (AF) or other organization responsible for repairs. He also notifies the Flight Service Station (FSS) if a NOTAM is required. The TS usually logs the outage on the Daily Record of Facility Operation (Form 7230-4). Ordinarily, all equipment outages are logged on this form, except the failure of an individual piece of

equipment such as a clock, altimeter, or wind instrument, for which backup sources are readily available. Equipment failures in the Cab that do not need to be logged and do not affect TRACON operations are not reported to the TS. The CS is not notified about equipment failures in the TRACON unless the outage affects the Cab operations. When the equipment check is completed, the TS makes the following notation on Form 7230-4; Watch Checklist Complete (WCLC). Any equipment that is logged out of service (OTS) must be logged as restored to service (RTS) by the TS before it is used again. The organization responsible for repairing the equipment notifies the TS when it is repaired. Planned equipment outages for maintenance are logged in the same way as actual failures. An "E" is typed in the margin of Form 7230-4 by the TS whenever an equipment outage or restoration to service is logged. Maintenance personnel may initial the entries pertaining to equipment failures beside the "E's".

4.1 WEATHER EQUIPMENT AND CLOCKS

4.1.1 Clocks

a) Status Determination

The status of the console clocks and the ARTS-III clocks are determined as part of the Watch Check and by controllers using them. This is done by comparing each time reading with an independent reference (such as a wristwatch), with each other, or with the time on the radar displays. Any clocks that are incorrect are reset by the supervisors. After resetting, they observe the seconds display to make sure it is moving, indicating proper operation. Since the ARTS-III clocks are all driven by the computer, it is necessary to check only one, with another time source, to verify that all are correct. This clock must be reset at least once a day when the ARTS returns to service after the midshift. It is reset at one of the TRACON radar displays by entering the correct time using the alphaneumeric keyboard. The clocks at the supervisor positions show a flag and buzz in the event of a power failure.

b) Status Information Dissemination

If a single console clock in the Cab or TRACON fails, this information is needed by only the supervisor, controllers normally using the equipment, and AF. If a controller notices the outage, he reports it to his supervisor, who notifies AF. If the supervisor discovers the outage, he informs the affected controllers and AF. The independent failure of the console clocks is not logged but the status information will be given to the relieving supervisor if the problem remains uncorrected.

When all the Cab or TRACON console clocks stop or are erroneous (a rare occurrence caused by power fluctuations or failures) the supervisor that first becomes aware of the problem informs the other and they disseminate the information to the controllers. The TRACON Supervisor reports the outage to AF and logs the status.

When the computer clock fails, the problem affects both the Cab and TRACON. If a controller notices the malfunction, he informs his supervisor, who in turn notifies the other controllers and supervisor. The TS notifies AF and logs the outage.

Except in the event of a power failure (during which most equipment is out until the standby power system is engaged) there is always a backup source for time information, either the ARTS-III clock or another console clock.

4.1.2 Altimeter

a) Status Determination

The status of the analog altimeters is determined as part of the Watch Check and by controllers using the instruments. The supervisors cross-check the altimeters and compare the readings with the hourly weather message received on the electrowriter from the Weather Service Forecast Office (WSFO). Usually during the morning equipment check, minor correction factors are marked on the instrument with a grease pencil. An analog altimeter is reported out of service if it is off by 0.02 inches or more.

The controllers using the analog altimeters also monitor their status by comparing instrument readings with the value displayed on the ARTS-III. The status of the ARTS-III altimeter readings is the responsibility of Flight Data/Clearance Delivery (FD/CD), who updates the reading whenever the ATIS message is recorded. This is updated hourly and more often when conditions require a new ATIS recording.

b) Status Information Dissemination

Controllers report analog altimeter failures to their supervisor who notifies the other controllers that use the equipment and reports the outage to AF. The failure of a single instrument does not require notifying the other supervisor or logging the outage.

FD/CD notifies the CS if the ARTS-III altimeter reading malfunctions. The CS then informs the Cab controllers and the TS. He, in turn, informs his controllers, AF, and logs the outage.

Backup sources for analog altimeters include another analog instrument, the ARTS-III display, and the WSFO weather reports.

4.1.3 Wind Direction and Velocity

a) Status Determination

The status of the analog wind instruments are checked as part of the Watch Check and are made by comparing the readings of the instruments with others. At least once a day, AF calls the Cab to compare readings with their wind instruments. Furthermore, the WSFO checks the field wind sensors daily. Since the controllers continuously use instruments, they tend to know immediately if a malfunction occurs, usually because of a sudden, unwarranted indicator change.

b) Status Information Dissemination

Controllers report the failure of a single wind instrument to their supervisor who notifies AF and the affected controllers. When they all fail, the first supervisor to learn of the outage

notifies the other and the TS calls AF and logs the outage. AF, when the problem is not with their equipment, calls the WSFO to correct the failure.

Backup sources for the wind instruments are the five wind socks located on the airfield. The CS is responsible for estimating the wind speed and direction and informing all controllers of the wind information when the regular equipment is out of service.

4.1.4 Runway Visual Range (RVR)

a) Status Determination

The status of the RVR system is established by AF,supervisor checks, controllers using the equipment and status indicators on the panel.

AF checks the system daily. An RVR panel in the equipment room is used to verify the visibility readings. During the Watch Check, each supervisor compares their RVR readings with the main unit in the equipment room by calling the equipment room and verbally verifying that the readings are the same. Controllers also check the system when they use it, making sure the readings are reasonable. The panels have status indicators: An "E" appears in the window when there is an error in the system and an "L" means the light level is too low for a proper reading.

b) Status Information Dissemination

AF reports RVR malfunctions by telephone to the Cab and TRACON Supervisors who in turn notify their affected controllers. The TS always logs an RVR outage on the 7230-4.

Controllers report RVR malfunctions to their supervisor who informs the affected controllers and the other supervisor who does the same. The TRACON Supervisor calls AF.

Backup sources for visibility information include reference objects on the field and the Visibility Reference Chart (Figure 4-1) that shows the distance to each one. Visibility information is also available on the surface aviation weather reports prepared by the WSFO.

FIGURE 4-1. VISIBILITY REFERENCE CHART IN CAB

4.2 VISUAL NAVIDs

The Visual NAVAIDs include the following: (Figure 4-2).

Runway 8: MALSR, VASI, High Intensity Runway Lights (HIRL)

Runway 26: Runway End Identifier Lights (REIL), VASI (3-bar), HIRL

Runway 17: HIRL

Runway 35: VASI, HIRL

Runway 3-21: Medium Intensity Runway Lights (MIRL)

Runway 12-30: MIRL

Taxiway Lights

Table 4-1 shows a summary of controllers interested in the operational status of these NAVAIDs. The status of these NAVAIDs is determined by visual inspection, pilot reports, and the monitoring of control and status panels. Any failures are usually brought to the attention of the CS, who informs the TS. Both then notify their affected controllers. The TS notifies the city maintenance department or AF to have the outage repaired, logs the outage on Form 7230-4, and notifies the FSS to issue a NOTAM, and FD/CD records a NOTAM on the ATIS. When repairs are made immediately, no NOTAM is necessary.

4.2.1 Runway (HIRLs, MIRLs) and Taxiway Lights

Whenever runway and taxiway lights are required, Ground Control (GC) checks their status by visual inspection of the field and the control panel. When the panel is turned on, any switch that is depressed illuminates, indicating proper operation of the switch. Further verification is made when the lights are initially turned on by looking out of the Cab to see if the correct lights are on. After this check, failures are usually reported to Local Control by a pilot. This information is relayed to the CS, who informs the TS. The supervisors inform the affected controllers. The TS notifies the city, since they own the runway and taxiway lighting system. He logs the outage and notifies the FSS. FD/CD

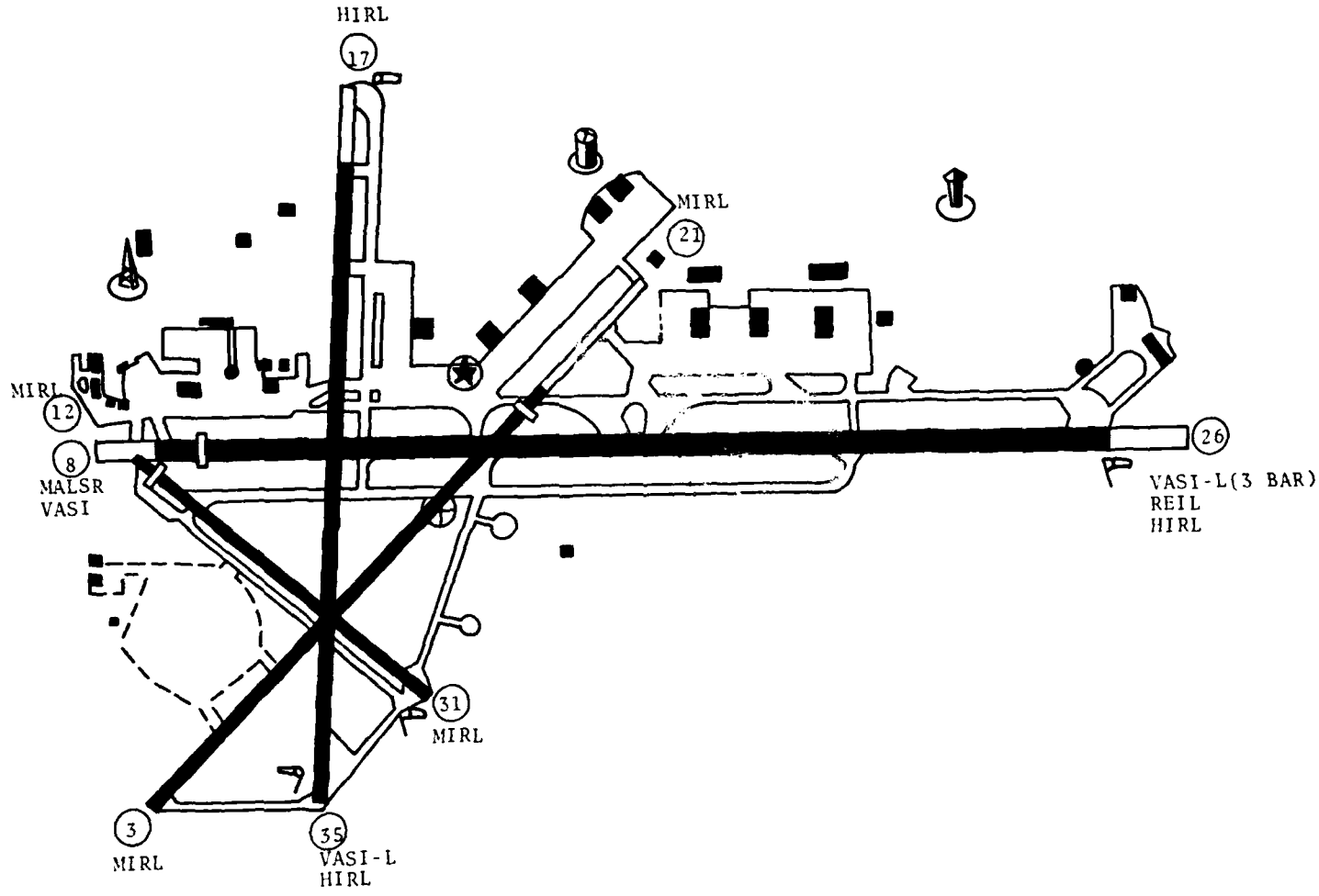


FIGURE 4-2. VISUAL NAVAIDS LAYOUT AT ALBUQUERQUE

TABLE 4-1. RADIO AND VISUAL NAVAIDS AT ALBUQUERQUE AIRPORT

NAVAID	CC	LC-1	LC-2	GC	FD/CD	HNR	LNR	USR	LSR	HSC	TC
Runway 8											
ABQ VORTAC	x	⊘			x	⊘	⊘	⊘	⊘	x	x
ILS-DME	x	⊘			x	⊘		⊘		x	x
NM	x	⊘			x	⊘		⊘		x	x
OM	x	⊘			x	⊘		⊘		x	x
GS	x	⊘			x	⊘		⊘		x	x
LOC	x	⊘			x	⊘		⊘		x	x
MALSR	x	⊘			x	x	x	x	x	x	x
VASI	x	⊘			x	x	x	x	x	x	x
Runway 26											
REIL		⊘			x					x	x
VASI		⊘			x	x	x	x	x	x	x
Runway 8-26 HIRL	x	⊘		x	x	x		x		x	x
Runway 35											
NDB		⊘	⊘		x	⊘	⊘	⊘	⊘	x	x
VASI		⊘	⊘		x			x	x	x	x
Runway 17-35 HIRL	x	⊘	⊘	x	x	x	x	x	x	x	x
Runway 3-21 HIRL	x		⊘	x	x		x		x	x	x
Runway 12-30 HIRL	x		⊘	x	x		x		x	x	x

O Works with aircraft using NAVAID
x Needs status information on NAVAID

puts the information on the ATIS recording as a NOTAM. If possible, a different runway is used while the field lights on a particular runway are out of service. Otherwise, the city places battery powered runway edge lights where necessary.

4.2.2 VASI

The status of the VASI systems on runways 8, 26 and 35 are determined by pilot reports and periodic checks made by AF. The runway 8 VASI is also monitored in the Cab by the Cab Coordinator (CC) and Local Control-1 (LC-1) using the VASI Monitor and Control Panels (Figure 3-17) as well as being checked by the CS as part of the Watch Check.

Pilot reports of VASI outages are received by LC-1 for runways 8 and 26 and either Local Control position for runway 35. This information is relayed to the CS who notifies the TS. They inform the affected controllers. The TS notifies AF, logs the outage and informs the FSS. FD/CD records the information on the ATIS message.

When AF detects a VASI failure during a field check, they notify the supervisors, who disseminate the information throughout the tower. Again, the TS logs the outage on Form 7230-4.

During the Watch Check, the CS checks the runway 7 VASI by turning the control panel on and observing the monitor lights and intensity lights. The monitor panel is also observed. The absence of illuminated indicator lights on that panel means that all the runway 7 VASI lights are working. Also, both panels are checked for panel operation; the control panel is checked by observing the indicator lights and depressing the test switch for the aural alarm and the monitor panel is checked by depressing the test switch to test the filaments of the indicator lights. Failures are reported to the TS. Both supervisors inform the affected controllers, the TS notifies AF, logs the outage and informs the FSS. FD/CD records the information on the ATIS message.

While runway 8 is in use, the VASI is monitored by LC-1 and CC. Outages are detected by the indicator lights and aural alarm

and are brought to the attention of the CS. The information is disseminated further as previously described.

4.2.3 MALSR

The status of the MALSR is determined from pilot reports, controllers using the system, and visual inspection. Pilot reports are received by LC-1 who informs the CS, who notifies the TS. Both notify the affected controllers and the TS informs the city and logs the outage.

Controllers using the system detect failures in the control panel if the power or transmit indicator lights do not turn on. A final check is made on dark nights by observing the glow from the approach lights. If a failure is confirmed through either visual inspection or a pilot report, the CS is informed and he notifies the relevant controller and calls the TS.

4.2.4 REIL

The status of the Runway End Identifier Light (REIL) on runway 26 is determined by pilot reports and visual inspection, from both the tower and field. Pilot reports concerning the REIL are received by LC-1 who informs the CS. The latter informs FD/CD and the TS. The TS notifies the city and logs it out of service.

When AF or the city notices the REIL malfunctioning, the CS is notified. He informs the affected controllers and the TS, who logs the outage.

4.3 INSTRUMENT LANDING SYSTEM

The instrument landing system (ILS) includes the localizer (LOC), the glide slope (GS), the distance measuring equipment (DME), the outer marker (OM), and the middle marker (MM). The status of the first three components is obtained by the CC and LC-1 by observing the monitor panels, by the CS during the Watch Check and through pilot reports. The status of the outer and middle markers is determined through pilot reports and AF during their checks

of field equipment. The layout of the radio NAVAIDs near Albuquerque Airport are shown in Figure 4-3.

The controllers that require status information on the ILS are shown in Table 4-1. These include LC-1, HNR, and HSR as they work with aircraft using the ILS, and the three coordinator positions in the Cab and TRACON, as they need status information to coordinate traffic flow and to relay information to other controllers. Furthermore, monitor panels are observed by the CC and LC-1, so they are the first to respond to an outage of the glide slope, Localizer, or DME. The Low Radar positions rarely need the status because they normally work with VFR aircraft. Also, the Low Radar positions aircraft that do use the ILS, usually do so for training during VFR weather.

4.3.1 DME, GS, LOC

The ILS-DME monitor panel and the ILS monitor panel for the Glide Slope and Localizer are shown in Figures 3-18 and 3-19 respectively. The CS checks these panels during the Watch Check, making sure the green lights are on for each component. If one is not, indicating a failure, he informs LC-1, the CC, FD/CD and the TS. LC-1 needs the information to alert aircraft using the ILS that a portion is unavailable. FD/CD records the information on the ATIS. The TS notifies AF, HNR, HSR, HSC, TC and logs the outage on Form 7230-4. If the outage is more than only a few minutes, the FSS is notified to issue a NOTAM. Since the localizer is the critical component of the ILS, when it fails the approach is cancelled. Although the approach can continue without the glide slope or DME, losing the glide slope raises landing minimums.

4.3.2 OM, MM

The status of the outer and middle markers are determined by AF during their checks of field equipment, and by pilots using the NAVAID.

When AF detects the failure, they notify the CS, who informs the CC, LC-1, and FD/CD. AF also notifies the TS so the High Radar

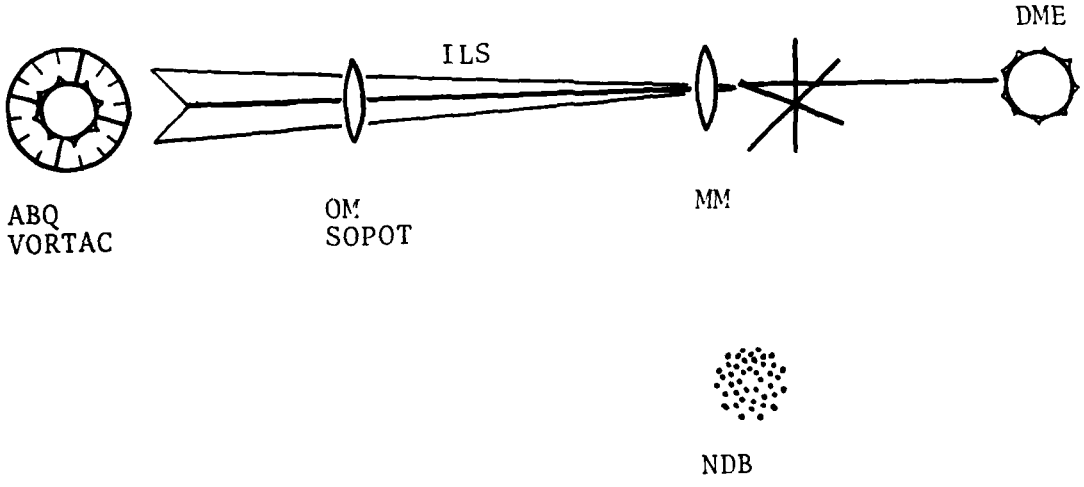


FIGURE 4-3. RADIO NAVAIDS LAYOUT NEAR ALBUQUERQUE AIRPORT

positions and the TC can be informed and the outage can be logged.

When LC-1 receives a pilot report indicating a failure of the Outer and Middle Marker, he informs the CS. He then takes the same action as with the other components, as does the TS. Failure of either of these NAVAIDs raises landing minimums but does not cancel the approach.

4.4 AREA RADIO NAVAIDS

TRSA Radio NAVAIDs are discussed in this section in relation to the status information requirements of the controller positions. Information concerning NAVAID malfunctions come from pilot reports, the FSS, ARTCC, and AF.

4.4.1 Non-Directional Radio Beacon (NDB)

In the Cab, LC-1 and LC-2 work with aircraft using the NDB. Air carriers under the control of LC-1 use the NDB on their approach to runway 26. Aircraft using the NDB while under the control of LC-2 usually do so to practice instrument landings. Both of these controllers and FD/CD (for the ATIS recording) need status information on this NAVAID. In the TRACON, all approach controllers work with aircraft using the NAVAID and require status information on it. LSR works with aircraft using the NDB primarily to practice IFR navigation during VFR conditions.

4.4.2 ABQ VORTAC

Almost all controllers working aircraft need status on the ABQ VORTAC because of its importance as a navigational reference for arrivals, departures, missed appraoches, and in locating hold patterns. The low radar positions work with aircraft using the ABQ VORTAC less frequently than the high positions, however, as the former monitor primarily VFR aircraft. In addition, FD/CD needs the information to enter on the ATIS recording and coordinator controllers need the status of navigational facilities important to coordinating traffic flow into the TRSA.

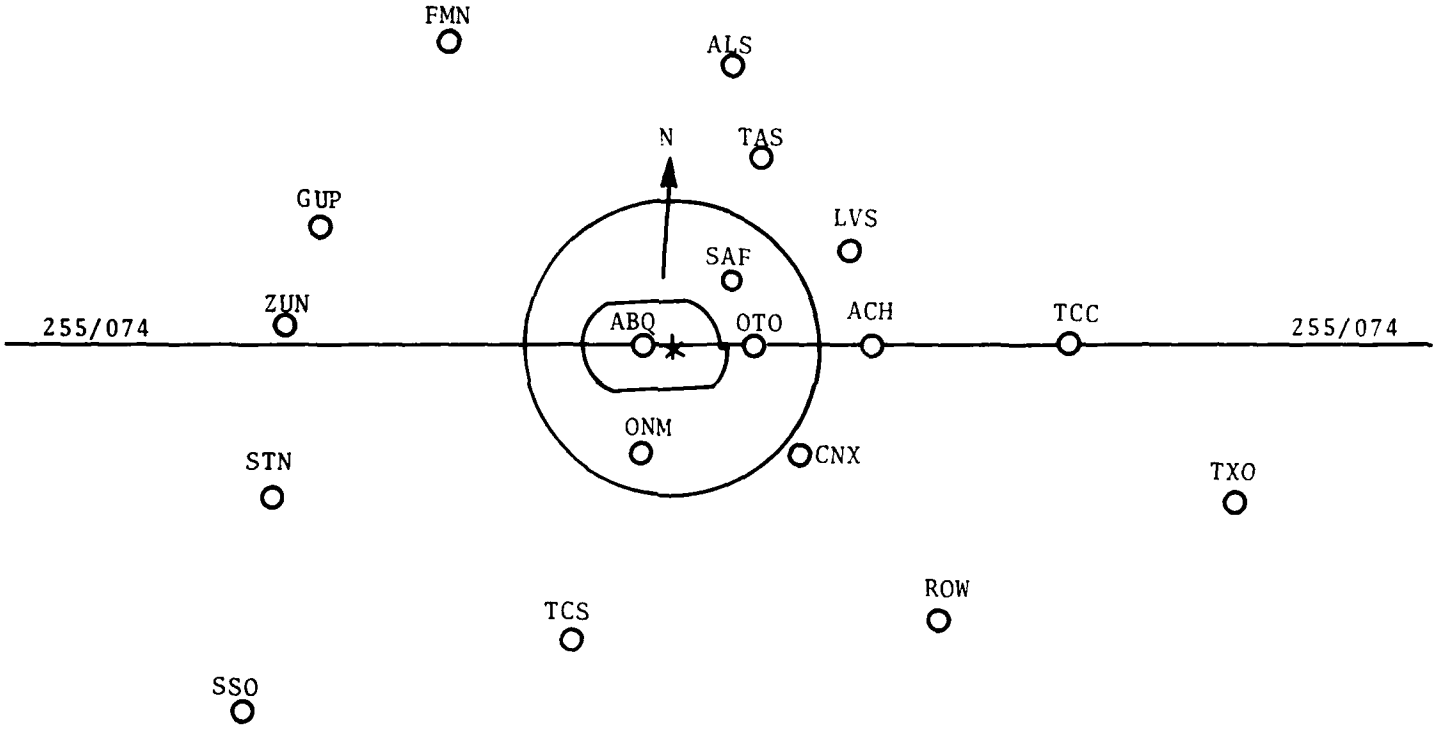
4.4.3 NAVAIDs Outside Terminal Area

Because of their importance in defining key navigational fixes for entering and departing the Albuquerque terminal area, the status of certain VORTACs and VORs (Figure 4-4) outside this area is of interest to TRACON controllers. These NAVAIDs are listed in Table 4-2 in four categories concerning frequency of use by TRACON controller aircraft along with indications of the controllers most interested in their operational status.

The VORs used most often are within about 60 miles of the airport, with those used infrequently extending to hundreds of miles away. Generally, LNR and HNR monitor aircraft using the VORs on or above the 255/074 radial and LSR and HSR monitor aircraft using the VORs on or below the radial. The Low Radar positions monitor aircraft using the VORs less frequently than their high counterparts because the former monitor primarily VFR aircraft.

The TRACON controllers are notified by the FSS, through a NOTAM whenever a frequently used VOR goes out of service. For the rest of the VORs included in the table, the controllers indicated an interest in having status information on them for guiding departing aircraft, but said it was not essential. Departing aircraft are usually "vectored" out using compass headings as well as navigating with the VORs. This means that if a pilot reports a problem with a particular VOR, he can easily be directed to another VOR or simply be guided by vectors alone. Therefore, status information on the VORs is used largely as a courtesy to inform pilots of what to expect.

The controllers want status information on all the VORs when it is received, even if it is not on a VOR in their current area of responsibility, because eventually, they will need the information as they progress through the different controller positions during their eight-hour work shift.



SCALE: 1 INCH = APPROXIMATELY 80 NAUTICAL MILES

FIGURE 4-4. RADIO NAVAIDS USED BY AIRCRAFT MONITORED BY TRACON CONTROLLERS

TABLE 4-2. VORS/TACANS OUTSIDE THE TERMINAL AREA AND FREQUENCY OF USE BY TRACON CONTROLLERS

o WORKS WITH AIRCRAFT USING NAVAID

VOR/TACAN	FREQUENCY OF USE	HNR	LNR	HSR	LSR
SOCORRO (ONM)	often			o	o
CORONA (CNX)	often			o	o
LAS VEGAS (LVS)	often	o	o		
SANTA FE (SAF)	often	o	o		
ANTON CHICO (ACH)	often	o	o	o	o
OTTO (OTO)	often	o	o	o	o
ZUNI (ZUN)	often	o	o	o	o
ST. JOHNS (SJN)	occasional			o	o
GALLUP (GUP)	occasional	o	o		
TUCUMCARI (TCC)	occasional	o	o	o	o
FARMINGTON (FMN)	rare	o	o		
ROSWELL (ROW)	rare			o	o
TRUTH OR CONSEQUENCES (TCS)	rare			o	o
ALAMOSH (ALS)	very rare	o			
TEXICO (TXO)	very rare			o	
SAN SIMON (SSN)	very rare			o	
TAOS (TAS)	very rare	o			

4.5 NOTAMS

NOTAMs are usually received on the electrowriter from the FSS (Figure 4-5). They are initiated by FSS personnel and by personnel at the tower, another airport, the city of Albuquerque, Kirtland Air Force Base, or AF by telephoning the FSS to report an equipment failure or other relevant information. The example in Figure 4-5 is translated as follows: To Albuquerque Tower, Local NOTAM Number 27, men and equipment working along taxiway 8 and taxiway 11 until further notice, from "KZ" at the FSS sent at 1514 Zulu.

