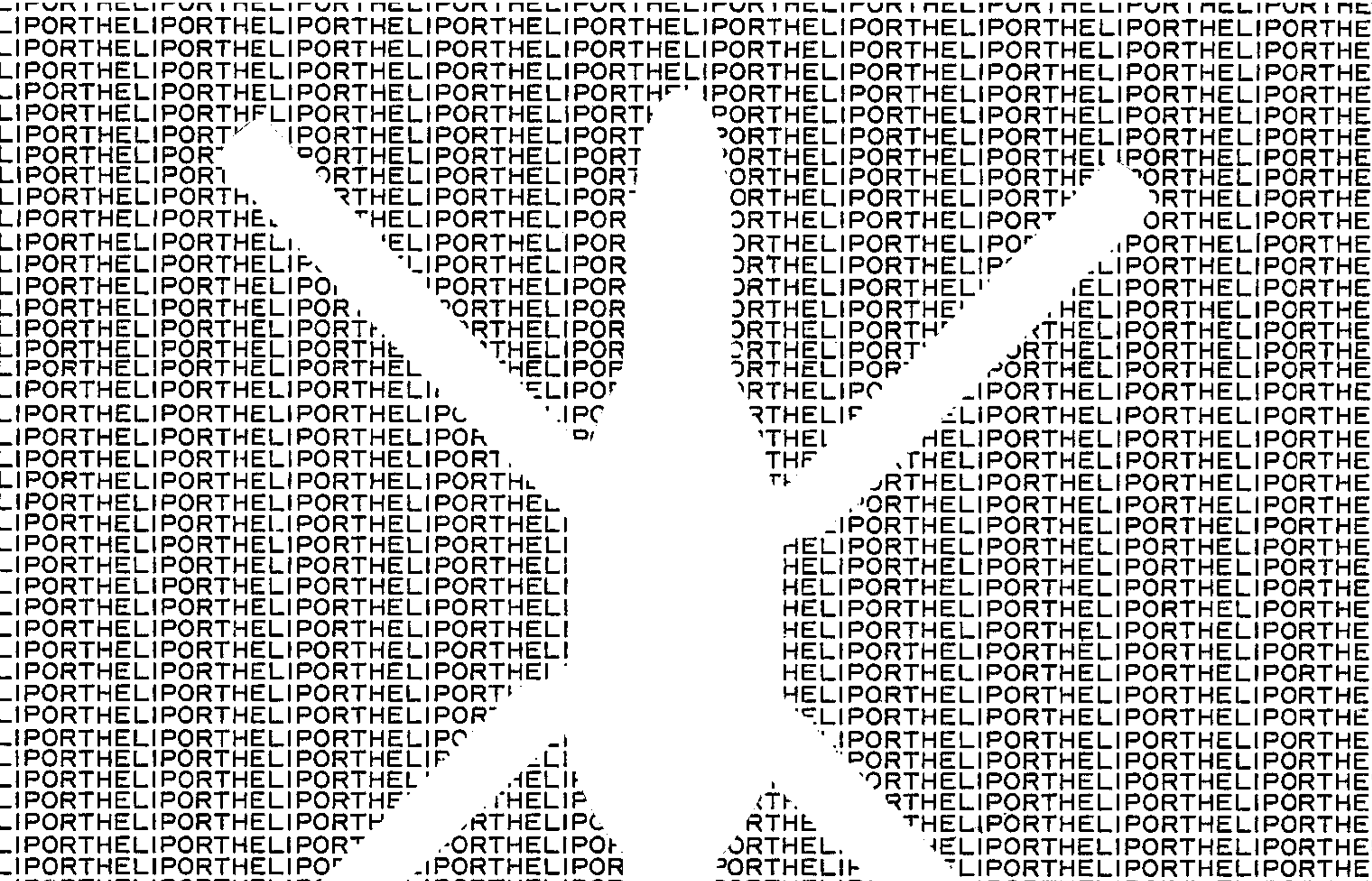

HELIPORT DESIGN GUIDE

AC 150/5390-1A

NOVEMBER 5, 1969

30771 20000

AC NO: AC 150/5390-1A (Announcement)
DATE: 