In the Cab, NOTAMs are left on the electrowriter. The roll of messages is saved as a record of weather reports, NOTAMs and other electrowriter communications. FD/CD confirms receipt of NOTAM messages in writing on the electrowriter (Figure 4-6) and notifies the CS of this action. CS logs the NOTAM on the Tower Status Sheet (Figure 4-7): This provides a record of all NOTAMs received in the Cab. Additional entries may be made when the NOTAM actually takes effect and again when it is cancelled. The supervisor then informs the affected controllers and the TS, to verify receipt of the NOTAM. If a NOTAM is of particular interest to a controller, he may write it down on a blank flight strip and place it at his position for reference. The controller destroys it when it is no longer useful. Cab controllers can also review the recent NOTAMs by reading them on the electrowriter. If the NOTAM is of potential interest to pilots, FD/CD writes the NOTAM on the ATIS Format (Figure 3-14) and records it with the ATIS message.

In the TRACON, the HSC takes the message off the electrowriter and gives it to the TS. The Supervisor copies the date, time, and text of the NOTAM onto the NOTAM Record (Figure 4-8) and the NOTAM number, date, effective time and information on the NOTAM List (Figure 4-9). The TS also logs the NOTAM on Form 7230-4 (Figure 4-11), if it pertains to Albuquerque equipment or operations. If the NOTAM is of long duration, the TS writes it on the transilluminated status board (Figure 4-11) which is about the size of a blackboard and is mounted on the wall of the TRACON. Otherwise, it is disseminated verbally to the affected controllers, who may note them on blank flight strips.

ABQ TWR

L 0027 NAEW MLNG

TBT TIL LFN

FSS) KZ/514

FIGURE 4-5. NOTAM FROM THE FLIGHT SERVICE STATION

TWR Rcv NOTAM

L0027 : 1514Z

FIGURE 4-6. ACKNOWLEDGEMENT OF NOTAM BY FLIGHT DATA/CLEARANCE DELIVERY

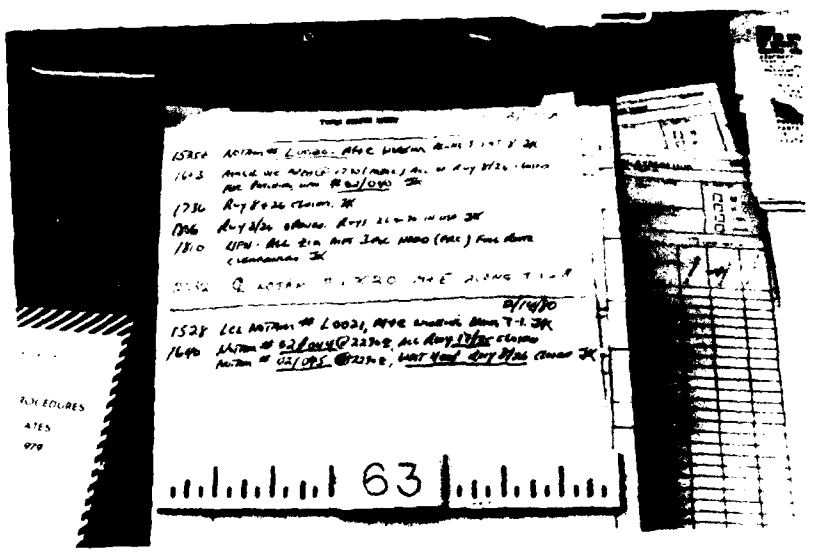


FIGURE 4-7. TOWER STATUS SHEET AT THE CAB SUPERVISOR POSITION

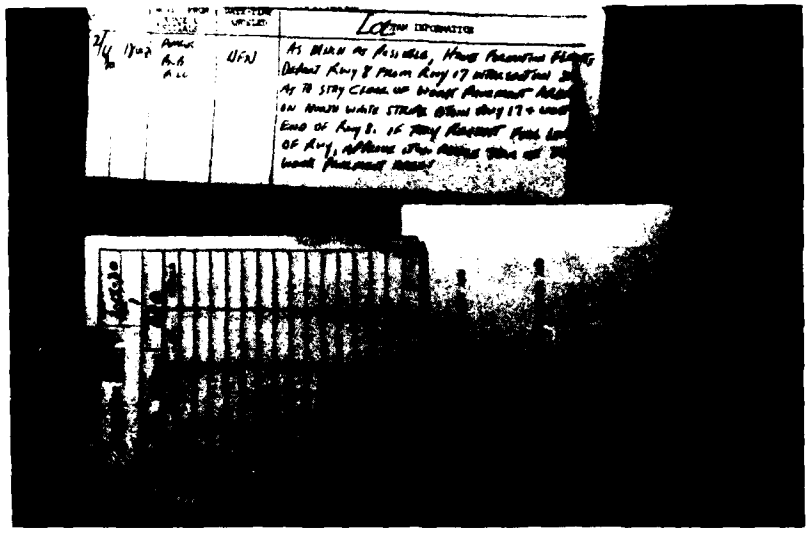


FIGURE 4-8. NOTAM RECORD AT THE TRACON SUPERVISOR DESK

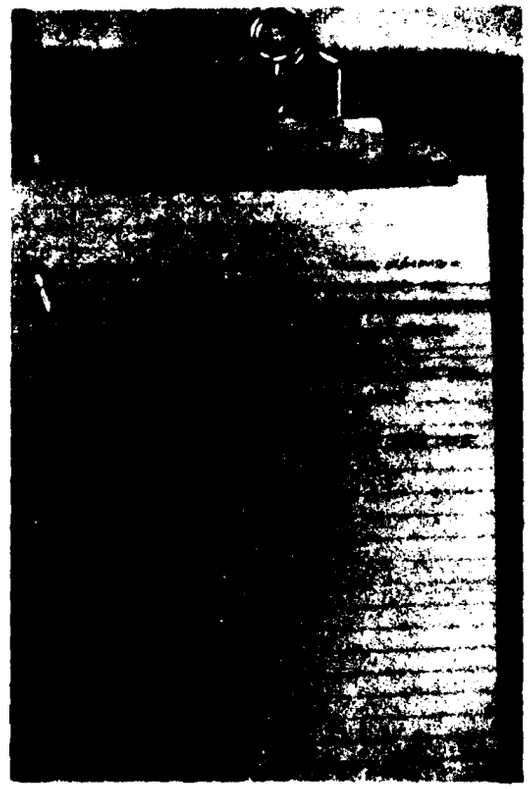


FIGURE 4-9. NOTAM LIST ON CLIPBOARD AT THE TRACON SUPERVISOR DESK

DAILY RECORD OF FACILITY OPERATION

PAGE NO. 1

DATE 11/29/80

CHECKED BY [signature]

CHIEF DONALD E. BESWICK

LOCATION	IDENTIFICATION	TYPE FACILITY	OPERATING POSITION
ALBUQUERQUE, NEW MEXICO	ABQ	TOWER	TS

TIME (GMT)	REMARKS
0700	WJ ON. WOIC. ASR CHANNEL B USABLE IN EMERG ONLY PER AFS. [illegible]
E 0930	ASR CHANNEL B RTS.
1354	TX ON, WOIC
E 1414	NOTAM ISSUED..ILS LOC AND ILS DME OTS AT 1630 FOR MAINT.
1615	RUNWAY 17 ACTIVE, ARRIVAL DEPT OPERATION
1714	NOTAM WEST 2000 FT 8-26 CLSD.
1813	ALL OF RUNWAY 8-26 OPEN, NOTAM CL
1914	TN ON.
2057	TACO 40 DECLARED EMERGENCY, FUEL TRANSFER PROBLEMS, CRITICAL FUEL, LESS THAN 1000#, 1 SOB.
2058	ILS RTS, ALL NORMAL. NOTAM CANCELLED.
2103	TACO 40 LANDED SAFELY, EMERGENCY TERMINATED.
2215	EF ON.
0005	SE ON, WOIC
0127	[illegible] CALLED OUT FOR N60712 SVR ICING
0130	EMERGENCY TERMINATED FOR N60712
0502	RUNWAY 26/30 IN USE
0559	SE ON.
0610	FT ON. FT.
0659	COB. FT.

I CERTIFY that entries above are correct; that all scheduled operations have been accomplished, except as noted, and that all abnormal occurrences and conditions have been recorded.

SIGNATURE(S) OF WATCH SUPERVISOR(S) [signatures]

FAA Form 7230-4 (8-76) FORMERLY FAA FORM 304

FIGURE 4-10. DAILY RECORD OF FACILITY OPERATION (FORM 7230-4)

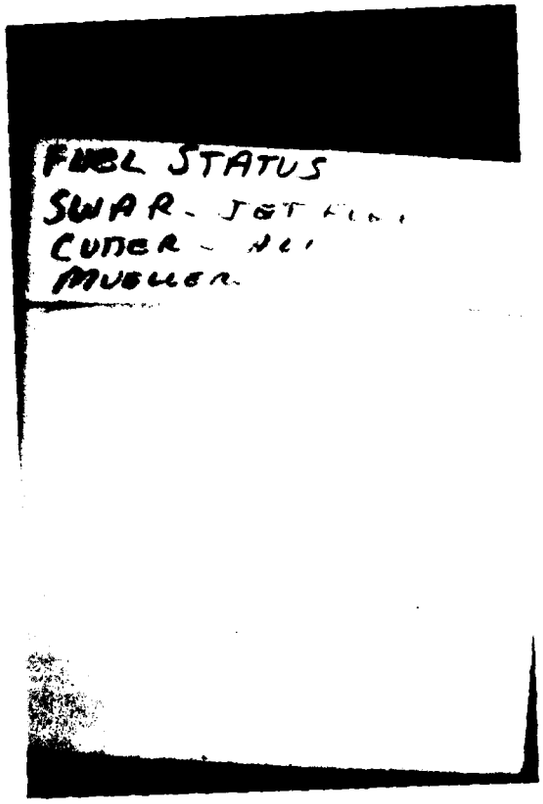


FIGURE 4-11. STATUS BOARD IN TRACON

Some NOTAMs, such as those for maintenance purposes are received over the electrowriter from the FSS a day before the scheduled outage. The NOTAM is acknowledged over the electrowriter by FD/CD. No further action is taken until it takes effect, then the TRACON Supervisor calls the Cab and both supervisors notify their controllers and it is logged as any other NOTAM. The reason for the delay in logging it is because the NOTAM may not take effect if poor weather conditions, or other unforeseen circumstances occur (for example the ILS will not be taken out of service for maintenance during IFR conditions).

When NOTAMs are cancelled, notification is received over the electrowriter from the FSS (Figure 4-12). FD/CD acknowledges the cancellation over the electrowriter (Figure 4-13), changes the ATIS if necessary, and informs the CS, who notifies the TS and his controllers. The TS notifies his controllers, removes the message from the status board, if it was posted there, draws a line through the NOTAM on the NOTAM list and logs the restoration on Form 7230-4, if it was logged originally.

It is usually the TS who calls the FSS to initiate a NOTAM. It is then sent over the electrowriter by the FSS to the Cab and TRACON and it is handled in the same way as other NOTAMs.

4.6 SUMMARY

Status of equipment in the Albuquerque tower is obtained through periodic watch checks by supervisors, visual and aural alarms, pilot reports, and direct controller observations as they use the equipment. Dissemination of status information is done through personal communications, the telephone, posting of messages, recording on the ATIS and through the FSS via NOTAMs. Outages and returns to service of important equipment is logged. Short term outages with little impact on the operation tend not to be. With the exception of the treatment of NOTAMs, the determination and dissemination of status information at Albuquerque is similar to that at other towers studied (Boston, Atlanta). At Albuquerque there is a high degree of record keeping associated

TWR
CNL Local NOTAM
L0022 RE Q64
ROTG BCN
FM 1755Z/5

FIGURE 4-12. NOTAM CANCELLATION FROM THE FLIGHT SERVICE STATION

FSS

(EL NTM CNL

L0022

TWR/RH

FIGURE 4-13. ACKNOWLEDGEMENT OF NOTAM CANCELLATION BY FLIGHT DATA/CLEARANCE DELIVERY

with NOTAMs, which includes written acknowledgement of message receipt, a special record of NOTAMs received, a record on Form 7230-4; and additional use of the same records for cancellation of NOTAMs.

5. CURRENT FLIGHT DATA SYSTEM AT THE ALBUQUERQUE TOWER CAB/TRACON

The Flight Data System at Albuquerque Air Traffic Control Tower is described in this section. This section includes information on:

- o The purpose and development of the National Flight Data System.
- o Flight data equipment and layout.
- o Flight strip analyses and processing.
- o Flight data layout and utilization by controller position.

5.1 PURPOSE AND DEVELOPMENT OF THE NATIONAL FLIGHT DATA SYSTEM

The purpose of The National Flight Data System is to provide air traffic controllers with the information necessary to safely and efficiently control flights operating at FAA controlled airports and in FAA controlled airspace. Such information is called "flight data" and includes an aircraft flight number, aircraft type and equipment, the planned route of flight, and selected operational data such as altitude and groundspeed.

First generation air traffic control systems primarily relied upon voice radio communication with pilots for receiving flight data. It was common practice for controllers to maintain this flight data on blackboards and scratch pads. This initial system was gradually improved as a result of technological advances in the fields of communications, radar, and navigation.

The current air traffic control system is based on a nationwide computer network containing the flight data on all flights having filed flight plans for operating in the FAA controlled airspace.

Each en route center in the country has a computer unit (9020 NASA Stage A) for the storage and processing of flight data affecting their airspace. This unit is part of the national computer

network and is used to exchange flight data with other en route centers and with its own client air traffic control facilities. In air traffic control towers, the Cab and TRACON facilities are connected to the network via Flight Data Entry and Printout (FDEP) units. These FDEPs function as flight data computer terminals and allow for the transmission and receipt of the flight data.

Controllers receive flight data from FDEP units in the form of printed paper strips (1" by 8") called flight progress strips or "flight strips". These strips are printed approximately thirty minutes before the corresponding flight is expected to come under the control of a Cab or TRACON facility. These printed strips are easily torn off the FDEP unit and distributed to the appropriate controllers for air traffic control activities. Each FDEP unit may also have a keyboard which enables the controllers to access the computer stored flight data base to request, modify, or add flight data.

Additional notes on traffic management, such as instructions to the pilot on runway assignments, are made on the printed strip as the flight is processed through the terminal area. For flights without printed flight progress strips (e.g., VFR flights) controllers use the FAA radio to obtain the information necessary for flight control from the pilot. This information may be noted on a scratch pad and used to prepare handwritten strips on blank strip forms. Blank strips may also be used to record pilot weather reports (PIREPs) or special information to be relayed to pilots as needed. Separate forms are maintained by controllers for more permanent record keeping and statistical purposes.

In the next stage of the flight data system improvements, the paper flight strips will be replaced by electronically displayed flight data. The system being designed for the terminal areas is called the Terminal Information Display System (TIDS) and is being designed to accommodate the individual flight data requirements of the separate towers as completely as possible.

5.2 FLIGHT DATA EQUIPMENT AND LAYOUT AT ALBUQUERQUE

The air traffic control function at the Albuquerque Tower is supported by flight data equipment located in both Cab and TRACON facilities; the layout of these facilities and the location and function of the equipment therein is described below.

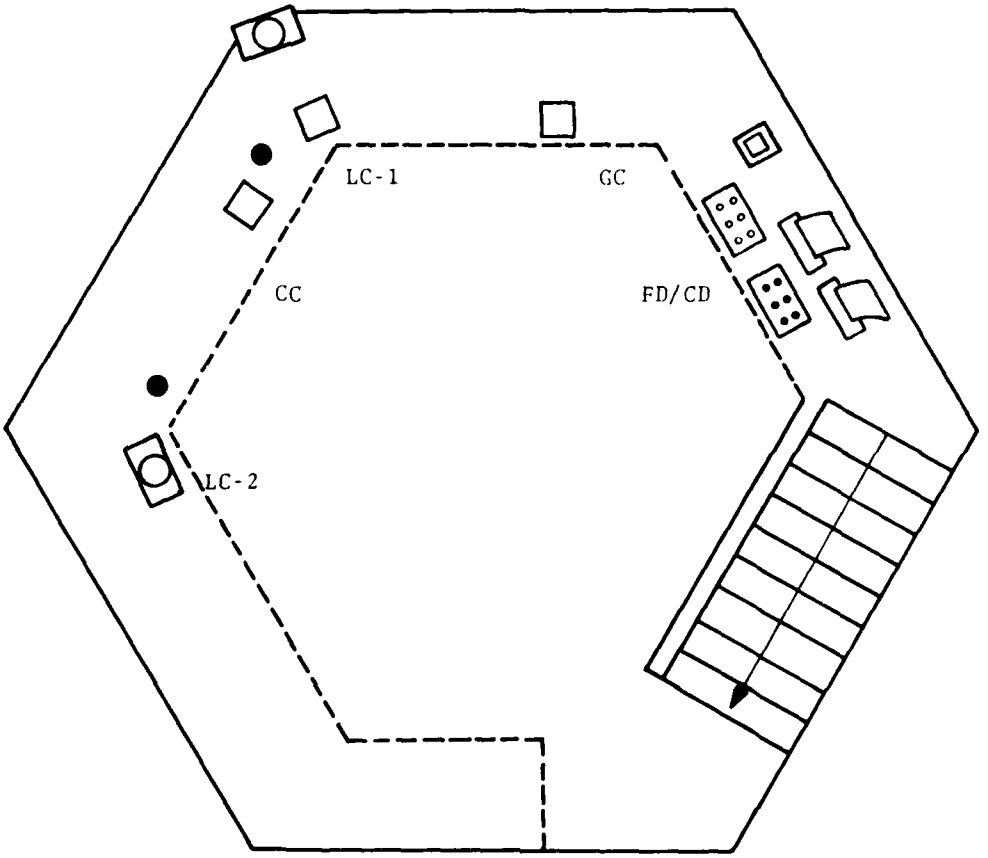
5.2.1 Tower Cab

The Cab (Figure 5-1) contains two FDEP units (Figure 5-2) located at the Flight Data (FD) position. During normal operations, one FDEP is actively used while the second unit remains on standby status. Usually the left side FDEP is used since it is closer to the Clearance Delivery (CD) position; it is common for these two positions (FD/CD) to be combined at Alburquerque (see Section 2). A single keyboard centered in front of the two FDEPs serves both units. The Cab FDEP prints flight strips on all Albuquerque IFR filed departures.

Flight data on arrivals is provided by the active FDEP and the BRITE radar displays at the Local Control positions (Figure 5-1). The BRITE radar display shows arriving aircraft in a manner similar to the ARTS display in the TRACON (described in Section 5.2.2). Cab controllers communicate with the TRACON to determine the sequencing of aircraft arrivals. Call signs of arriving aircraft displayed on the BRITE may be written on a scratch pad by Ground Control (GC) to facilitate aircraft taxi operations.[1]

A third unit of flight data equipment in the Cab is the Conrac video display located at the FD/CD position (Figure 5-3). This video display is the same as the BRITE display. However, the Conrac equipment also displays the radar beacon codes of VFR stage III flights following a requested entry by a controller. The beacon code is assigned by the ARTS computer and is coded on the aircraft transponder by the pilot; the transponder is turned on following

[1]The Cab also maintains an hourly traffic log summary for all arrivals and departures.



LEGEND

FDEP PRINTER

FDEP KEYBOARD

RADAR DISPLAY

CONRAC MONITOR

ARTS KEYBOARD

SCRATCH PAD OR DATA FORM

STRIP DROP TUBE TO TRACON (PLANNED)

FIGURE 5-1. LAYOUT OF FLIGHT DATA EQUIPMENT IN THE ABQ TOWER CAB

FIGURE 5-2. FLIGHT DATA ENTRY AND PRINT OUT (FDEP) UNITS IN CAB

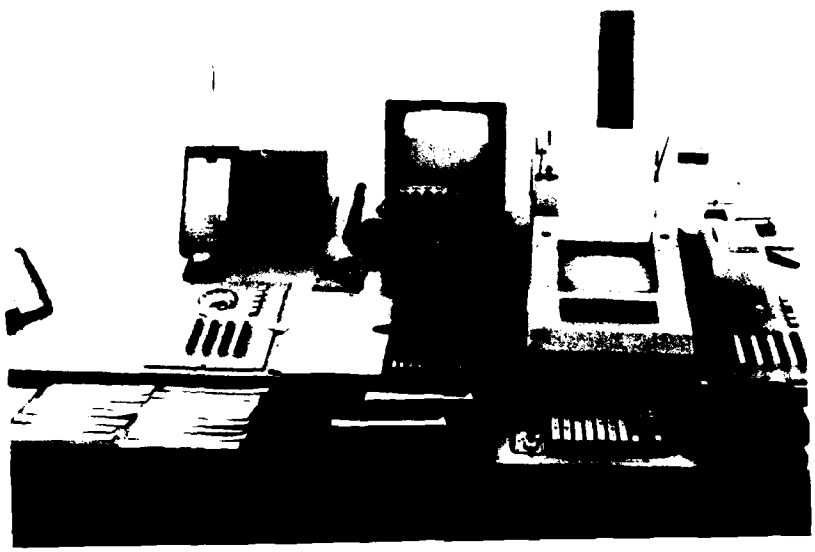


FIGURE 5-3. CONRAC EQUIPMENT AT CLEARANCE DELIVERY POSITION IN CAE

takeoff. This procedure enables the ARTS system to identify an aircraft through radar interrogation.

The Cab Coordinator (CC) or the controller responsible for the functions of this position, maintains a record of military arrivals and departures (Figure 5-4) and he is required to call the Kirtland air traffic controller every 15 minutes or so and report these operations to him. The Local Controller-2 (LC-2) maintains a log (not illustrated) of arrivals and departures and local flights using the secondary runway; and Local Control-1 (LC-1) maintains a log (Figure 5-5) of arrivals, departures, and locals using the primary runway. GC maintains a scratch pad (Figure 5-6) which he uses to record the identification numbers of the aircraft that will require instructions.

The flight strip drop tubes are designed to transport flight strips in plastic holders from the Cab to the TRACON following the issuance of a takeoff clearance for a particular aircraft. The Albuquerque Tower was not using such drop tubes at the time this analysis was performed; however, Tower administrative personnel indicated they were planning to use the tubes in the near future. By providing the TRACON with strips prepared in the Cab such drop tubes would eliminate the need for the TRACON FDEP to print flight strips on IFR filed departures and for having VFR state III departure flight strips handwritten in the TRACON (discussed in Section 5.3).

5.2.2 TRACON

The Albuquerque TRACON (Figure 5-7) contains one FDEP unit located opposite the High South Coordinator (HSC) position. So located, the FDEP is convenient to both the High North Radar (HNR) and High South Radar (HSR) controllers. The keyboard faces the HSC console position (Figure 5-8).

The TRACON FDEP prints flight strips for all IFR filed departures, arrivals, and overflights for Albuquerque and secondary airports in the terminal area. VFR flight strips may also be

FIGURE 5-4. FACILITY OPERATION LOG MAINTAINED BY CAB COORDINATOR

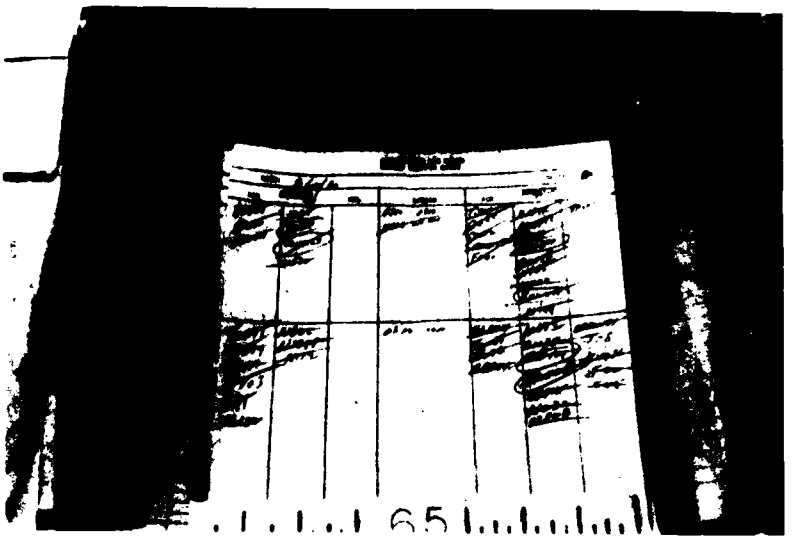


FIGURE 5-5. HOURLY TRAFFIC COUNT MAINTAINED BY LOCAL CONTROL-1

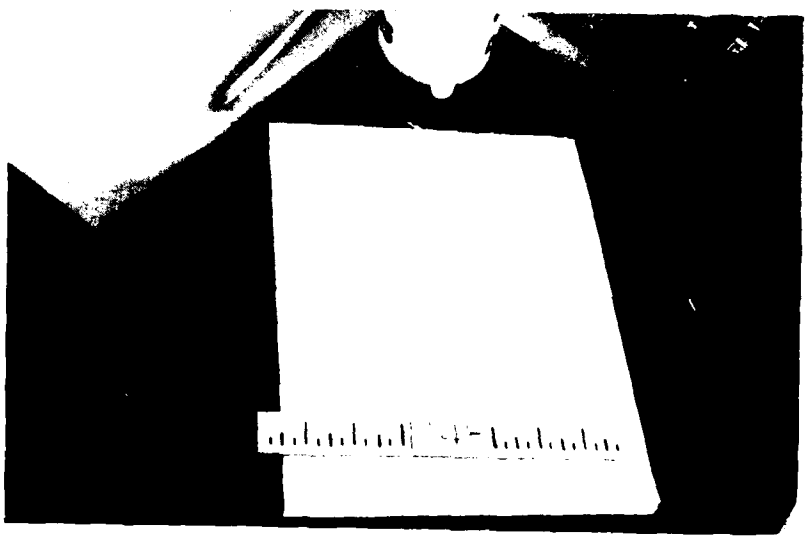


FIGURE 5-6. LIST OF AIRCRAFT IDENTIFICATION NUMBERS MAINTAINED BY GROUND CONTROLLER FOR TAXIING AIRCRAFT

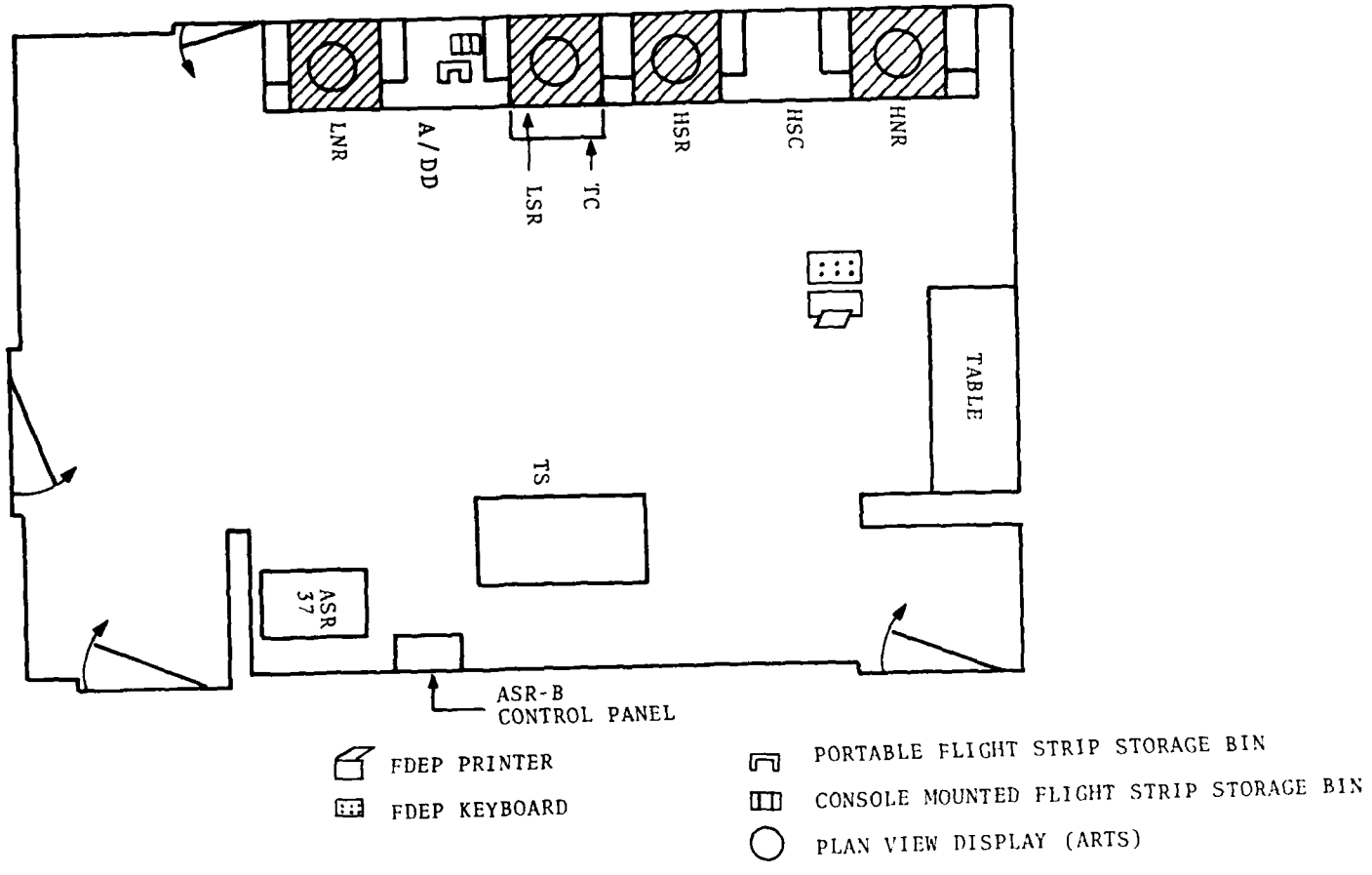


FIGURE 5-7. FLIGHT DATA EQUIPMENT LAYOUT IN THE ABQ TRACON

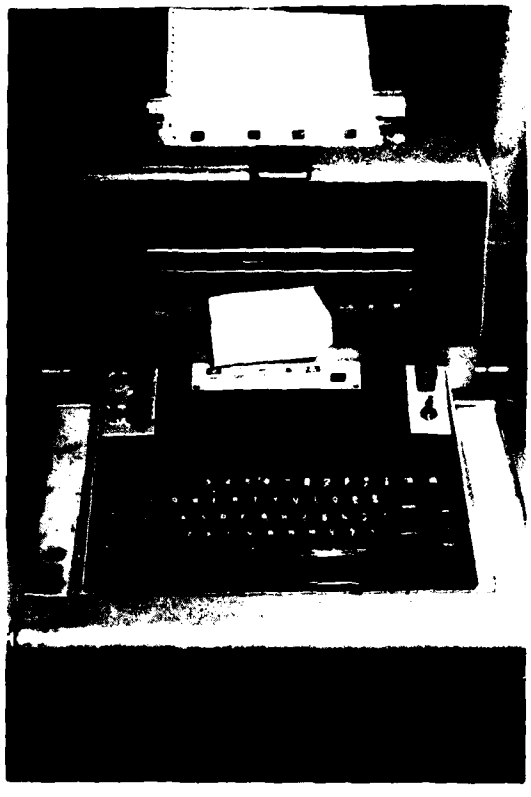


FIGURE 5-8. FLIGHT DATA ENTRY AND PRINTOUT UNIT IN TRACON

printed on the FDEP if the aircraft is on a filed VFR flight plan and is being handed off to the Albuquerque Tower by the en route center.

Printed VFR flight strips are not common in the TRACON and they usually number only two to three per day.

The second source of flight data in the TRACON is the radar surveillance displays at each of the four operational radar positions (Figure 5-7). Each aircraft which is on instrument operation (IFR or VFR stage III) is identified on the radar display with an ARTS data block, located next to the primary target. This data block continually displays the aircraft flight number and altitude; data on aircraft type and ground speed are displayed alternately. The ARTS system correlates these flight data with the identifying aircraft using the discrete beacon code on the aircraft transponder. The ARTS display also has a "tab list" near the edge of the radar screen; which shows pending instrument operations (e.g., VFR stage III) departures which have been processed through the FD/CD positions in the Cab. Such flights have been assigned a discrete beacon by the ARTS computer.

5.3 FLIGHT STRIP ANALYSIS AND PROCESSING

5.3.1 General Information

Flight data is primarily maintained in the Tower Cab and TRACON by means of flight strips. These rectangular paper strips serve as a reference for each flight requiring air traffic control service in the Albuquerque terminal area.

The use of additional flight data paper reference is limited at Albuquerque. No scratch pads are used in the TRACON, and only one scratch pad is used in the Cab, at GC (Figure 5-6).

In general, flight strips differ according to form and format. Three flight strip formats are used for:

- o arrival flight strips
- o departure flight strips
- o overflight flight strips

Flight strip format varies since operational flight data most important to the controller varies with the type of flight. For example, on an arrival flight strip the coordination fix is highly important for planning the handoff procedure with the en route center; on a departure flight strip, the controller is more concerned with the scheduled departure time, requested altitude, and preferred departure route. These three basic formats are presented in the following sections for applicable TRACON and Cab (departures only) flight strips.

The form of flight strips may also vary such that the strips may be either machine printed or handwritten.

Whether a strip is machine printed depends upon its source. The sources and the form of the standard flight strips processed at Albuquerque are summarized in Table 5-1. Flight strips printed by the FDEP units are generally for flights with IFR filed flight plans, handwritten strips are generally for VFR flights without a filed flight plan.

In addition to format and form, flight strips also vary according to the nature and extent of the manual notations made on the strips by the controllers. Such notations are made to facilitate the air traffic control function and are made on both printed and handwritten strips. They include:

- Noting changes to update the typewritten flight data (e.g., changing the requested altitude (flight level) or destination airport).
- Emphasizing information critical to the handling of the flight even though it already is typed out on the flight strip (e.g., special coordination fixes are sometimes emphasized on arrival flight strips).
- Noting critical information to be used in the handling of flight (e.g., the type of approach to be made to Albuquerque, or that the flight is a secondary airport arrival).

TABLE 5-1. SOURCES OF STANDARD FLIGHT STRIPS BY TYPE OF FLIGHT AT ALBUQUERQUE

TYPE OF FLIGHT	DEPARTURES		ARRIVALS		OVERFLIGHTS	
	CAB	TRACON	CAB	TRACON	CAB	TRACON
IFR Filed	Printed by FDEP	Printed by FDEP	Not received or Filled Out	Printed by FDEP	Not received or Filled out	Printed by FDEP
VFR Stage III Non-filed	Handwritten by FD/CD controller with information provided through voice radio link with pilot before takeoff; ARTS computer assigns discrete beacon code for flight and is displayed on Conrac.	Flight data appears on TRACON controller's "tab list" on ARTS display; controller makes strip on flight. Local controller calls off flight over radio to TRACON controller on takeoff.	Not recieved or filled out	Handwritten by TRACON controller with information. Usually provided by pilot through voice radio link.	Not received or filled out.	Handwritten by TRACON controller with information usually provided by pilot through voice radio link
VFR Non-Stage III	Usually handwritten by GC controller, pilot has no need for clearance or discrete beacon code; normal VFR squawk is 1200. Pilot must call if below 3000 feet AGL within 5 miles of Tower	Not received or filled out; no radar service provided.	Not received or filled out.	Not received or filled out (traffic advisory information may be provided to pilot, however)	Not received or filled out.	No strip required if no radar service provided.

- o Noting that a particular instruction has been issued to the pilot (e.g., altitude instructions, speed control).
- o Noting that required inter-controller coordination has taken place (e.g., a radar termination notation is made when a flight is handed off to the ARTCC or to the Tower for a visual approach).
- o Noting information for other than controller purposes such as for traffic counting or incident reconstruction (e.g., radar surveillance approach).

Examples and explanations of manual notations for both printed and handwritten flight strips are presented in the following sections.

5.3.2 Albuquerque Flight Strip Profile

Detailed analyses of Albuquerque flight strips are better understood if placed in the context of the operational flight strip environment in the TRACON. A summary breakdown of daily flight strip processing at Albuquerque is presented in Table 5-2 by:

- o Operations category (air carrier, air taxi; general aviation and military).
- o Type of flight (arrival, departure, overflight).
- o Airport (Albuquerque or secondary airport).
- o Form of flight strip (printed or handwritten).

On a typical weekday (Thursday, January 31, 1980) the Albuquerque TRACON process approximately 770 flight strips with roughly 46% printed and 54% handwritten. The high percentage of handwritten strips primarily results from extensive general aviation activity (51% of all strips). Almost all such activity is conducted under VFR state conditions thus requiring radar control to maintain aircraft separation. Albuquerque flight strips are also relatively diverse in terms of the mix of air carrier (18%), air taxi (10%), general aviation (51%) and military (21%) operations. Secondary airport flight strips represent only one percent of the total

TABLE 5-2. FLIGHT STRIP BREAKDOWN FOR ALBUQUERQUE TRACON FOR AN EXAMPLE WEEKDAY UNDER VFR CONDITIONS

Airports	Categories of Flight Operations															
	Air Carrier			Air Taxi			General Aviation			Military			TOTALS			GRAND TOTALS
	A	D	O	A	D	O	A	D	O	A	D	O	A	D	O	
Albuquerque International																
o Printed Strips	72	67	-	22	30	1	33	31	10	32	51	2	159	179	13	351 Printed
o Handwritten Strips	-	-	-	13	14	-	137	123	46	43	21	12	193	158	58	409 Handwritten
Secondary Airports																
o Printed Strips	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0
o Handwritten Strips	-	-	-	-	-	-	4	6	-	-	-	-	4	6	0	10 Handwritten
	72	67	0	35	44	1	174	160	56	75	72	14	356	343	71	770
		18%			10%			51%			21%		46%	45%	9%	100%

A = Arrival
D = Departure
O = Overflight

Total Printed Strips: 351 = 46%
Total Handwritten Strips: 419 = 54%

number of strips. The arrival and departure flight strips each represent approximately 45 percent of the total number of strips processed with the remaining 10 percent representing overflights.

5.3.3 Tower Cab Departure Flight Strips

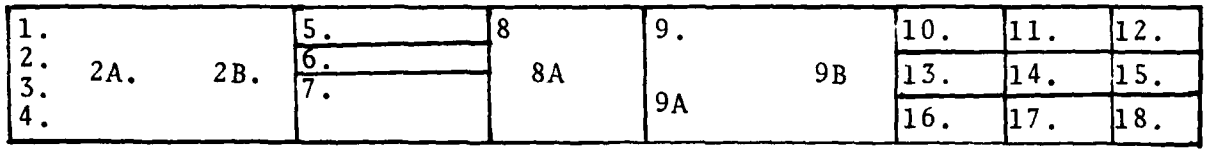
The format and form of Cab departure strips are illustrated in the following:

Figure 5-9: Flight Strip Format for Departures from Albuquerque (Cab Strip).

Figure 5-11: Typical Cab Flight Strips for Departure from Albuquerque (Printed and Handwritten).

An IFR departure flight strip is printed on the Cab FDEP approximately thirty minutes prior to scheduled takeoff time. FD/CD removes the flight strip from the sheet of printed strips, reviews the flight data for errors, places the strip on the CD position counter (Figure 5-10) and awaits the pilot's call. When the aircraft pilot calls in for clearance, the controller reads the clearance data off the strip and also provides initial heading and altitude instructions to the pilot; the controller manually notates the strip to indicate these instructions have been given and the clearance has been read (Figure 5-11). It is also a common practice for the controller to write the radio frequency of the appropriate TRACON controller on the strip (Figure 5-11); this is a convenience for Local Control when he directs the pilot to change frequency following takeoff.

After the clearance is read, FD/CD passes the flight strip to the adjacent CG position (Figure 5-12) the flight strip movement is counterclockwise along the Cab counter. The flight strip usually remains flush on the console counter until the pilot calls in for permission to taxi. When he calls in, GC scans the strips on the counter to select the proper flight strip. It is common practice for GC to manually notate the strip with the correct runway number (Figure 5-11); this practice helps to organize taxi operations and insure coordination with Local Control as GC must receive approval from Local Control before permitting an aircraft to taxi across an active runway.



Typed out information

1. Aircraft identification
2. Revision number
3. Number of aircraft, if more than one, type of aircraft, and any special equipment; e.g., DME, transponder, heavy etc.
4. Computer identification
5. Secondary radar (beacon) code assigned
6. Proposed departure time
7. Requested altitude (hundreds of feet)
8. Departure airport
9. Route and destination
9A.

handwritten information (general location on strip)

10. Initial turning and heading instructions (entered by CD Position)
13. Frequency of radar position in TRACON that will handle aircraft
9B. Runway (entered by GC position)
8A. Initial altitude assignment (entered by CD Position)
2B. Check mark to indicate clearance read (entered by CD position)

FIGURE 5-9. FLIGHT STRIP FORMAT FOR DEPARTURES FROM ALBUQUERQUE-(CAB STRIP)

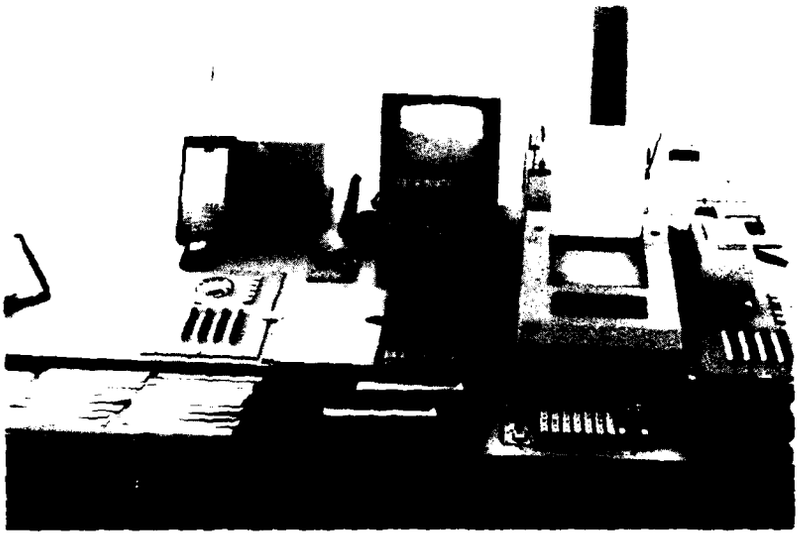
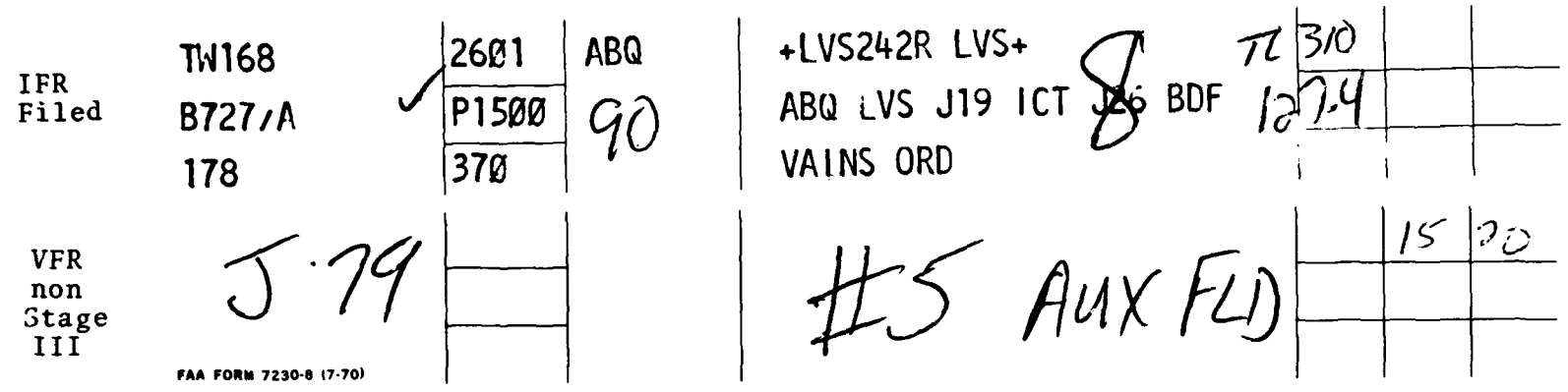


FIGURE 5-10. FLIGHT STRIPS AT THE FLIGHT DATA/CLEARANCE DELIVERY POSITION



TW168	J79	Aircraft identification
B7271A		Aircraft type/transponder equipment
178		Computer identification number
2601		Secondary radar beacon code assigned
P1500		Proposed departure time
370		Requested altitude (hundreds of feet)
ABQ		Departure airport
+LVS242R...	#5 AUX FLD	Preferred departure route (+...+), route, and destination
✓		Clearance read
90		Initial altitude assigned (hundreds of feet)
8		Runway for takeoff
TL310		Turn left to a headway of 310°
127.4	1520	Time of departure

FIGURE 5-11. TYPICAL CAB FLIGHT STRIPS FOR DEPARTURES FROM ALBUQUERQUE (PRINTED AND HANDWRITTEN)

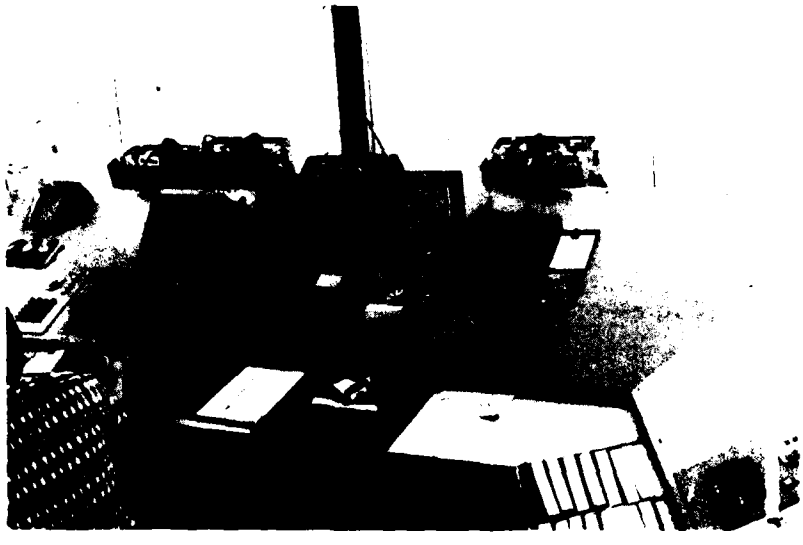


FIGURE 5-12. THE GROUND CONTROL POSITION SHOWING SCRATCH PAD AND LAYOUT OF FLIGHT STRIPS

When the taxiing aircraft is ready to enter the primary runway for takeoff, GC slides the flight strip over to the LC-1 position (Figure 5-13). LC-1 clears the aircraft for takeoff and provides final Cab instructions prior to directing the pilot to change to the TRACON frequency. LC-1 calls the flight number to the TRACON Controller (via Telco) who assumes radar control of the flight. The flight strip is then filed by LC-1 in the storage bin at the Cab Coordinator position (Figure 5-14).

Additional examples of Cab departure flight strips for military, air taxi, and general aviation flights are illustrated in Figure 5-15. The corresponding manual notations on these strips are presented and explained in Table 5-3.

The processing of handwritten Cab departure flight strips for non-filed VFR stage III flights is different from that of the printed strips in several respects. FD/CD obtains the necessary flight data (aircraft identification, type, requested altitude, route, and destination) information necessary to prepare a strip from the pilot when he calls in for departure clearance. Strips are taken from the storage bin at the FD/CD position for this purpose. If the aircraft has transponder equipment, FD/CD provides the flight with a discrete beacon code through a request made with the ARTS keyboard. He can observe the resulting assigned code on the Conrac video screen preview area. This process also results in the flight appearing on the appropriate TRACON screen "tab list" thus enabling the TRACON controller to prepare a handwritten strip for the pending VFR stage III departure.

Remaining flight strip processing procedures are similar to those previously described with the possible exception that the flight strip will pass from the GC position to LC-2 for takeoff on the secondary runway. Following the "call off" to the TRACON by LC-2 the flight strip is placed in the storage bin at the LC-1 position (if secondary runway is used).

The processing of VFR non-stage III departure flights in the Cab is less complex since no mandatory radar separation service is provided for them by the TRACON. The pilot can call the GC

FIGURE 5-13. LOCAL CONTROL-1 POSITION SHOWING COUNTER ON WHICH STRIPS IN USE ARE NORMALLY LAID

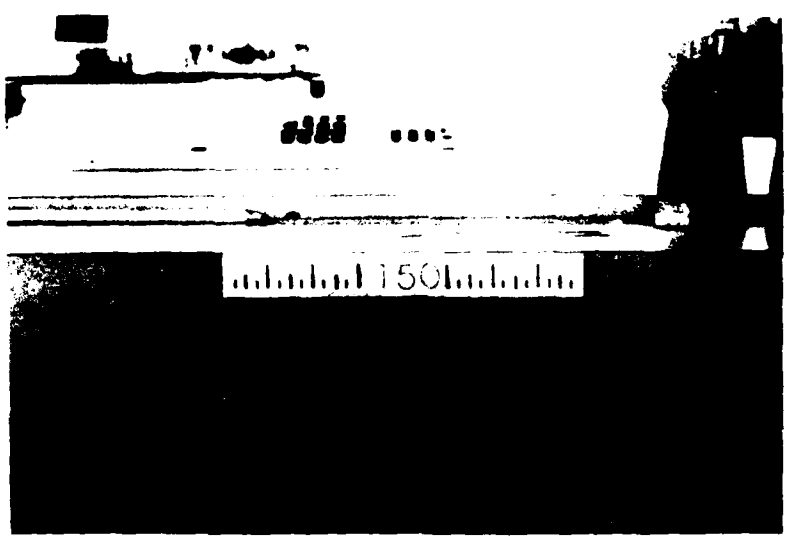


FIGURE 5-14. FLIGHT STRIP STORAGE BIN AT THE CAB COORDINATOR POSITION

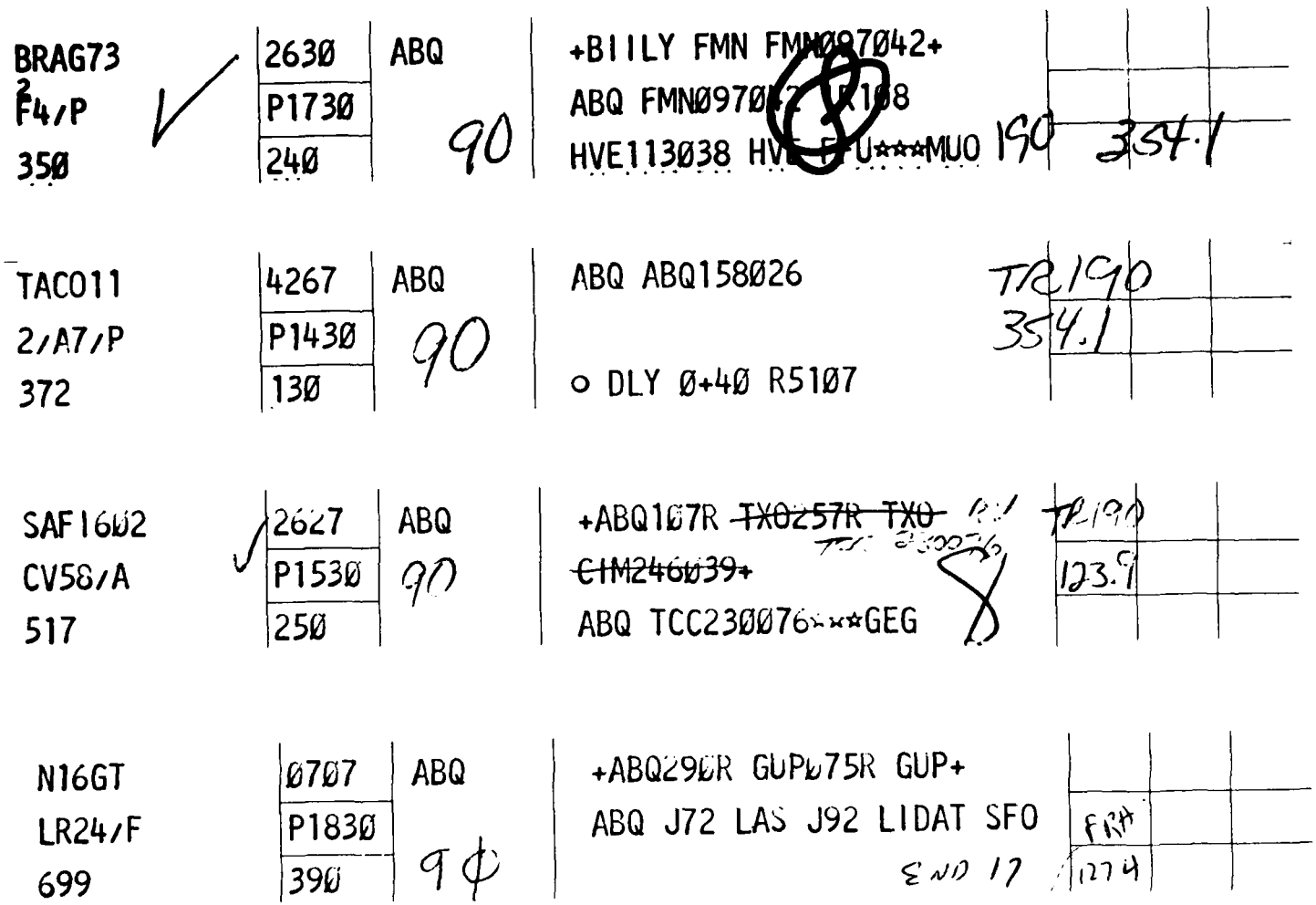


FIGURE 5-15. CAB DEPARTURE FLIGHT STRIP EXAMPLES

TABLE 5-3. SAMPLE OF MANUAI NOTATIONS MADE ON CAB DEPARTURE FLIGHT STRIPS

FIGURE 5-9. FLIGHT STRIP LOCATION	MANUAL NOTATION	FIGURE 5-15. EXAMPLE FLIGHT STRIP	MEANING	PURPOSE	WRITTEN BY	EXTENT NOTATION USED
Right side Boxes	190 TR190 FRH	1 2,3 4	Heading of 190° Turn right to 190° heading Fly runway heading	To emphasize the direction of departures for quick controller reference	CD	Routinely
Right Side Boxes	354.1 123.9	1,2 3	UHF frequency for HSR controller VHF frequency for HSR South controller	To enable LC to easily communicate departure radar frequency	CD	Routinely
	127.4	4	VHF frequency for HNR controller	Frequency to pilot		
8A	90	1-4	Initial altitude assignment of 9000 feet	Controller instruction to pilot to keep departing aircraft below inbound arrivals	CD	Routinely
2B	✓	1,3,4	Clearance read to pilot	Reminder to controller that clearance read	CD	Routinely
9B	8 End 17	1,3 4	Runway 8 Depart runway 17	To enable GC to organize taxi Instructions by takeoff runway		
9B area	TCC230076 RV	3	Center gave permission to aircraft to follow direct route instead of PDR	To note change to the filed flight plan	CD	Seldom

position direct since there is no requirement for a clearance or the assignment of a discrete beacon code.[1] GC handwrites a strip on the flight, and it is processed through the Cab. The TRACON has no contact with such flights and so does not prepare a strip on them.

5.3.4 TRACON Departure Flight Strips

The format and form of TRACON departure flight strips are illustrated in the following:

Figure 5-16: Flight Strip Format for Departures from Albuquerque (TRACON Strip).

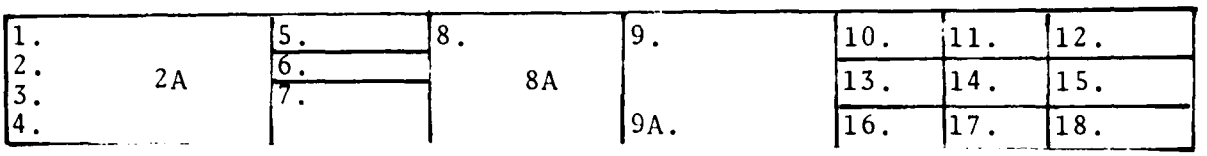
Figure 5-17: Typical TRACON Flight Strips for Departure from Albuquerque (Printed and Handwritten)

Flight strips for filed departures are printed on the TRACON FDEP approximately thirty minutes prior to scheduled takeoff time. The vast majority of these are IFR strips, with most VFR flight strips being handwritten. The strip is usually removed from the printed sheets by the TRACON Supervisor (TS) or the HSC if the position is staffed. The person removing the strip reviews the flight data for accuracy and to determine which controller should handle the flight. The main determinants in this decision are the type of aircraft, preferred departure routes, and requested altitude and destination. As a general rule, the IFR filed departures are handled by the High Radar positions (HNR, HSR) with the responsible controller being determined by the direction of flight following takeoff from the primary runway.

The TRACON Supervisor usually places the flight strip on the controller's console counter consistent with the arrangement of flight strips preferred by the controller. The controller usually has strips organized in groups such as:

- working flight strips;
- pending arrivals chronologically ordered;
- pending departures chronologically ordered.

[1] VFR non-stage III flights use a common transponder code of 1200.



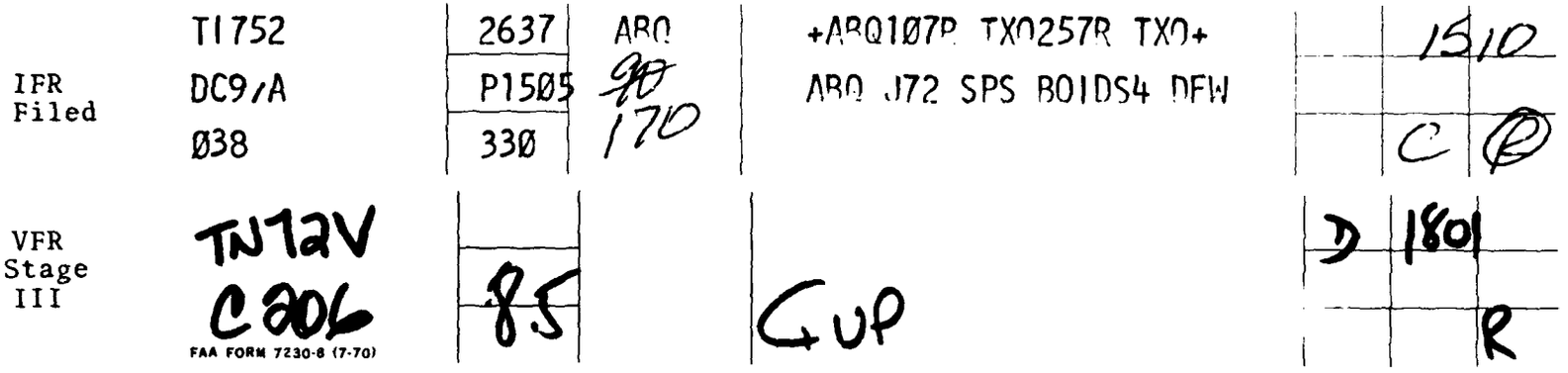
Typed information

1. Aircraft identification
2. Revision number
3. Number of aircraft, if more than one, type of aircraft, and suffix indicating any special equipment; e.g., DME, transponder, heavy etc.
4. Computer identification number
5. Secondary radar (beacon) code assigned
6. Proposed departure time
7. Requested altitude
8. Departure airport
9. Route and destination
9A.

Handwritten information

8A. Altitude control information
10. Requested reporting point and time over
11.
12. Departure time (2 digit)
13. Requested reporting point and time over or intercepting
14. " " " " " " " "
15.
16.
17.
18. Time release of control or cancelled IFR

FIGURE 5-16. FLIGHT STRIP FORMAT FOR DEPARTURES FROM ALBUQUERQUE-(TRACON STRIP)



T1752		TN72V	Aircraft identification
DC91A		C206	Aircraft type/transponder equipment
Ø38			Computer identification number
2637			Secondary radar (beacon) code assigned
P15Ø5			Proposed departure time
33Ø		8.5	Requested altitude (hundreds of feet)
ABQ			Departure airport
+ABQ107R...		GUP	Preferred departure route (+...+), route and destination
~~90~~ 170			Altitude assignments (hundreds of feet)
1510		1801	Actual departure time
CR			Radar service terminated; handoff to Center
		R	Radar contact
		D	Departure

FIGURE 5-17. TYPICAL TRACON FLIGHT STRIPS FOR DEPARTURES FROM ALBUQUERQUE (PRINTED AND HANDWRITTEN)

As soon as time permits, the controller reviews the departure flight strip to ascertain the flight data, taking note of planned departure time and any special handling requirements.

This preparation and strategy enables the controller to anticipate the "call off" from Local Control when the aircraft is on takeoff roll (Section 5.3.3). After takeoff, the pilot of the departing aircraft changes to the appropriate TRACON radio frequency to receive instructions on the departure from the Albuquerque terminal area. The controller usually manually notates the flight strip with the time the aircraft came under his control; it is also common for an "R" to be written on the flight strip to indicate that the aircraft is in radar contact and subject to active TRACON control (Figure 5-17).

The TRACON controller may issue altitude and heading instructions to the aircraft. Departing IFR flights cannot ascend beyond the initial altitude assignment (9,000 ft. MSL) until cleared by the departure controller in the TRACON. Higher altitudes are usually authorized by the TRACON when the departing aircraft clears the inbound path of arriving flights. It is common practice for the controller to manually notate the strip with the latest authorized altitude while drawing a line through the previously authorized altitude (Figure 5-17).

As the departing aircraft approaches the boundary of the terminal area, the controller initiates handoff of the flight to the en route center. When this handoff is completed, the controller usually manually notates the strip (by circling the "R" and adding a "C") to indicate the handoff and the termination of Albuquerque TRACON radar service (Figure 5-17). The flight strip is then usually filed in a storage bin at the HSC position.

Figure 5-18 provides additional examples of printed TRACON departure flight strips including one for each type of aircraft operations category (air carrier, air taxi, general aviation and military); the corresponding manual notations on these strips are presented and explained in Table 5-4.

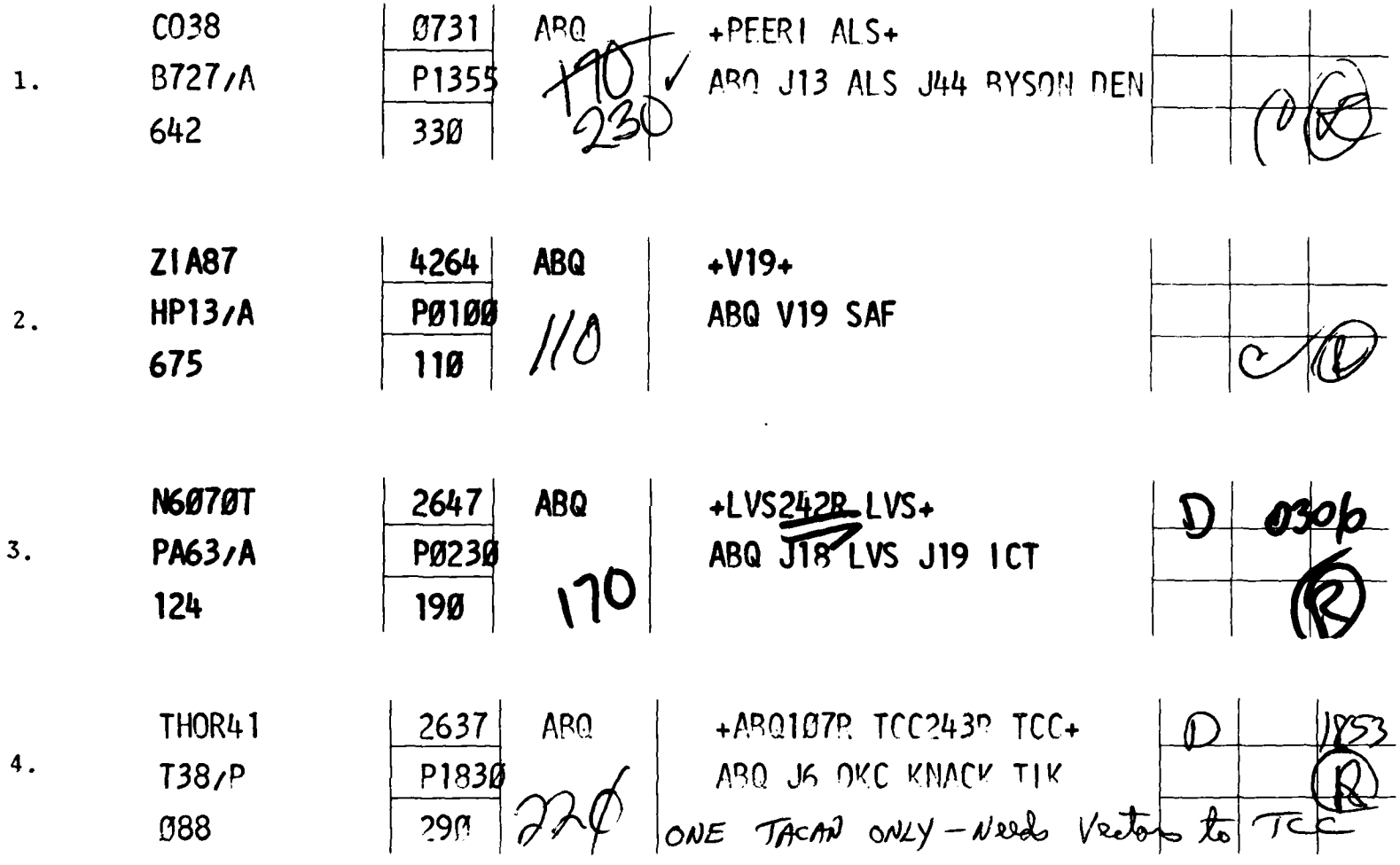


FIGURE 5-18. TRACON DEPARTURE FLIGHT STRIP EXAMPLES

TABLE 5-4. SAMPLE OF MANUAL NOTATIONS MADE ON TRACON DEPARTURE FLIGHT STRIPS

Figure Flight Strip Location	Manual Notation	Figure Example Flight Strip	Meaning	Purpose	Written by	Extent Notation Used
8A	~~170~~	1	Altitude instructions in hundreds of feet	A reminder to the controller that instruction issued to the pilot	TRACON Controller HNR	Routinely
	230					
	110	2				
	170	3				
	220	4				
9	//	3	Underscoring a radial in the PDR	To highlight specific data for the controller	TRACON Controller HNR	Controller dependent but common
9A	One TACAN only Needs Vectors to TCC	4	Note that the military aircraft (T-38) has one TACAN navigational unit and requires radar vectors to get to the Tucumcari, VORTAC per PDR	A reminder to the controller of aircraft status and need for radar vectors	TRACON Controller HNR	Controller dependent and rare
10	D	3,4	Departure	A reminder to the controller that the flight strip is a departure	TRACON Controller HNR	Controller dependent and not commonly recorded
12	0306	3	Departure time or time assumed control	A record for the controller of what time radar service initiated	TRACON Controller HNR	Routinely
	1853	4				
18	C(R)	1,2	Radar service terminated, handoff to center	A reminder to controller	TRACON Controller HNR	Routinely
18&15	(R)	3,4				

The processing of handwritten TRACON departure strips is directly related to the Cab VFR stage III departure flight strip process (Section 5.3.3). Flight data on pending VFR stage III departures first appears in the TRACON on the ARTS radar screen "tab list" following the input of the data on the ARTS keyboard located at the FD/CD position in the Cab. As a general rule, VFR stage III flights are handled by the Low Radar positions (LNR, LSR) in the TRACON. The LNR or LSR controller handwrites a flight strip on the VFR state III flight using the tab list data on aircraft identification and beacon code. The controller may also manually notate the strip with a "D" to indicate it is a pending departure (Figure 5-18). This procedure enables the controller to be prepared for the "call off" from LC as the aircraft is on takeoff roll. In the "call off," LC usually states the critical flight data (aircraft identification, type, destination or direction and requested altitude) to enable the TRACON controller to enter the data on the strip. Following the takeoff, the pilot switches to the appropriate TRACON radio frequency. Similar to the procedure on an IFR departure, the controller usually manually notates the flight strip with the time the flight comes under TRACON control and with an "R" to indicate radar contact. At the termination of stage III radar service, the controller usually draws a line through the radar contact symbol "R".

The TRACON does not prepare flight strips on VFR non-stage III departures.

5.3.5 TRACON Arrival Flight Strips

The format and form of TRACON arrival flight strips are summarized in the following:

Figure 5-19: Flight Strip Format for Arrivals to Albuquerque. and Secondary Airports

Figure 5-20: Typical TRACON Flight Strips for Arrivals to Albuquerque (Printed and Handwritten).

An IFR and occasionally, a VFR filed arrival flight strip is printed on the TRACON FDEP approximately thirty minutes prior to the scheduled aircraft arrival time at the coordination fix. The flight

1.	5.	8.	9.	10.	11.	12.
2. 2A	6.			13.	14.	15.
3.	7.					
4.			9A.	16.	17.	18.

Typed out information

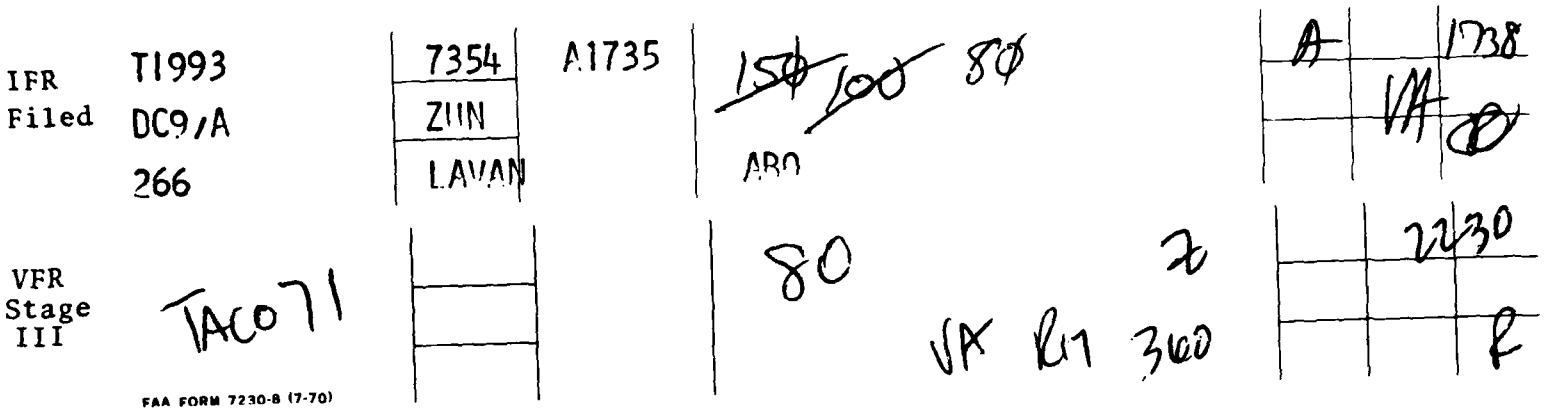
1. *Aircraft identification
2. Revision number
3. *Number of aircraft, if more than one, type of aircraft, and suffix indicating any special equipment, e.g., DME, transponder, heavy, etc.
4. Computer identification number
5. Secondary radar (beacon) code assigned
6. *Previous fix; inbound airway or transfer of control point
7. *Coordination fix
8. *Estimated time of arrival at the coordination fix
9A. Destination airport

Handwritten information**

9. Altitude (in hundreds of feet) and remarks
10-11. Secondary fix
12. Time of initial contact or time assumed control
13. Time over approach fix used only if holding
14. Time approach clearance issued
15. Time leaving approach fix commencing approach
16. Time of procedural penetration turn, or time over approach fix and final
17. Time transfer of control to the tower
18. Time landing assured, landed, cancels or missed approach

*When FDEP out of service hand print boxes 1,3,6,7,8 and 9.
**Radar: Box 10 to 18 not required but may be used at discretion of controller

FIGURE 5-19. FLIGHT STRIP FORMAT FOR ARRIVALS TO ALBUQUERQUE AND SECONDARY AIRPORTS



T1993	TACO 71	Aircraft identification
DC9/A		Aircraft type/transponder equipment
266		Computer identification number
7354		Secondary radar (beacon) code assigned
ZUN		Previous fix
LAVAN		Coordination fix
A1735		ETA at coordination fix
ABQ		Destination airport
~~150~~ ~~100~~ 80	80	Altitude assignments (in hundreds of feet)
A		Arrival
1738	2230	Time of initial contact
VA	VA	Visual approach
(R)		Radar service terminated; handoff to tower
	R	Radar contact
	R17	Runway 17
	Z	Handoff to Tower

FIGURE 5-20. TYPICAL TRACON FLIGHT STRIPS FOR ARRIVALS TO ALBUQUERQUE (PRINTED AND HANDWRITTEN)

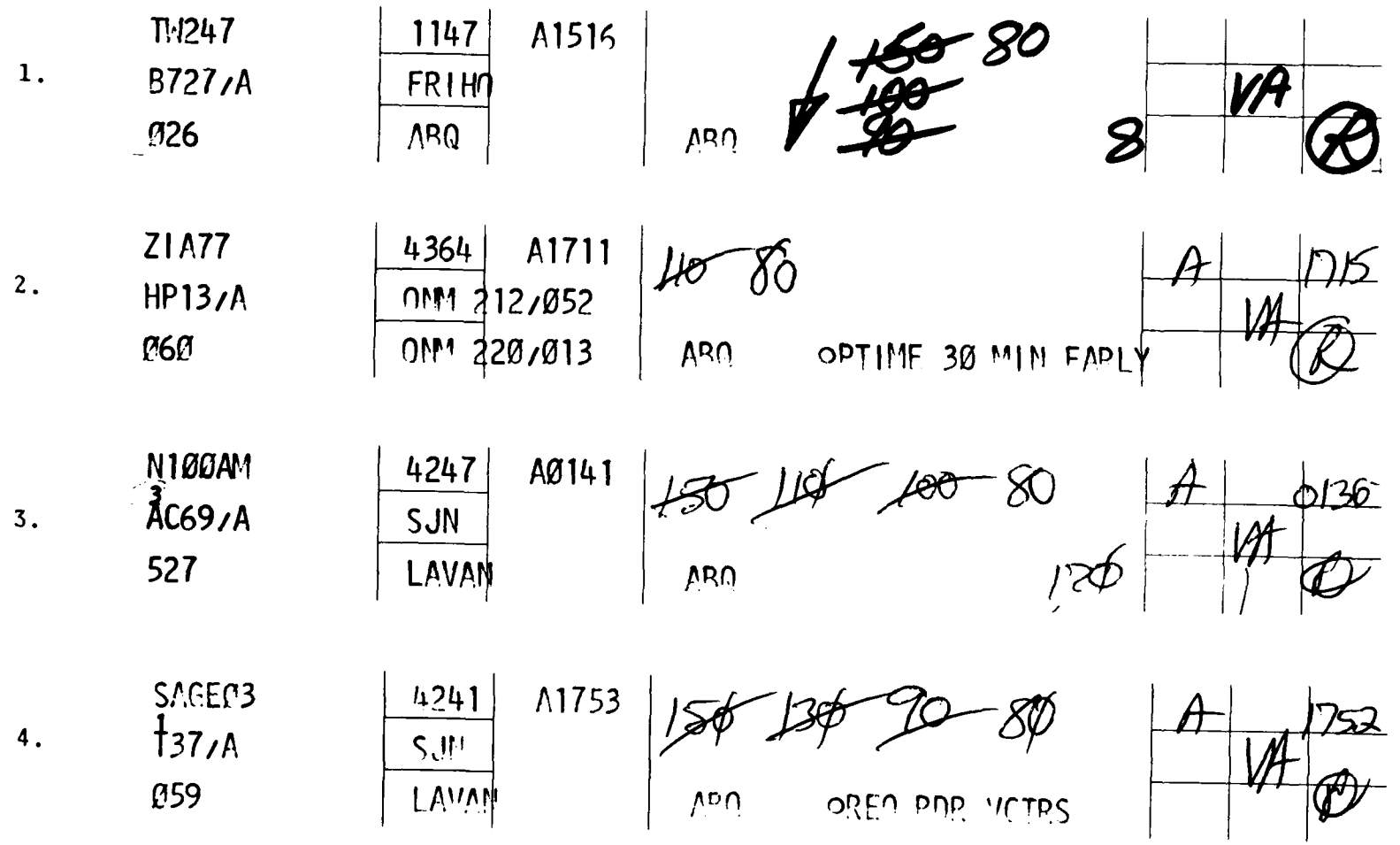


FIGURE 5-21. TRACON ARRIVAL FLIGHT STRIP EXAMPLES

strip is usually removed from the FDEP by the TRACON Supervisor of HSC if the position is staffed. The person removing the strip reviews the flight data for accuracy and to determine which contoller will handle the flight. Similar to IFR departures, the IFR filed arrival flights are handled by the High Radar positions (HNR, HSR) in the TRACON. The flight strips are delivered to the controller who handles aircraft using the coordination fix identified on the strip. Similar to the procedure on arrivals, the TRACON Supervisor (or HSC) places the flight strip on the controller's console counter consistent with the arrangement of flight strips (see Section 5.3.4.).

As soon as time permits, the controller reviews the arrival flight strip to ascertain the flight data and to take special note of the coordination fix and the estimated time of arrival at the fix. The controller may manually notate the strip with an "A" to indicate an arrival flight; although this information is indicated by the flight strip format, the handwritten letter symbols are convenient when scanning a line of flight strips on the console counter.

This preparation and manual notation enables the controller to anticipate the flight handoff from the en route center. When the designated flight appears on the radar surveillance display with an ARTS data block, the TRACON controller coordinates the required radar handoff using the ARTS equipment. The en route center advises the aircraft pilot to change to the appropriate TRACON frequency at Albuquerque. Upon accepting control of the flight, the TRACON controller manually notates the time in the upper right-hand corner of the strip; the handwritten "R" radar contact symbol is also commonly used (Figure 5-20).

In guiding the aircraft in its approach and descent to Albuquerque or a secondary airport, it is common for the controller to manually notate sequential altitude changes on the flight strip (Figure 5-20); some controllers even prefer to hand draw a downward facing arrow on the flight strip to indicate descent. TRACON controllers usually communicate with the pilot several times during the approach procedure to coordinate changes in altitude and heading.

When the aircraft is positioned for final approach and the runway is in the pilot's sight, the TRACON controller usually clears the aircraft for a visual approach (manually notated on the strip with a "VA") and subsequently transfers the flight to the Tower Cab when the aircraft is between 10 and 5 miles from touchdown. The handoff to the Cab is coordinated by using ARTS to type a T on the flight data block on the BRITE video screen, which is watched by the Local Controllers and the Cab Supervisor. When the Cab assumes control of the flight, the TRACON controller usually manually notates the flight strip by encircling the "R" or writing a "Z"; these symbols indicate that the Tower Cab now controls the flight. The flight strip is then usually placed in a storage bin at the HSC position.

LC issues the aircraft a clearance for landing; the controller's flight data reference is the data block on the BRITE display. GC, at this point, may log the aircraft's call sign on a scratch pad in preparation for issuing taxi instructions.

Figure 5-21 provides additional examples of printed TRACON arrival flight strips including one for each type of aircraft operations category (air carrier, air taxi, general aviation, and military); the corresponding manual notations on these strips are presented and explained in Table 5-5.

Handwritten arrival flight strips are completed in the TRACON for non-filed VFR stage III operations. The strip is written up by the TRACON controller (usually the Low Radar positions) with flight data information provided by the aircraft pilot using his radio. The extent of the flight data on these strips varies but usually includes the aircraft identification and transponder code. Manual notations on these strips are similar to the IFR strips and includes time assumed control, radar contact (R), arrival symbol (A), and Tower handoff symbols. Approach procedures are also similar with the exception that the Cab coordination takes place with the LC-2 position and landing occurs on the secondary runway.

TABLE 5-5. SAMPLE OF MANUAL NOTATIONS MADE ON TRACON ARRIVAL FLIGHT STRIPS

Flight Strip Location	Manual Notation	Example Flight Strip	Meaning	Purpose	Written by	Extent Notation
9	~~150~~ 80 ~~100~~ ~~90~~	1	Altitude instructions in hundreds of feet	A reminder to the controller that instruction issued to pilot; arrows also a reminder of aircraft descent	HSR Controller	Routinely
9	~~110~~ 80	2			HSR Controller	
9	~~150~~ ~~110~~ ~~100~~ 80	3			HSR Controller	Routinely
9	~~150~~ ~~130~~ ~~90~~ ~~80~~	4			HSR Controller	
10	A	2,3,4	Arrival	A reminder to the controller that the flight strip is an arrival	HSR Controller	Controller dependent and not commonly recorded
12	1715 0136 1752	2 3 4	Time of initial contact or time assumed control	A record for the controller of what time radar service initiated	HSR Controller	Routinely
14	√A	1-4	Visual Approach	A reminder to the controller that instruction for visual approach issued to pilot	1: HNR Controller 2-4: HSR Controller	Routinely
18	(R)	1-4	Radar service terminated; handoff to Tower	A reminder to controller	1: HNR Controller 2-4: HSR Controller	Routinely

Handwritten strips are not completed in the TRACON for VFR non-stage III arrival flights. However, pilots of such aircraft must call the Tower Cab when below 3,000 ft. (AGL) altitude within five miles of the Tower.

5.3.6 TRACON Overflight Flight Strips

Overflights are defined in Albuquerque as any flight which has communications with the TRACON without departing from, or landing at, Albuquerque.

The format and form of most overflight flight strips is presented in the following:

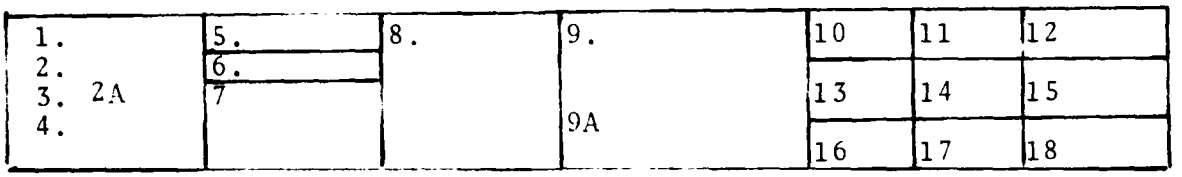
Figure 5-22: Flight Strip Format for Overflights through the Albuquerque Terminal Area.

Figure 5-23: Typical TRACON Flight Strips for Overflights through the Albuquerque Terminal Area (Printed and Handwritten).

An IFR filed flight with a flight plan approved through the Albuquerque terminal area results in an overflight flight strip being printed on the TRACON FDEP approximately thirty minutes before the aircraft is to arrive at the coordination fix shown on the strip. The strip is processed in the TRACON similar to an IFR arrival strip requiring controller assignment and processing (see Section 5.3.5).

The principal manual notation made on the strip is a large "X" in the upper right-hand corner to designate overflight. Other manual notations are similar to those illustrated in Figure 5-23. Radar service is terminated when the flight leaves the Albuquerque terminal area.

Handwritten overflight strips are completed for VFR state III flights passing through the Albuquerque terminal area. Manual notations on these strips are also similar to those shown in Figure 5-23.



Typed out information

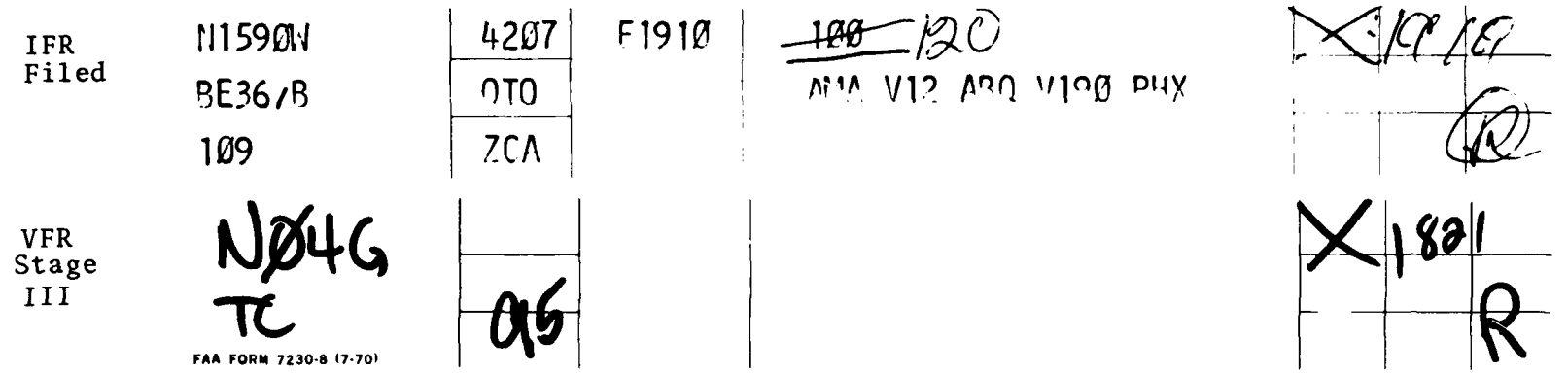
1. Aircraft identification
2. Revision number
3. Number of aircraft, if more than one, type of aircraft, and suffix indicating any special equipment; e.g., DME, transponder, heavy, etc.
4. Computer identification number
5. Secondary radar beacon code assigned
6. Coordination fix
7. Facility to which flight data forwarded
8. Estimated time of coordination fix (preceded by an "E"
9. Altitude and route of flight through terminal area

9A.

Handwritten information

9B. Altitude changes
10. A large "X" to indicate overflight
11.
12. Time of initial contact or time assumed control
13.
14.
15.
16.
17.
18. Radar contact status

FORMAT FOR OVERFLIGHTS THROUGH THE



	N1590W	N046	Aircraft identification
	BE361B	TC	Aircraft type/transponder equipment
	109		Computer identification number
	4207	95 (9500)	Secondary radar beacon code assigned
	OTO		Coordination fix
	ZCA		Facility to which flight data forwarded (en route center)
	~~100~~ AMA...		Altitude and route of flight through terminal area
	= 200		Altitude changes
	X	X	Overflight symbol
	1910	1821	Time of radar contact or time assumed control
	Ⓡ	R	In radar contact

FIGURE 5-23. TYPICAL TRACON FLIGHT STRIPS FOR OVERFLIGHTS THROUGH ALBUQUERQUE TERMINAL AREA (PRINTED AND HANDWRITTEN)

A second format for an overflight flight strip is used for departures from Coronado Airport located on the fringe of the terminal area. The format and form of this type of overflight strip is summarized in the following:

Figure 5-24. Flight Strip Format for Overflights from Secondary Airports through Albuquerque Terminal Area.

Figure 5-25. Typical TRACON Flight Strips for Overflights from Secondary Airports through Albuquerque Terminal Area.

Information on the generation, processing and manual notations on this type of overflight flight strip is similar to that described above.

Figure 5-26 provides additional examples of printed TRACON overflight flight strips; the corresponding manual notations on these strips are presented and explained in Table 5-6.

5.4 FLIGHT DATA LAYOUT/UTILIZATION BY POSITION

This section presents the layout and utilization of flight data by position in both the ABQ Tower Cab and TRACON. Particular emphasis is placed on the positioning and use of flight strips by type at each controller position. The principal data collection methodologies utilized were observation and photography; these methodologies were supplemented by controller interviews.

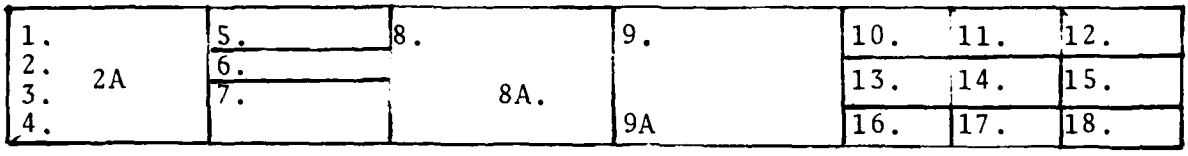
The principal presentation method is via annotated photographs and diagrams which show actual flight strips in use relative to location on the controller console counter, the arrangement of strips, and the relationship to other flight data.

5.4.1 Tower Cab

Controllers in the Tower Cab use activity logs and scratch pads as well as the usual flight strips for record keeping and to facilitate the handling of flight data. Controllers in the Cab maintain an activity log of arrivals, departures, and local flights and a special log of military operations. In addition, the Ground

Controller uses a scratch pad to record the call signs of arrivals as they appear on the BRITE as an aid to planning taxiing strategies and communicating taxiing instructions to the aircraft. The location and movement of these flight data materials as they are used is shown in the following figures:

Figure 5-27: Overview of Flight Data Arrangement by Cab Position for Typical Tower Operation.



Typed out information

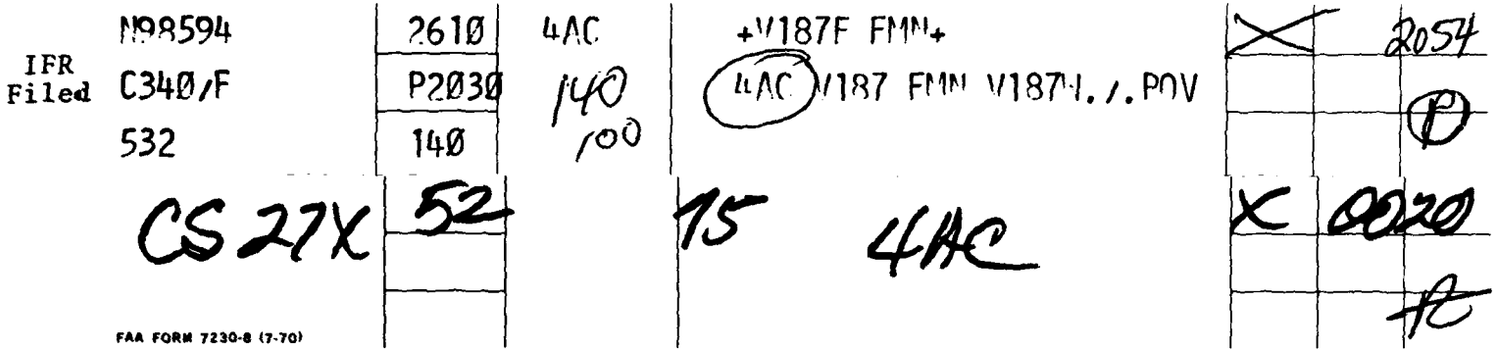
1. Aircraft identification
2. Revision number
3. Number of aircraft if more than one, type of aircraft and suffix indicating any special equipment, e.g., DME, transponder, heavy, etc.
4. Computer identification number
5. Secondary radar beacon code assigned
6. Proposed departure time
7. Requested flight altitude
8. Departure airport
9. Route and destination

9A.

Handwritten information

8A. Altitude information
10. A large "X" to indicate overflight
12. Time of initial contact or time assumed control
18. Radar contact status

FIGURE 5-24. FLIGHT STRIP FORMAT FOR OVERFLIGHTS (SECONDARY AIRPORT DEPARTURES) THROUGH ALBUQUERQUE TERMINAL AREA



N98594	CS27X	Aircraft identification
C3401F		Aircraft type/transponder equipment
532		Computer identification number
2610	52	Secondary radar beacon code assigned
P2030/		Proposed departure time
140	75	Requested altitude (hundreds of feet)
4AC	4AC	Departure airport (Coronado = 4AC)
+V178E...		Preferred departure route (+...+), route and destination
140 100		Altitude changes
0		Circle to highlight secondary airport
X	X	Overflight symbol
2054	0020	Time of radar contact or time assumed control
®	R	In radar contact; radar contact terminated

FIGURE 5-25. TYPICAL TRACON FLIGHT STRIPS FOR OVERFLIGHTS (SECONDARY AIRPORT DEPARTURE TYPE) THROUGH ALBUQUERQUE TERMINAL AREA

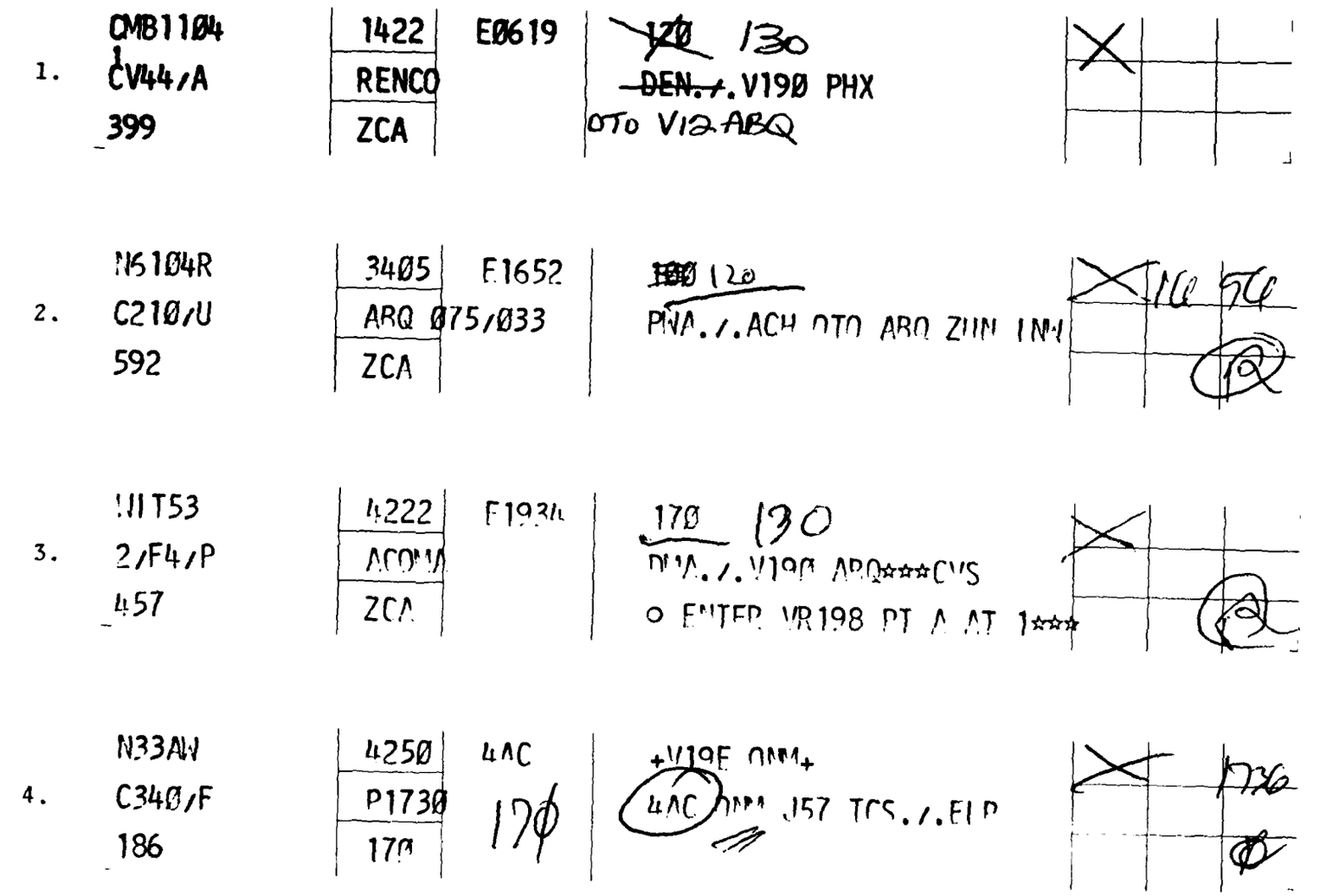


FIGURE 5-26. TRACON OVERFLIGHT FLIGHT STRIP EXAMPLES

TABLE 5-6. SAMPLE OF MANUAL NOTATION MADE ON OVERFLIGHT FLIGHT STRIPS

See Fig. 5-24 Flight Strip Location	Notation	See Fig. 5-26 Example Flight Strip	Meaning	Purpose	Written by	Extent Notation Used
9B	X 130 120 130	1 2 3	Altitude instructions in hundreds of feet	Reminder to controller that instruction issued	HSR Controller HNR Controller	Routinely
8A	170	4				
9A	OTO V12 ABQ	1	Route through Albuquerque terminal area; from OTTO VOR via Victor 12 to Albuquerque	Shows planned route of overflight for controller; enables controller to handle traffic with knowledge of overflight passage	HSR Controller	Uncommon
9		4	Highlight-encircle the "4AC" symbol for Coronado Airport	To highlight the secondary airport departure for the controller	HNR Controller	Controller dependent and common
10	X	1-4	Overflight	Reminder to the controller that the flight is an overflight	1-3 HSR Controller 4 HNR Controller	Routinely
12	1656 1736	2 4	Time radar service initiated or time of initial contact	Reminder to controller	2 HSR Controller 4 HNR Controller	Routinely
18	(R)	2,3,4	Radar service terminated	Reminder to controller	2-3 HSR Controller 4 HNR Controller	Routinely

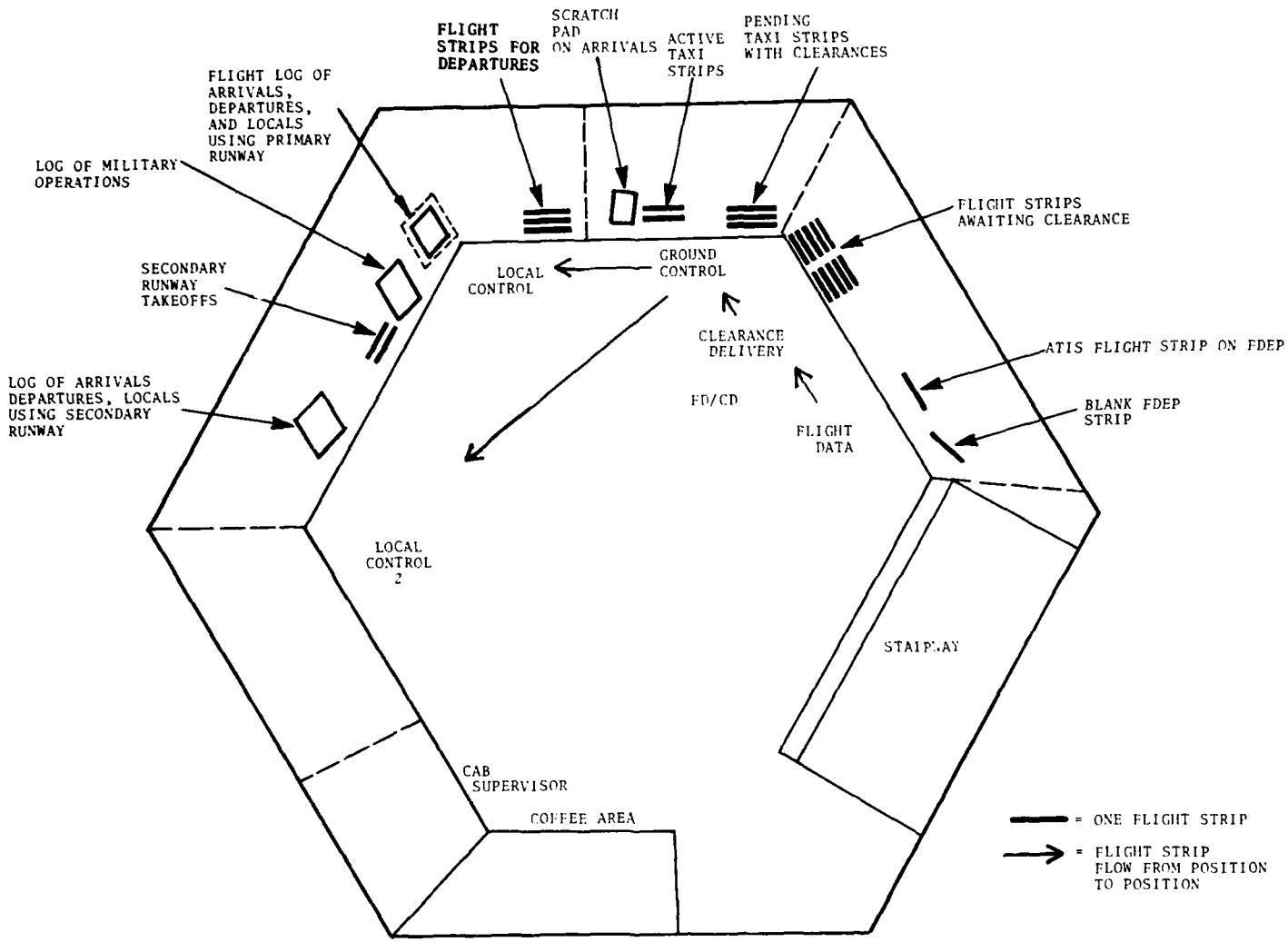


FIGURE 5-27. OVERVIEW OF FLIGHT DATA ARRANGEMENT BY CAB POSITION FOR TYPICAL TOWER OPERATION

Figure 5-28. Annotated Photographic Flight Data Survey of
to 5-33: Cab Positions for Typical Tower Operation

5.4.2 TRACON

The presentation of the flight data layout and utilization in the TRACON differs for the different position consolidation configurations (see Table 2-6) that are used depending upon the level of traffic, the time of day and visibility. The layout variations are illustrated by the following:

Figure 5-34: Flight Data Arrangement by TRACON Position for Typical Configuration 1 .

Figure 5-35: Flight Data Arrangement by TRACON Position for Configuration 2 (with Surveillance Approaches at Low Positions).

Figure 5-36: Flight Data Arrangement by TRACON Position for Configuration 3 (with Lows Combined at LNR Position).

Figure 5-37 to 5-42: Annotated Flight Data Photographic Survey of TRACON Positions for Configuration 3 presented in Figure 5-36.

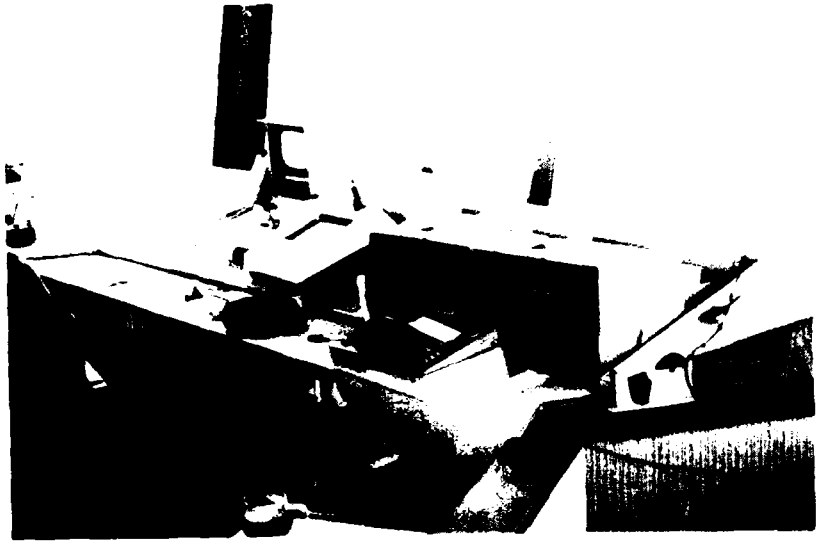
5.5 SUMMARY

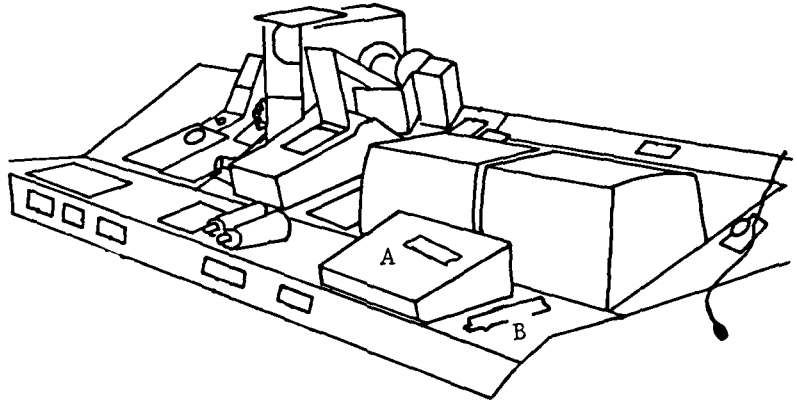
Flight data equipment at ABQ is fairly standard with one FDEP in the TRACON and two in the Tower Cab (one backup unit). Drop tubes are not used at ABQ[1] thus requiring machine printed flight strips to be received on both the Cab and TRACON units.

The system for handling and processing flight strips does not involve either plastic holders or trays. Controllers use the strips in a free standing manner and arrange them at their console position counters according to personal preference.

There is a high proportion of handwritten flight strips (54 percent of total TRACON number) at ABQ due to the extensive general aviation activity operating with Stage III radar service. In addition, numerous manual notations are common on all strips; the free standing flight strips are arranged on the console counter by the controller to promote the use of the strip for manual flight data management notations.

[1]As of March 1980.



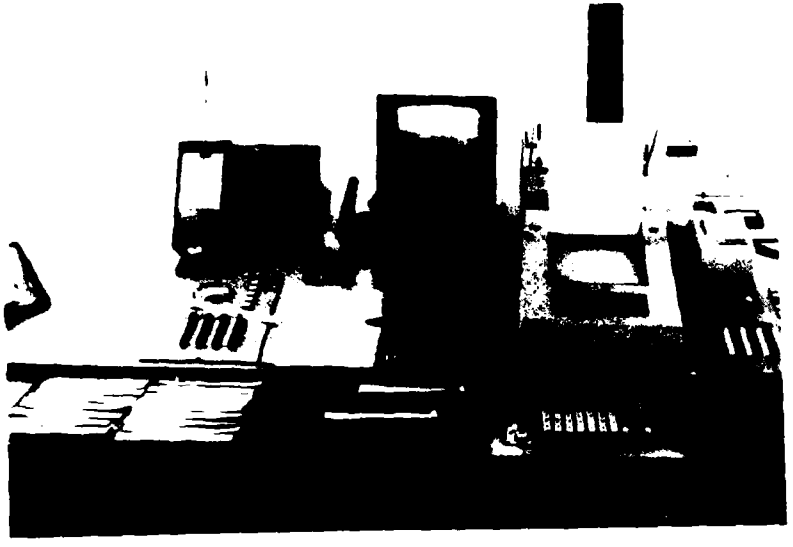


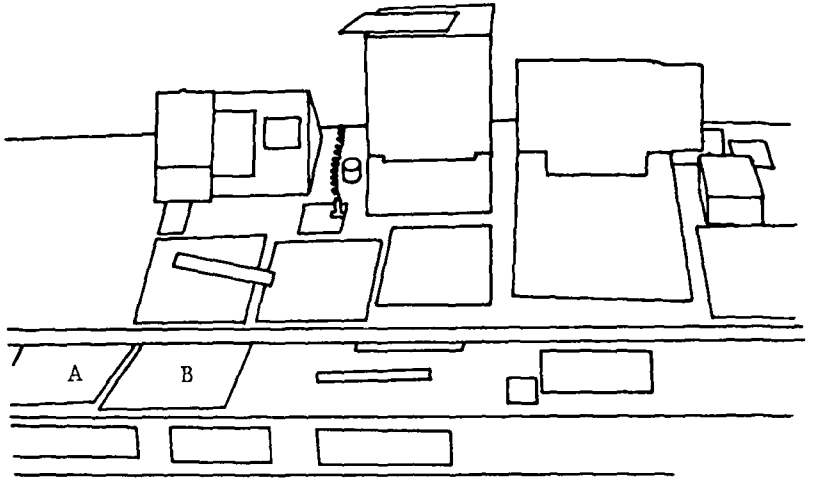
A. Single printed flight strip containing ATIS information

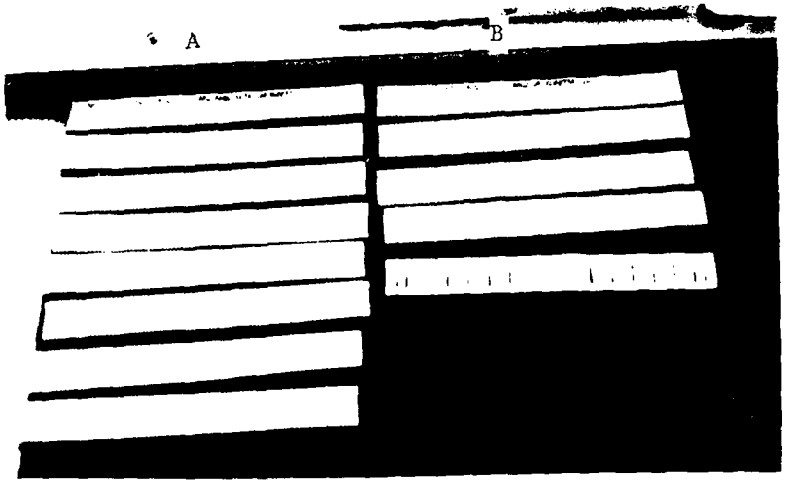
B. Blank flight strips off FDEP sheet

(No detailed photograph available)

FIGURE 5-28. EXAMPLE FLIGHT DATA LAYOUT AT FLIGHT DATA POSITION

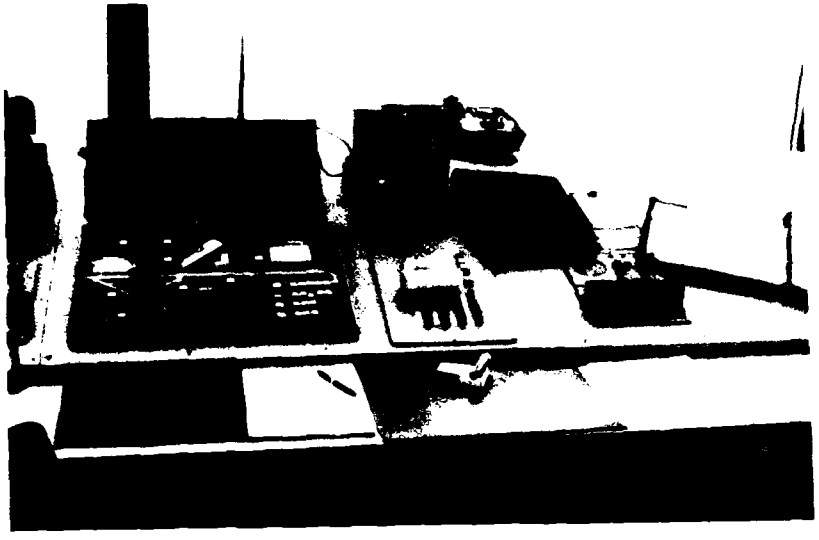




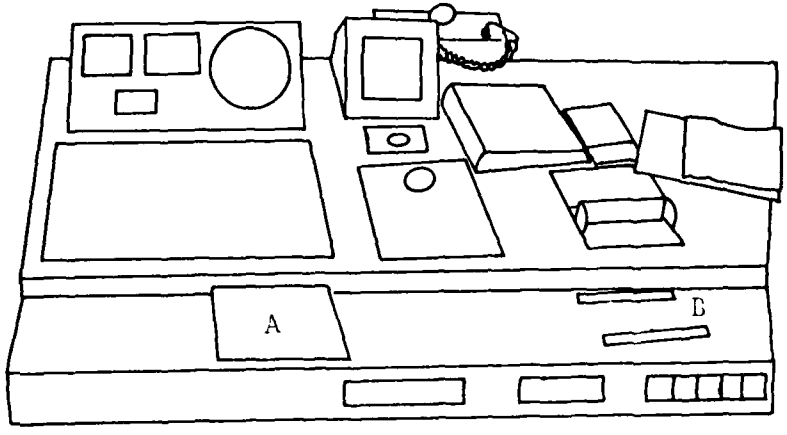


IFP Departure Strips
No manual notes on strips indicates no clearance issued yet. When pilot calls, the controller scans the chronologically ordered strips for the call sign.

FIGURE 5-29. EXAMPLE FLIGHT DATA LAYOUT AT CLEARANCE DELIVERY POSITION

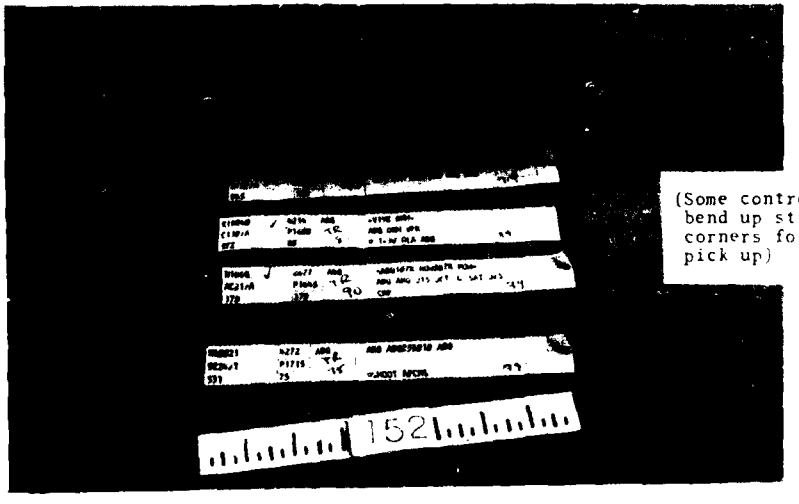


A. Scratch pad used by GC to log aircraft call signs from BRITE



(Strips lined up for photograph)

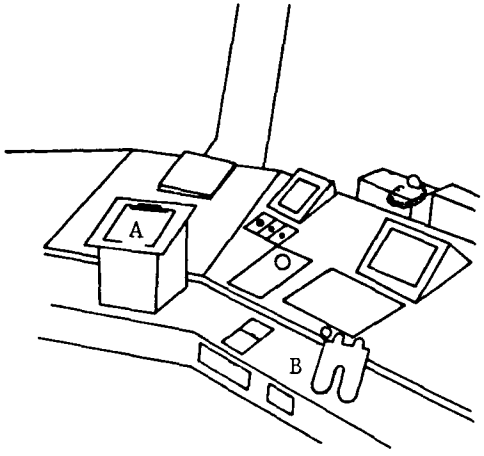
B. After clearance is read the flight strip is passed to the GC position by CD. When the pilot calls for taxi instructions GC will move the strip to the left on the counter and manually rotate the strip with the runway number.



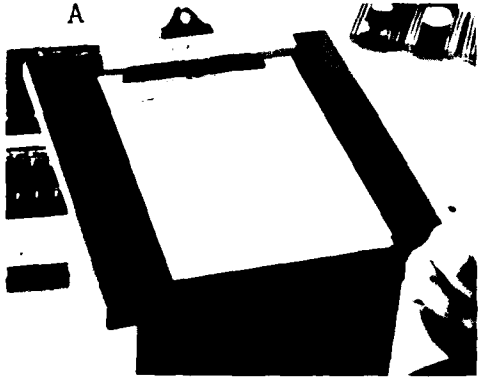
(Some controllers bend up strip corners for easy pick up)

FIGURE 5-30. EXAMPLE FLIGHT DATA LAYOUT OF GROUND CONTROL POSITION

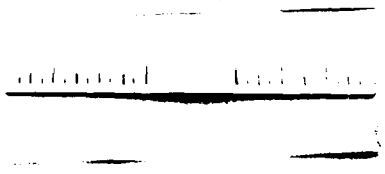
Log of arrivals, departures and locals maintained by LC-1.



B Indicates normal location of strips used by GC. Sample strips are shown below.

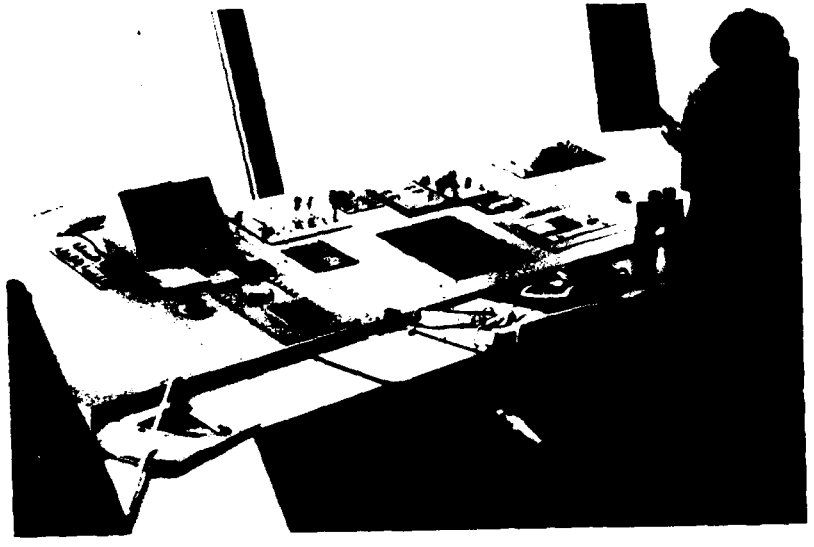


B

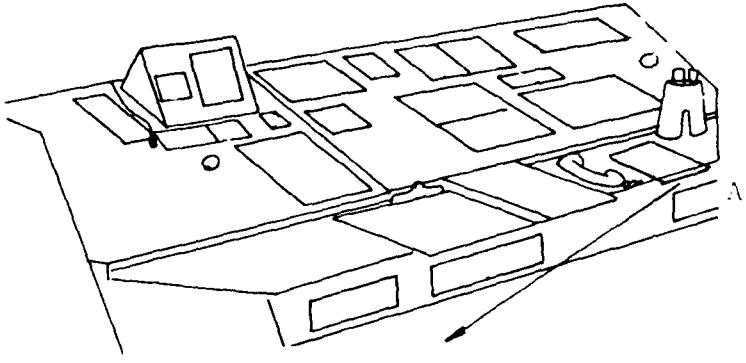


GC slides departure strips over to LC position when aircraft is positioned for runway entry for takeoff. LC issues takeoff clearance and calls off flight to TRACON

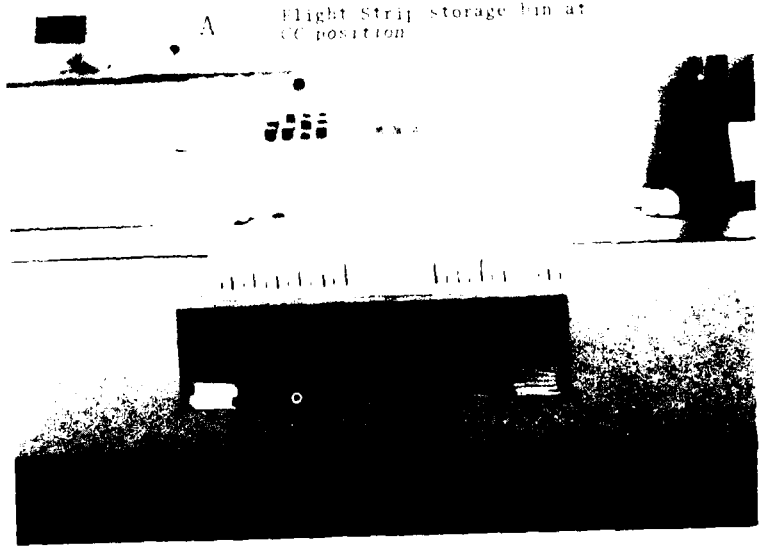
FIGURE 5-31. EXAMPLE FLIGHT DATA LAYOUT AT LOCAL CONTROL-1 POSITION



Temporary storage for flight strips All cab flight strips are discarded at least daily.



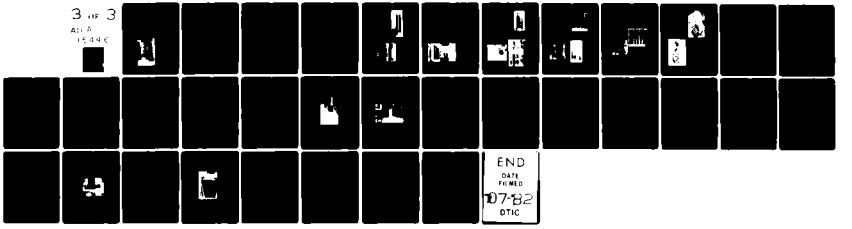
Facility Operation Log of Military flights maintained by Cab coordinator (Figure 4-4).

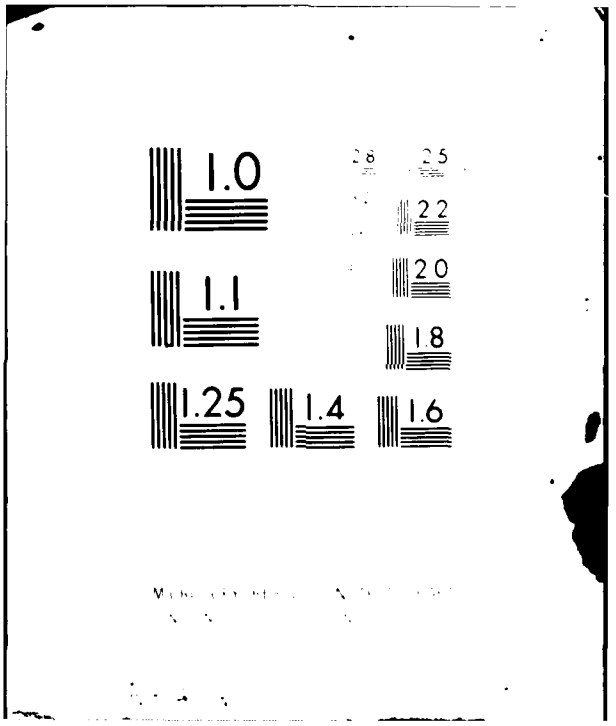


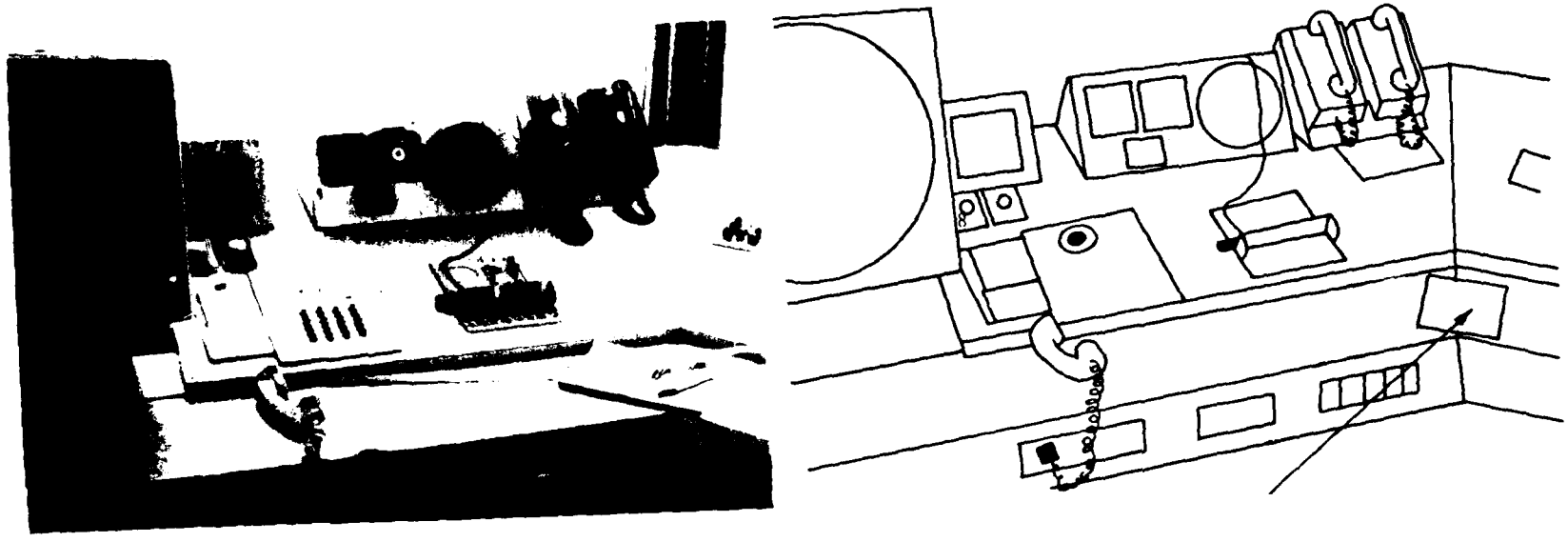
Flight Strip storage bin at CC position

FIGURE 5-52. EXAMPLE FLIGHT DATA LAYOUT OF CAB COORDINATOR POSITION

AD-A115 446 TRANSPORTATION SYSTEMS CENTER CAMBRIDGE MA F/G 17/7
ALBUQUERQUE AIR TRAFFIC CONTROL TOWER OPERATIONS ANALYSIS.(U)
JAN 81 M S HUNTLEY, R L MUMFORD
UNCLASSIFIED DOT-TSC-FAA-81-2 DOT-FAA/RD-81-42 NL

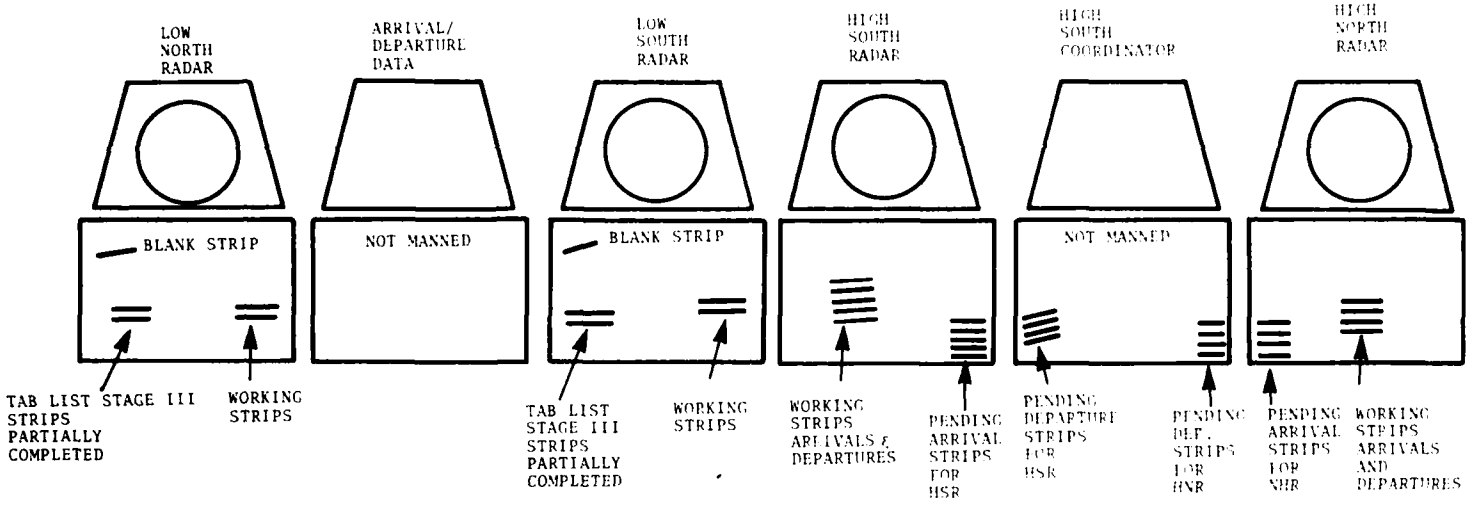



1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8



Log of arrivals and departures using secondary runways normally kept at LC-2 position when staffed

FIGURE 5-33. EXAMPLE FLIGHT DATA LAYOUT AT LOCAL CONTROL-2 POSITION



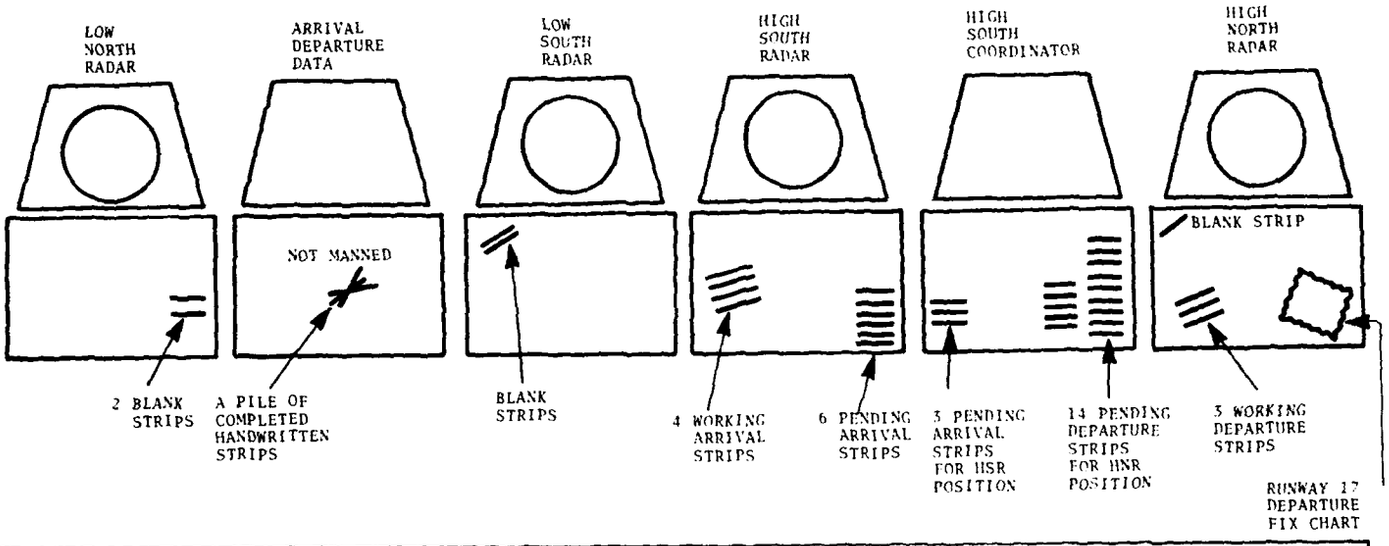
RESPONSIBILITIES OF POSITIONS					
LN TRAFFIC PER SOP*		LS TRAFFIC PER SOP	HS TRAFFIC PER SOP		HN TRAFFIC PER SOP

— = ONE FLIGHT STRIP

*SOP = STANDARD OPERATING PROCEDURE

DATE: TYPICAL DAY
TIME: 0730-1930
RUNWAY: 08

FIGURE 5-34. FLIGHT ARRANGEMENT BY TRACON POSITION FOR CONFIGURATION 1 WITH ALL SCOPES IN OPERATION.

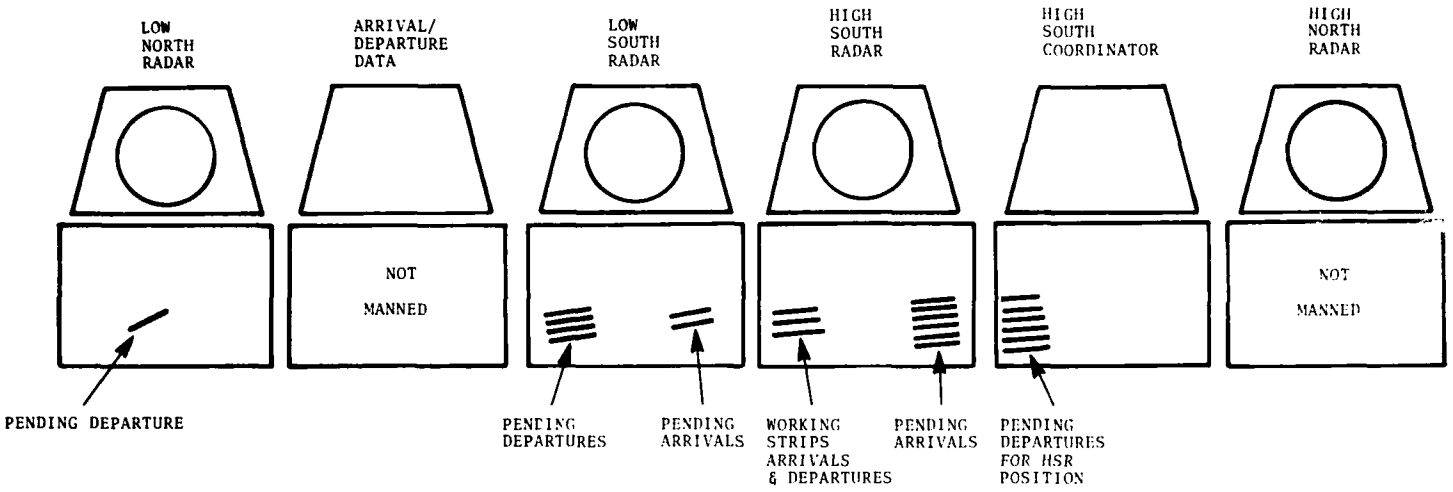


RESPONSIBILITIES OF POSITIONS					
PERFORMING SURVEILLANCE APPROACHES TO 17		PERFORMING SURVEILLANCE APPROACHES TO 17	ALL ARRIVALS (HANDS STRIP TO LSR POSITION FOR FINAL APPROACH)	TAKING OFF AND DISTRIBUTING FLIGHT STRIPS FOR HSR AND HNR POSITIONS	ALL DEPARTURES

— = 1 ONE FLIGHT STRIP

DATE: 28 MARCH 1980
TIME: 1030(L)
RUNWAY: 17
SPECIAL: SURVEILLANCE APPROACHES BEING PERFORMED BY LNR AND LSR POSITIONS

FIGURE 5-35. FLIGHT DATA ARRANGEMENT BY TRACON POSITION FOR CONFIGURATION 2 (WITH SURVEILLANCE APPROACHES AT LOW POSITIONS)



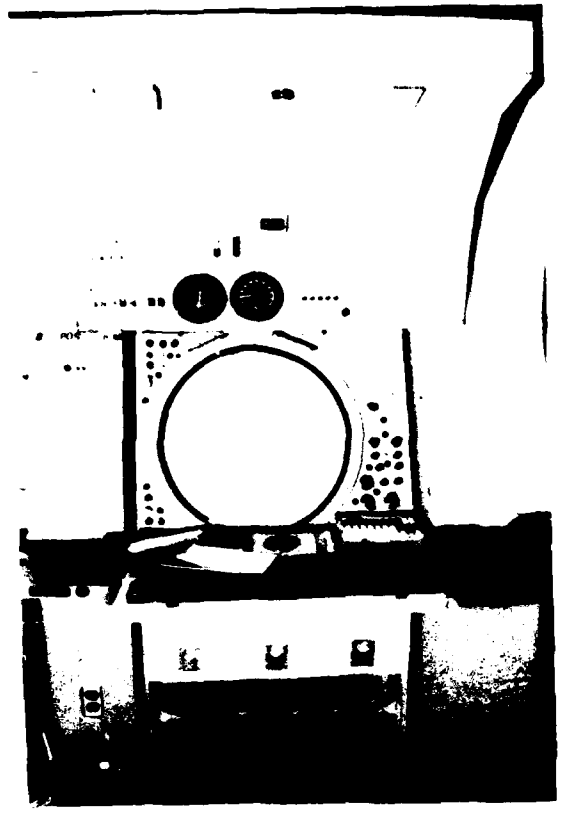
RESPONSIBILITIES OF POSITIONS					
LNR & LSP TRAFFIC		HNR TRAFFIC	HSR TRAFFIC		

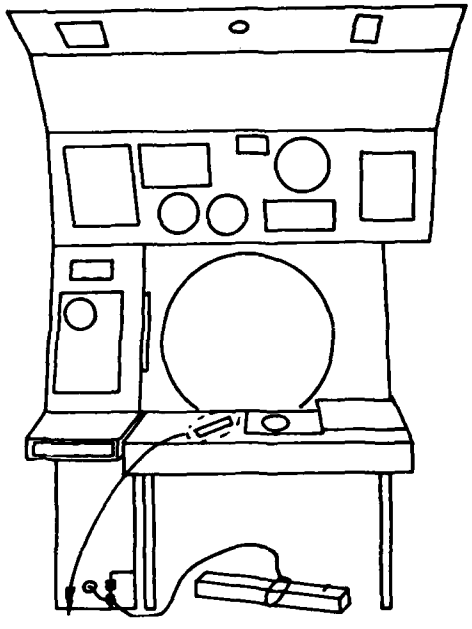
= ONE FLIGHT STRIP

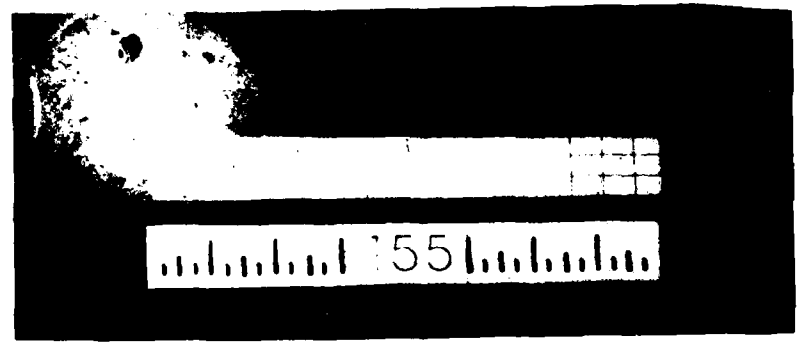
CONTEXT

DATE: 14 FEBRUARY 1980
TIME:
RUNWAY: 08

FIGURE 5-36. FLIGHT DATA ARRANGEMENT BY TRACON POSITIONS FOR CONFIGURATION 3 (WITH LOW RADAR FUNCTIONS CONSOLIDATED AT LOW NORTH RADAR POSITION)

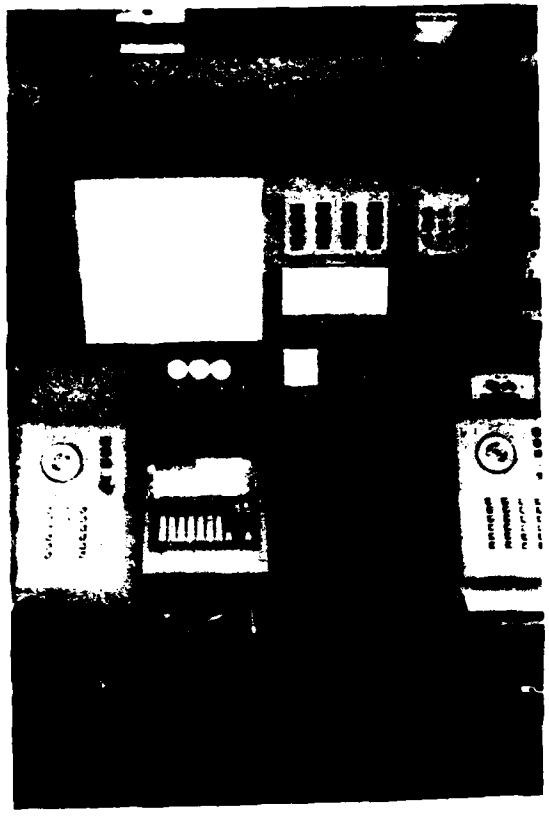


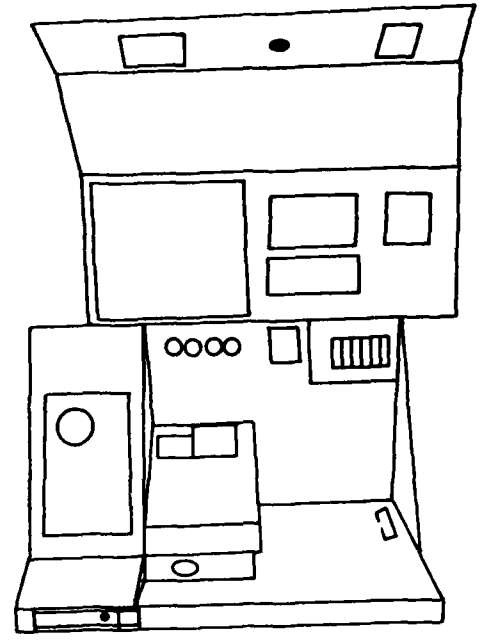




Single flight strip for a pending Stage III departure. Controller has started completing strip with data displayed on Tab List on PPI. Cab Local Controller will "call off" flight to TRACON on takeoff.

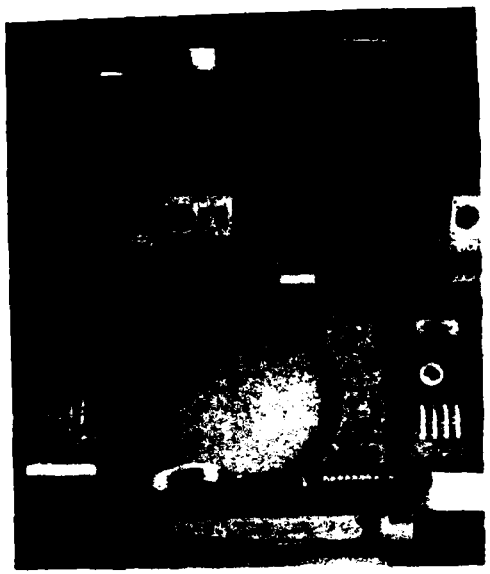
FIGURE 5-37. EXAMPLE FLIGHT DATA LAYOUT AT LOW NORTH RADAR POSITION

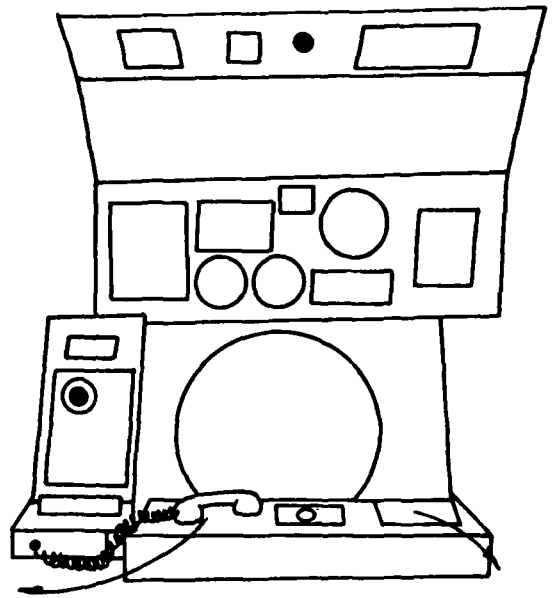




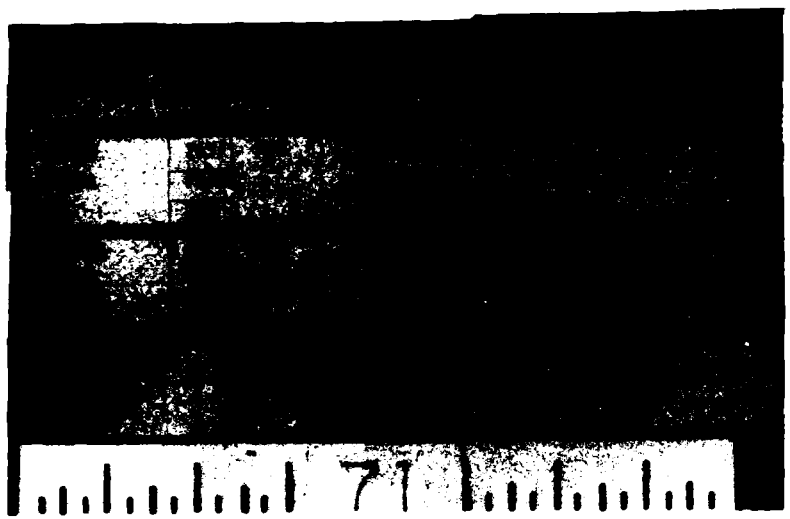
Not currently an operational position in Albuquerque TRACON

FIGURE 5-38. EXAMPLE FLIGHT DATA LAYOUT AT ARRIVAL/DEPARTURE DATA POSITION





A Departure Strips Pending



B Arrival Strips Pending:

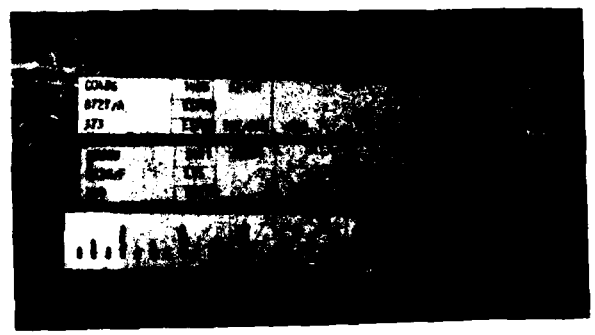
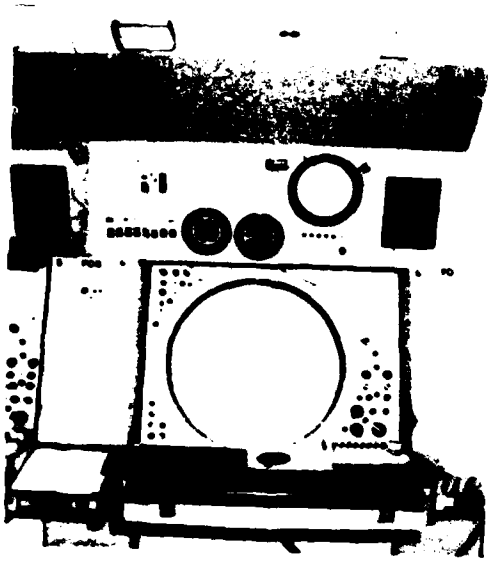
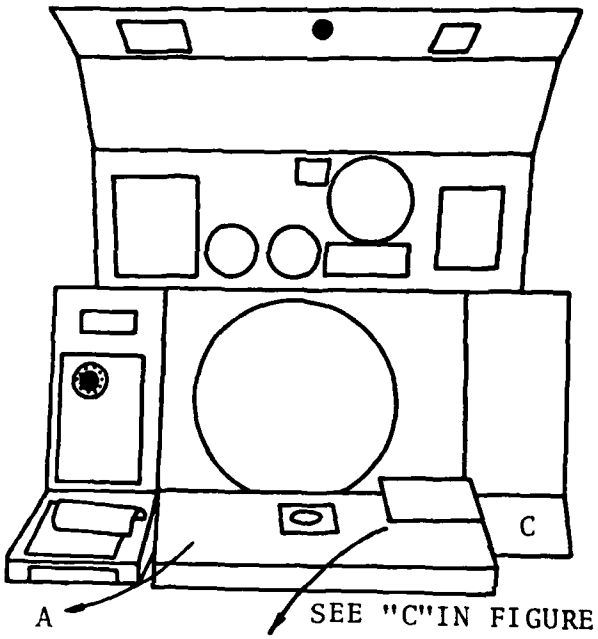


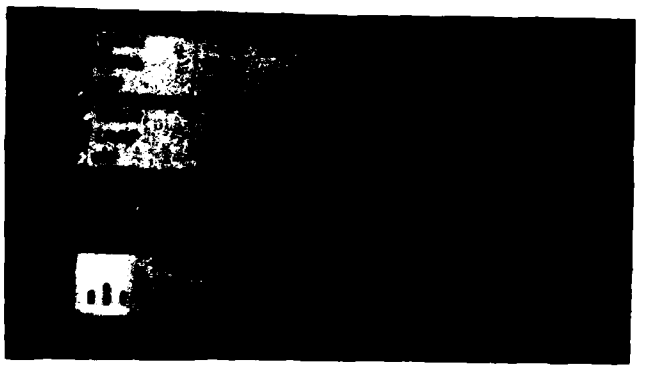
FIGURE 5-39. EXAMPLE FLIGHT DATA LAYOUT AT LOW SOUTH RADAR POSITION



A. WORKING FLIGHT STRIPS
ARRIVAL AND DEPARTURES



B. PENDING ARRIVAL
FLIGHT STRIPS



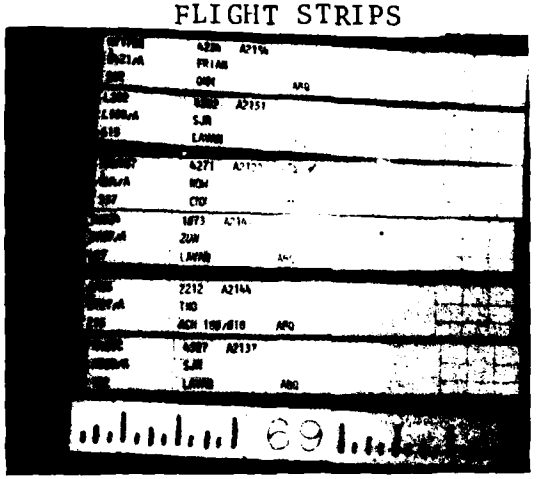
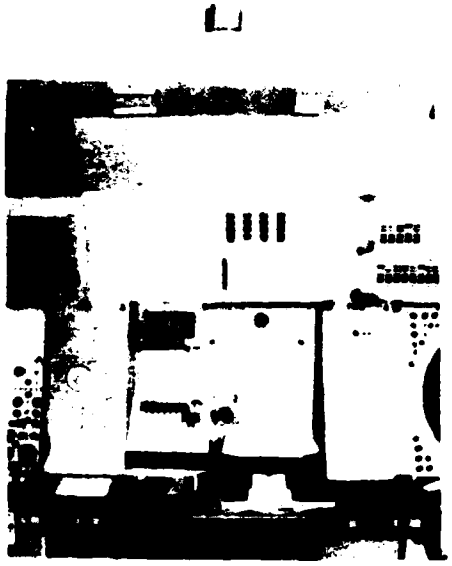
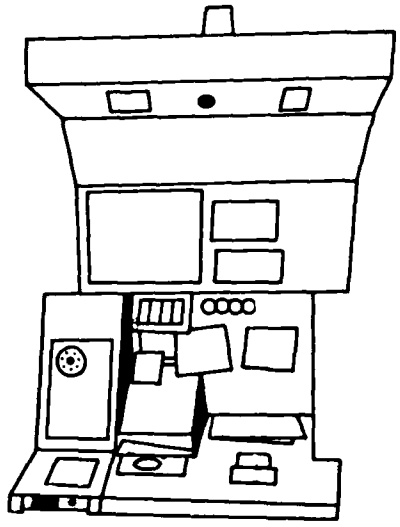
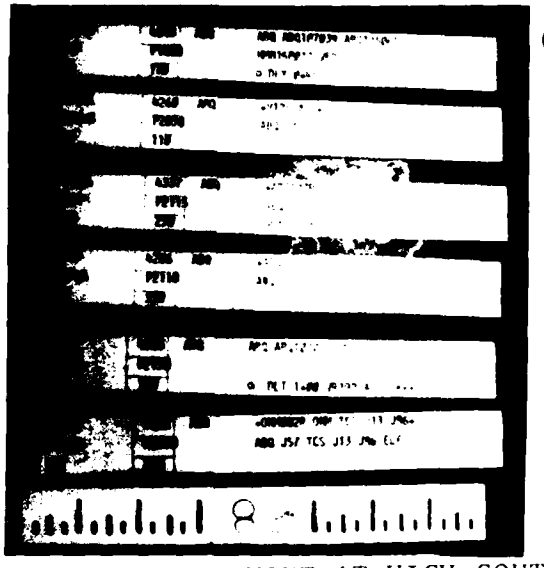


FIGURE 5-40. EXAMPLE FLIGHT DATA LAYOUT AT HIGH SOUTH RADAR POSITION

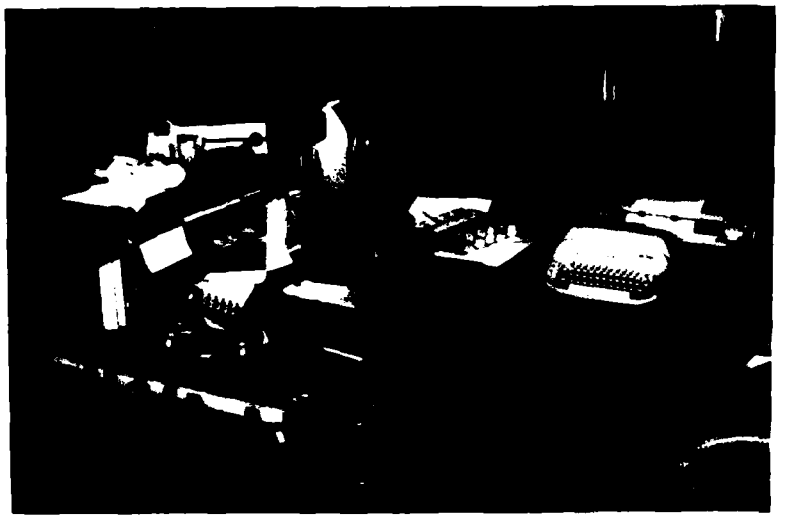


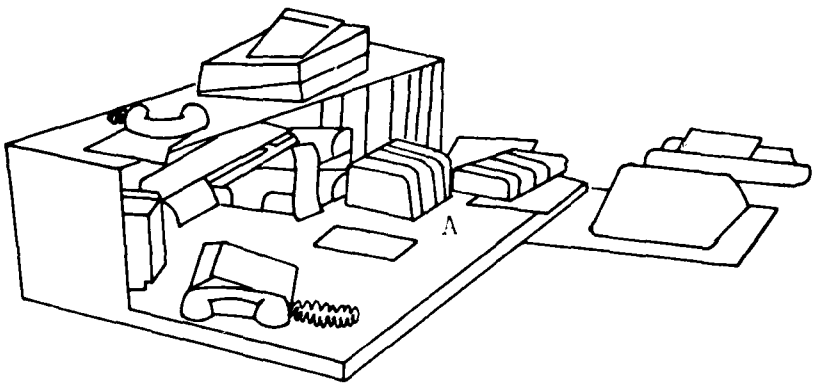




C. PENDING DEPARTURE FLIGHT STRIPS SERVING CONTROLLER SITTING AT HIGH SOUTH RADAR POSITION (SEE FIGURE 5-40)

FIGURE 5-41. EXAMPLE FLIGHT DATA LAYOUT AT HIGH SOUTH COORDINATOR POSITION





In the early morning the completed flight strip storage boxes are placed on Team Supervisor's desk for administrative processing. The strip boxes are normally stored and used at the arrival position.

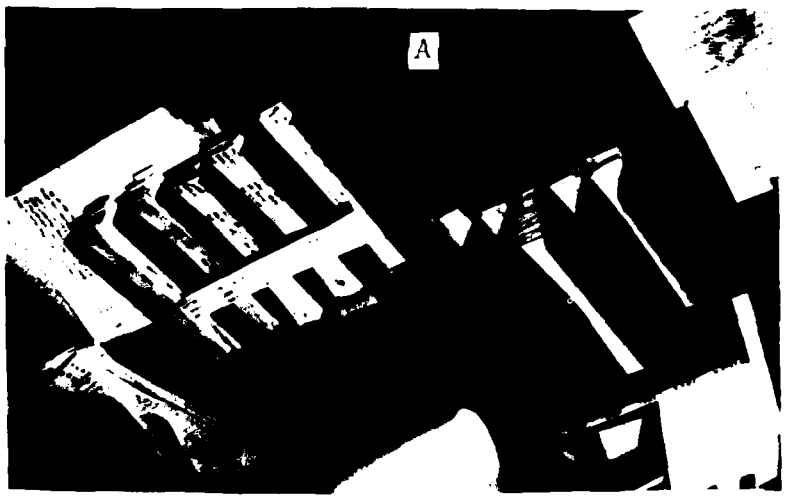


FIGURE 5-42. EXAMPLE FLIGHT DATA LAYOUT AT TEAM SUPERVISOR'S DESK

6. WEATHER

6.1 WEATHER INFORMATION RECEIVED AT ALBUQUERQUE TOWER

The Albuquerque Tower receives weather information primarily from the Weather Service Forecast Office (WSFO), the Flight Service Station (FSS), Kirtland Air Force Base (KAFB)(all located at the airport); the Air Route Traffic Control Center (ARTCC) in Albuquerque; pilots aloft; the satellite airports; and its own on-site weather sensors. The communications equipment linking the Cab and TRACON with these organizations are represented in Figure 6-1 and include the flight data entry and printout system (FDEP), electrowriters, FAA radios, and the telephone system. Categories of the weather information normally received, their sources and other information is shown in Table 6-1.

6.1.1 WSFO

The WSFO sends weather information to the Cab and TRACON over the electrowriter from its airport office and weather observation site. This weather information includes the Terminal Forecast (FT) that is issued 3 times a day, the hourly Surface Aviation Weather Report (SA) and when necessary, the Special Surface Aviation Weather Report (SP). The WSFO also issues AIRMET (WA) and Severe Weather Watch Alerts (AWW) as conditions warrant. When messages are unreadable, due to machine malfunction, unfamiliar terminology, or poor handwriting a controller or supervisor may telephone the WSFO to obtain the necessary Information.

(a) Terminal Forecasts (Figure 6-2)

The Terminal Forecasts cover 24-hour periods for the area within five miles of the airport. They are issued at approximately 0930Z, 1530Z, and 2230Z each day and in accordance with the "Aviation Weather Services" (AC00-45) are valid from 1000Z to 1000Z, 1600Z to 1600Z, and 2300Z to 2300Z, respectively.

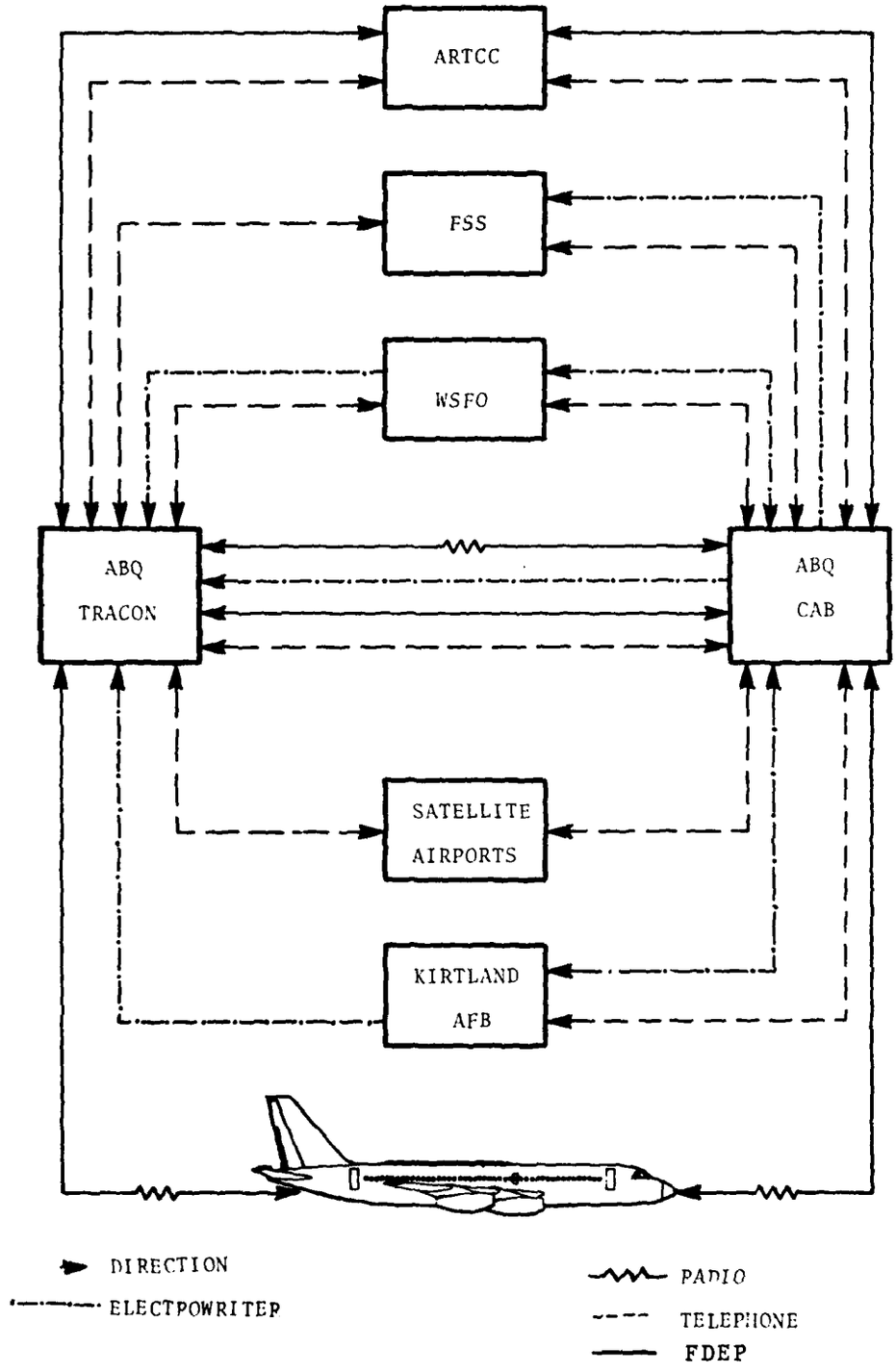


FIGURE 6-1. WEATHER COMMUNICATIONS AT ABQ TOWER

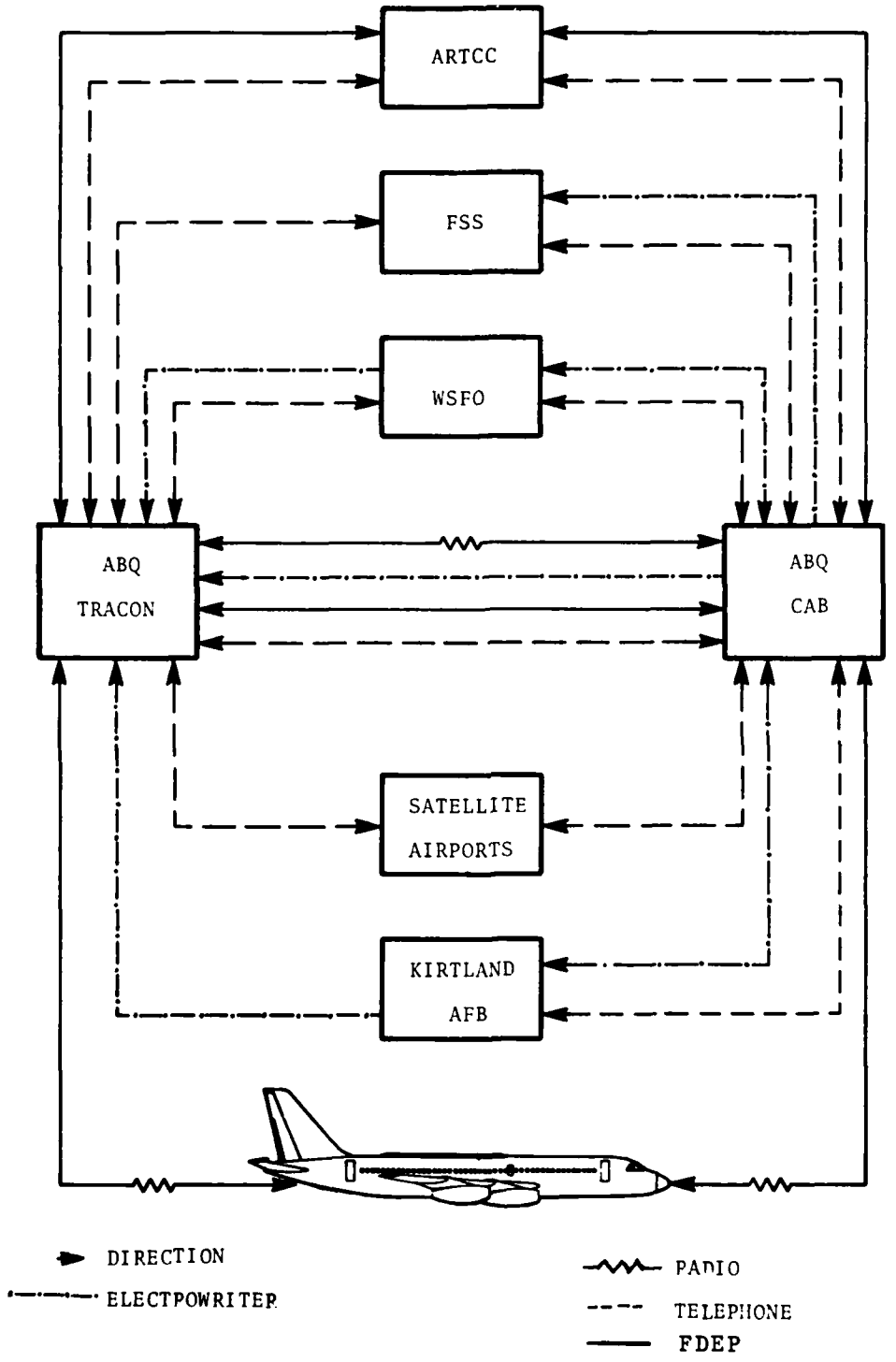


FIGURE 6-1. WEATHER COMMUNICATIONS AT ABQ TOWER

TABLE 6-1. CATEGORIES OF WEATHER INFORMATION RECEIVED AT ABQ TOWER

WEATHER MESSAGE	CONTENTS	SOURCE	EQUIPMENT	TIMELY?	FREQUENCY	USEFUL?	PRIMARY POSITION(S) OF INTEREST	COMMENTS
Terminal Forecast (FT)	24 hour forecast for area within 5 miles of airport	WSFO	Electrowriter	Yes	3 times/day	Yes	Supervisors	
Surface Aviation Weather Report (SA)	Observed weather conditions at airport	WSFO	Electrowriter	Yes	Hourly	Yes	FD/CD	Dew point, temperature used for ATIS
Special Surface Aviation Weather Report (SP)	Updates of SA	WSFO	Electrowriter	Yes	Not Regular	Yes	FD/CD	
AIRMET (WA)	Weather hazards to light aircraft	WSFO	Electrowriter	Yes	Not Regular	Yes	Low radar, FD/CD, GC LC-1, LC-2	
Severe Weather Watch Alert (AWW)	Thunderstorm bulletins	WSFO	Electrowriter	No	Not Regular	Yes	All	Tower may observe storms before bulletin issued
Wind and Temperature Aloft Forecast (FD)	Wind and temperature information at various altitudes	FSS	Telephone	Yes	Upon Request	Yes	All radar FD/CD	
METWATCH (MWA)	Kirtland Air Force Base terminal area forecast	KAFB	Electrowriter	No	Not Regular	No	-	Inaccurate; duplication with other forecasts
RAREP	Thunderstorms and areas of precipitation	KAFB	Electrowriter	No	Not Regular	No	-	Duplication with tower radar
SIGMET (WS)	Advises of hazardous weather in area	ARTCC	FDEP	No	Not Regular	No	LC-1, FD/CD All radar	Broadcast as required
CONVECTIVE SIGMET (WST)	Advises of thunderstorms in area	ARTCC	FDEP	No	Not Regular	No	LC-1, FD/CD All radar	Broadcast as required
PIREPS (UA)	Tops, ceiling information, Poor conditions, etc.	Pilots	FAA radio	Yes	Upon Request	Yes	All radar LC-1, LC-2 GC, FD/CD	Relayed to FSS

ABQ FT

ABQ 2410/0 CLR 3310 OCNL
250-SCT. 19Z 250-SCT 2914
SCT OCNL-BKN 22Z 250-SCT
SCT OCNL BKN 04Z VFR CLR..
OBS 2004Z RJL

FIGURE 6-2. WSFO TERMINAL FORECAST FOR ALBUQUERQUE AIRPORT

A typical Albuquerque Terminal Forecast is shown in Figure 6-2. It usually includes the following categories of information and is translated as follows:

- o The type of Forecast.

  ABQ FT Albuquerque Terminal Forecast.

- o Station identifier.

  ABQ The forecast is for the area within 5 miles of Albuquerque International Airport.

- o Date issued and valid times.

  241010 This forecast was issued on the 24th of the month and was valid from 1000Z on the 24th until 1000Z on the 25th.

- o Sky ceiling, visibility, weather, wind, and when necessary, obstruction to vision information

  CLR The visibility is not restricted.

  3310 Wind is from 330° at 10 knots.

  OCNL 250-SCT Occasional ceiling at 25,000 feet with thin scattered clouds.

- o Remarks if necessary to describe weather more thoroughly (None in example).

- o Expected changes.

  19Z 250-SCT 2914-SCT-OCNL BKN

  Weather changes are expected at 1900Z with thin scattered clouds at 25,000 feet and wind from 290 at 14 knots. The scattered cloud cover may occasionally become a broken cloud cover.

  02Z 250-SCT SCT OCNL BKN

  Further changes are expected at 0200Z. The omission of a wind entry implies wind of under 10 knots.

- o Categorical outlook for the last 6 hours of the forecast period.

  04Z VFR CLR

  The categorical outlook for 0400Z - 1000Z is for VFR condition under clear skies.

o Source, date, and time issued.

OBS 240915Z RK

The forecast is from the WSFO observer on the 24th day of the month and it was issued at 0915Z by "RK".

In the Cab, the message is left on the electrowriter (Figure 6-3) and in the TRACON it is posted at HSC (Figure 6-4) until a new one is received, then the old forecast is discarded. It is read by the supervisors to get an indication of the weather conditions for the day. Controllers may read it but are more interested in the existing conditions obtained from the tower instruments, the radar display and, in the Cab, by visual observation.

(b) Surface Aviation Weather Report (Figure 6-5)

These weather reports indicate observed local weather conditions and are valid until a new or special report is issued. The observations for the SAs are usually made at 54 minutes after the hour by the WSFO in Albuquerque and transmitted almost immediately to the tower. A typical report is shown in Figure 6-5. The categories of information normally included and translations of the messages are as follows:

o Station identifier for the reporting station.

ABQ The report is from Albuquerque International Airport.

o Type and time of report.

SA 1554Z This is a regular weather report and observations were made at 1554Z.

o Sky condition, ceiling, and visibility information.

50 SCT 100 SCT 60 There are two layers of scattered clouds, one at 5000 feet, the other at 10,000 feet, above ground level. Visibility is reported as 60 statute miles.

o Sea Level barometric pressure in millibars, temperature, dew point, wind, and altimeter reading.

143/47/32/2008/004 Sea level barometric pressure is 1014.3 millibars/temperature is 47°F/Dew point is 32°F/Wind is from 200° at 8 knots/Altimeter reads 30.04 inches.

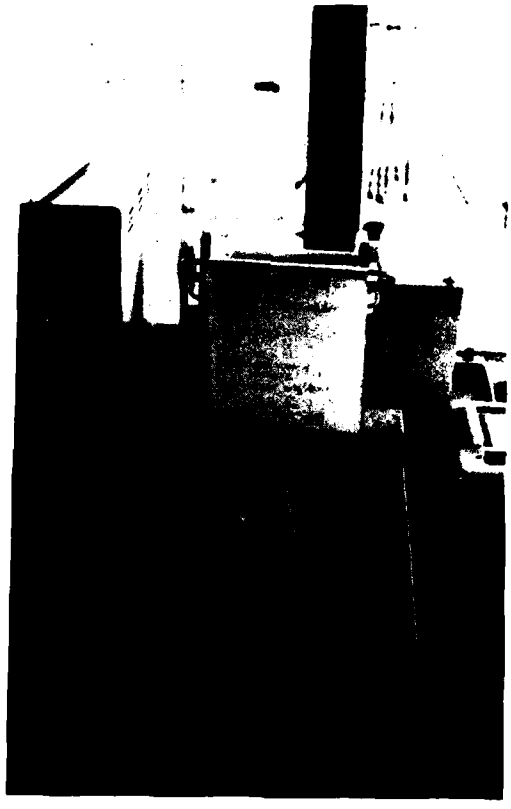


FIGURE 6-3. WEATHER MESSAGE ON THE ELECTROWRITER AT THE FLIGHT DATA/CLEARANCE DELIVERY POSITION

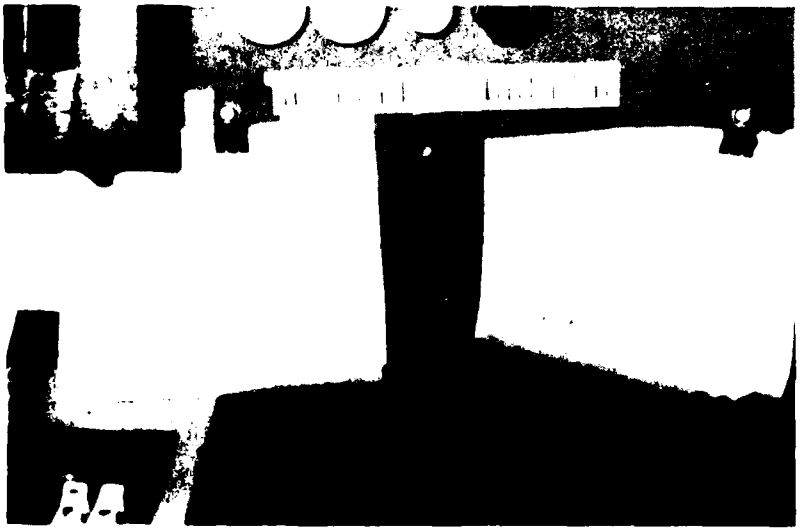


FIGURE 6-4. WEATHER MESSAGES POSTED AT THE HIGH SOUTH COORDINATOR POSITION

ABQ SA 1554Z

5C SCT 10C SCT 6C

1W3/ W7/ 32/ 2008/ 004

SLUG CVR MTNS NE/ CLDS

TPC MTNS NE

OBS/32/1554Z

FIGURE 6-5. WSFO SURFACE AVIATION WEATHER REPORT FOR ALBUQUERQUE AIRPORT

o Remarks, when necessary.

SW U OVR MTNS NE/CLDS TPG MTNS NE Snow showers of unknown intensity over mountains to the Northeast/Clouds topping mountains to the Northeast.

o Source, date, and time issued.

OBS/22/1556Z The report is from the WSFO observer on the 22nd at 1556Z.

The Surface Aviation Weather Reports are left on the electrowriter in the Cab and posted at HSC in the TRACON. In the Cab, FD/CD uses the temperature reading and ceiling information for the ATIS recording. He disseminates the information verbally to the other controllers who request it, or they read it on the electrowriter. Most Cab controllers, however, get weather information they need by their own observations. In the TRACON, they are read by the High Radar controllers and HSC and disseminated verbally to the other controllers by the latter.

(c) Special Surface Aviation Weather Report (Figure 6-6)

Special weather reports are similar to the hourly reports, but may be briefer. They are, however, of special interest to controllers because they indicate significant weather changes and may require a new ATIS recording. Figure 6-4 shows an hourly report for observations taken at 1855Z and a subsequent special report for observation taken at 1931Z. The changes include the ceiling dropping from a measured height of 4500 feet with overcast skies to a measured height of 4000 feet with broken clouds. Visibility changes are from 60 miles to 30 miles and closing. Wind has changed from 260 degrees at 20 knots with gusts to 30 knots to 270 degrees at 26 knots. Altimeter reading has risen .022 inches from 29.73 to 29.75 inches.

(d) AIRMETS

AIRMET are issued by the WSFO weather observer over the electrowriter to warn of weather conditions potentially hazardous to light aircraft. They are disseminated verbally by FD/CD to all cab controllers and usually by the TRACON Supervisor to all TRACON

ABQ SA 1855Z

M45 OVC 60

047/48/29/2621G34/997

ACSTE15 ALSTO 1/5/5[illegible]

CVR MTNS X1 + S2/VIRGA DSNT

N/LC-K1/ CLND 23V30

GFS/20/1855Z

ABQ SP 1931Z

M40 BKN 30 BSG

2726/975

OFS/20/1932Z

FIGURE 6-6. WSFO HOURLY AND SPECIAL SURFACE AVIATION WEATHER REPORTS FOR ALBUQUERQUE AIRPORT

controllers. The TRACON Supervisor also writes the information on the status board. The controllers working with the light aircraft (the Low Radar controllers, GC, LC-1, LC-2, and FD/CD relay information to the pilots.

The information is disseminated and the messages are handled in the same way as the SA reports.

(e) Severe Weather Watch Alert

Severe Weather Watch Alerts are issued by the WSFO observer to warn of hazardous weather conditions such as thunderstorms and tornadoes. These messages are usually too late to be useful and are often the result of a report from the tower to the WSFO or FSS of a visual sighting. Regardless of the source of information, the alerts are brought to the attention of the supervisors by Flight Data/Clearance Delivery in the Cab and HSC in the TRACON. The warnings are then disseminated verbally by the supervisors. If time allows, the message is written on the status board in the TRACON. If it is timely, the information is of interest to all controllers to relay to pilots.

6.1.2 FSS

The Flight Service Station supplies weather information to Albuquerque usually only when requested by a supervisor or controller. The information obtained is usually a Wind and Temperature Aloft Forecast and is in response to a pilot request.

Occasionally, a controller or supervisor will ask the FSS for weather information while calling on another matter. This query is usually for a clarification of weather information received from another source.

6.1.3 KAFB

Kirtland Air Force Base sends weather information to the Cab and TRACON over the electrowriter. This includes the Met Watch (MWA) that is a forecast issued two to three times a day and Radar Reports (RAREP) issued when significant areas of precipitation appear on radar.

(a) Met Watch (Figure 6-7)

The Met Watch forecasts are for the terminal area. They usually include the following information that is translated for the message shown in Figure 6-7:

o A station identifier and type of report.
KAFB MWA The forecast is from Kirtland Air Force Base and is a Met Watch.

o Valid dates and times
VT: 26/2100Z - 27/0100Z Valid time for this Met Watch is from 2100Z on the 26 to 0100Z on the 27.

o Significant weather information
SFC WIND 12G20 Surface wind at 12 knots with gusts to 20 knots.

o Initials of issuer and time issued.
2022Z GG Issued by "GG" at 2200Z.

In the Cab, the message is left on the electrowriter and rarely referred to by any controllers. In the TRACON, it is torn off the electrowriter, left at HSC until it is no longer valid, then discarded.

These messages are not issued on a regular basis and are not particularly useful because the information is more accurately presented in the WSFO terminal forecasts, which are issued three times a day.

(b) Radar Report (RAREP, Figure 6-8

Radar Reports are received over the electrowriter from Kirtland Air Force Base usually when precipitation is observed on radar screens within the Albuquerque area. These are of little interest to controllers because they can observe the same precipitation on their own radar screens and usually notice it before the RAREP is received.

The RAREPs usually include the following information which is reported and interpreted for the message shown in Figure 8:

o A station identifier, type of report and time of observation.
KAFB RAREP 0335Z Radar Report from Kirtland Air Force Base and observations were made at 0335Z.

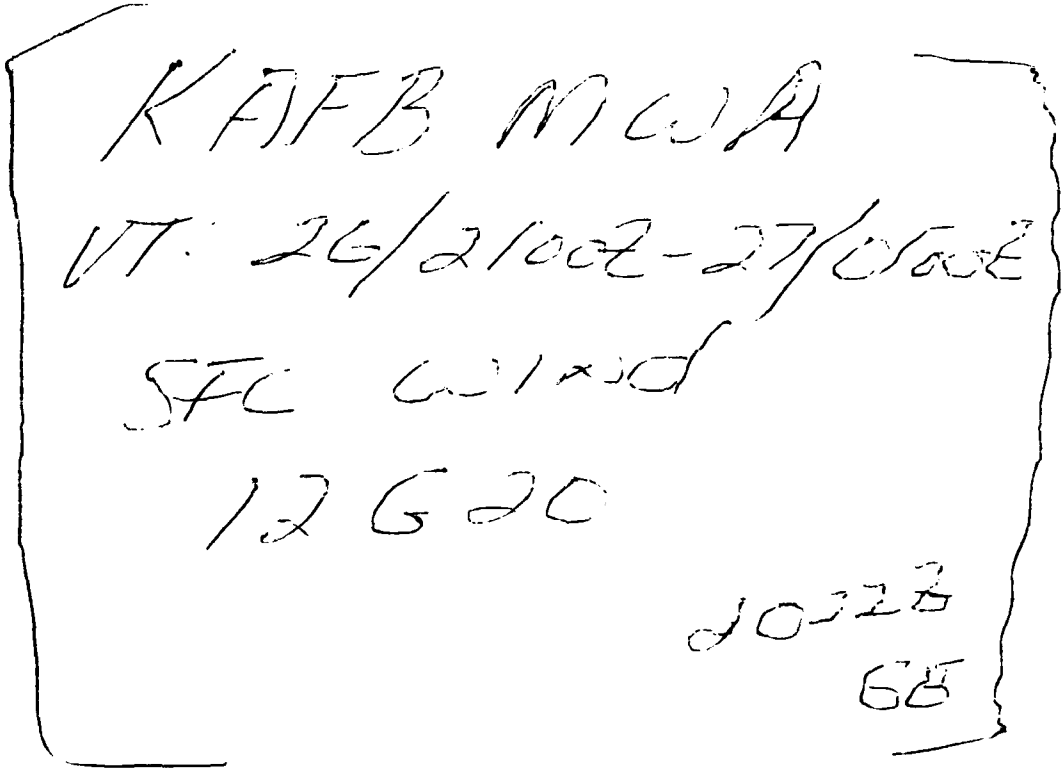


FIGURE 6-7. KIRTLAND AIR FORCE BASE MET WATCH FOR ALBUQUERQUE AIRPORT

KAFB RAREP 0335Z

AREA 6 RW/F

250/58 20/34

200/06 310/59

A2510 MT 200 AT

8/22 36/8

FIGURE 6-8. KIRTLAND AIR FORCE BASE RADAR REPORT FOR ALBUQUERQUE AREA

- o The type of echo pattern, its coverage of the defined area in tenths, and intensity information.

AREA 6 RW/+ An area of echoes covering 6/10 of the described region of rain showers, increasing in intensity.

- o Azimuth and range in nautical miles of points defining the pattern.

250/58 20/34 200/06 310/59 The region is defined by points located at 250° 58 nautical miles (NM); 20°, 34 NM; 200°, 06 NM, 300, 59 NM.

- o Pattern Movement

2510 The area is moving from 250° at 10 knots.

- o Maximum Tops and location

MT 200 at 8/22 Maximum tops are 20,000 feet at 8°, 22 NM.

- o Initials of issuer and time issued.

36/(initials) Report issued at 0336Z by (initials).

These reports are disseminated the same way as Met Watch forecasts.

6.1.4 ARTCC

The ARTCC sends Significant Meteorological Information (SIGMET) and convective SIGMETs over the FDEP to the Cab and TRACON as General Information (GI) messages (Figure 6-9). Other weather information, when necessary, may be telephoned by the ARTCC to the tower.

(a) SIGMET(WS)

SIGMETs generally advise of potentially hazardous weather, such as severe icing, turbulence, hail or thunderstorms expected within approximately 150 miles of the airport. The information contained in the messages usually include a message identifier, area covered, valid times, type of hazard, movement and tops information.

FIGURE 6-9. GENERAL INFORMATION MESSAGE FROM ARTCC POSTED AT THE FLIGHT DATA/CLEARANCE DELIVERY POSITION

Usually, three copies of SIGMETs are received in both the Cab and the TRACON. In the Cab, FD/CD takes the copies of the SIGMETs giving one to LC-1 if the storm is within the terminal area. FD/CD verbally notifies the other Cab controllers. LC-1 and FD/CD broadcast the SIGMET every 15 minutes if it affects aircraft under their jurisdiction. In the TRACON, A/DD gives one copy to each High Radar controller and informs the supervisor and other controllers of the SIGMET. The Radar Controllers also broadcast the SIGMETs every 15 minutes. When only a single copy of SIGMET is received, the TRACON Supervisor hand copies the message and distributes the copies.

(b) Convective SIGMET (WST)

Convective SIGMETS usually contain information that advise of widespread thunderstorms or tornadoes. These are received and disseminated in the same way as SIGMETs.

6.1.5 Pilots

Pilots issue weather information to controllers in the form of Pilot Weather Reports (PIREPs). These reports usually contain information concerning aircraft icing, turbulence, cloud tops or other hazards. Some are issued spontaneously by pilots but most are requested by controllers. PIREPs are received by any controllers communicating with aircraft. When one is received, it is usually written on any available piece of paper, such as a blank flight strip. The controller marks down the time received, the reported condition, type of aircraft involved and any other relevant information.

It is then reported to the supervisor, who informs the other supervisor. Both then inform their controllers. The TRACON Supervisor logs the PIREP on the PIREP Log (Figure 6-10), writing the date received as well as the information given by the controller. The last column indicates that the information has been relayed to the FSS as is required. Sometimes, check (✓) marks are put in the

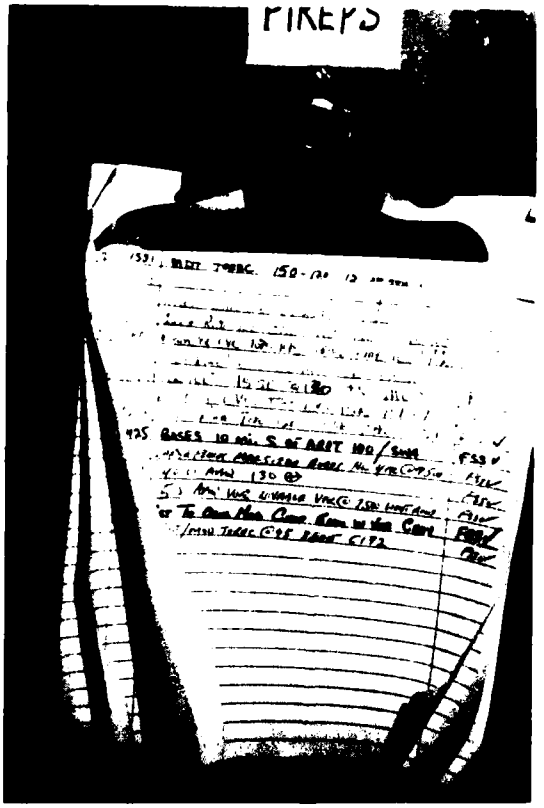


FIGURE 6-10. PIREP LOG AT TRACON SUPERVISOR DESK

final column, as a further indication that the FSS has received the PIREP. Controllers relay this information to pilots likely to be subject to the reported weather or other hazards.

6.1.6 Satellite Airports

Weather information usually is received from the satellite airports in response to a specific request telephoned by a controller or supervisor. These requests are generally stimulated by poor weather and are concerned with the satellite airport's operating status or visibility conditions. Any tower controller or supervisor may make the request and its results are usually disseminated verbally to the others. The information is then relayed to pilots of small aircraft or used for purposes of flow control within the terminal area. Such requests, however, are rare.

6.2 WEATHER INFORMATION SENT FROM ALBUQUERQUE TOWER

The Albuquerque Tower sends weather information to the WSFO, FSS, KAFB, ARTCC, pilots aloft and the satellite airports (Figure 6-1). The communications equipment linking the tower with these organizations includes the FDEPs, Cab electrowriter, FAA radios, and the telephone system.

6.2.1 WSFO

The Tower Cab issues visibility information to the WSFO over the electrowriter when visibility goes below 4 miles. This information is obtained by the Cab Supervisor by visual inspection of reference objects and determining the distance to them using a visibility reference chart (Figure 4-1). He relays the information to his controllers and FD/CD writes the readings on the electrowriter. The message is then issued to the WSFO.

Other weather information issued to the WSFO by the tower are usually telephone requests made to the TRACON supervisor concerning altimeter readings or wind information.

6.2.2 FSS

Visibility information is simultaneously issued over the electrowriter to the FSS whenever it is sent to the WSFO. Additional weather information issued to the FSS include PIREPs which are relayed by telephone as discussed in 6.1.5.

6.2.3 KAFB

Kirtland Air Force Base also receives visibility information from the tower over the electrowriter whenever it is issued to the WSFO and FSS. Additional weather information is issued to KAFB by telephone in response to a request for specific readings. These requests usually are made of the Cab Supervisor, who provides the necessary information.

6.2.4 ARTCC

The ARTCC in Albuquerque receives General Information (GI) messages sent over the FDEP (these include the ATIS message, as discussed in 3.2.6). Special messages are authorized by a supervisor and issued by FD/CD and usually concern flow restrictions. They may, however, report weather conditions or storm sightings in the area. Additional weather information is issued to the ARTCC in response to a specific request. These requests are usually made of the TRACON Supervisor, who supplies the necessary information.

6.2.5 Pilots

Important weather information is relayed by FAA radio to pilots communicating with controllers or on the ATIS recording. The information includes altimeter readings, wind speed and direction, and other reports as necessary. It is given as a courtesy, a requirement, or in response to a pilot's request. Some information that is requested by a pilot, such as a Wind and Temperature Aloft Forecast, may require a controller to contact the FSS, then relay the information to the pilot. Another significant type of weather information issued to pilots by the tower includes the SIGMETs which are broadcast by controllers whose aircraft are affected.

Pilots often request density altitude readings on hot days. High density altitudes reduce the performance of aircraft, requiring larger aircraft to use the longer runways, restricting the climbing speed of all aircraft and lowering the altitude smaller aircraft can achieve. One result of this condition is that aircraft cannot take off toward the east because of the mountains. Occasionally, large military aircraft are unable to land or depart because their density altitude maximums are exceeded. As mentioned in 3.2.6, a caution is recorded on the ATIS for density altitude when temperatures reach 70°F. The exact reading is given by GC FD/CD, LC-1 or LC-2 upon a pilot's request. Each of these positions has a density altitude chart (the Local Control positions share one) on which the density altitude (in feet) can be derived from the current altimeter readings and the temperature from the latest Surface Aviation Weather Report. Some pilots of military aircraft request density altitude information even when temperatures are only 50°F.

6.2.6 Satellite Airports

Satellite Airports normally receive weather information from Albuquerque Tower only when they telephone a specific request for reports concerning wind, altimeter or visibility. These calls may be received in the Cab or TRACON by the supervisors.

6.2.7 Other

Weather information is issued from the Albuquerque Tower to individuals when they call for reports or forecasts. Usually, these are received and responded to by the TRACON Supervisor. Frequently, organizations that repair altimters call the tower to verify instrument readings.

6.3 SUMMARY

Weather information from organizations outside the tower does not seem to be of great importance to the controllers. Most of this information consists of the terminal forecasts and hourly

reports from the WSFO observer site. Controllers report that some of the weather information from outside sources is not very useful because of its lack of timeliness. Therefore, controllers tend to rely on their own observations to be aware of potential weather.

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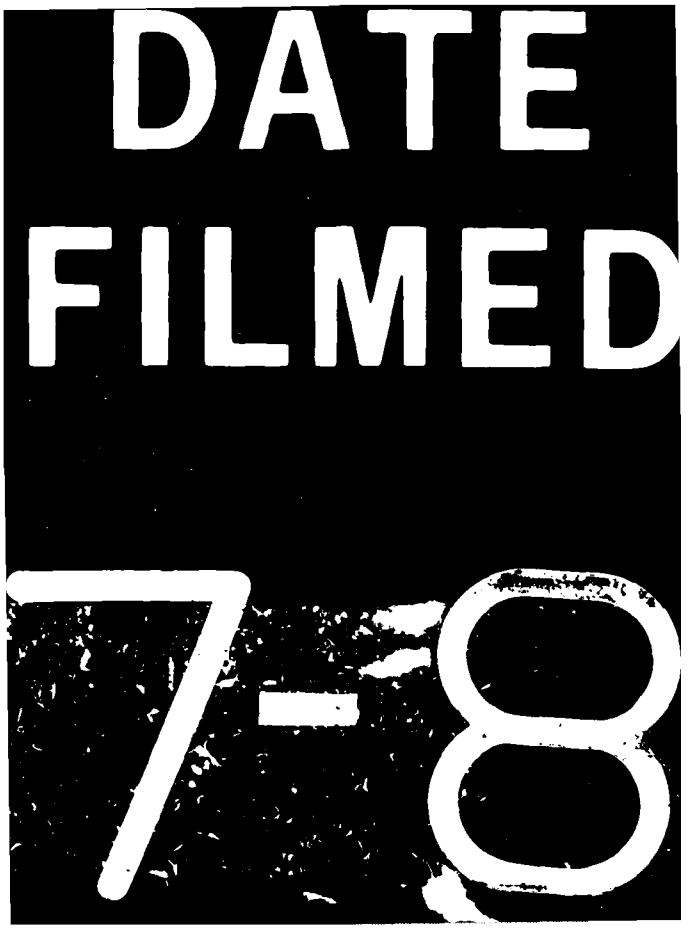
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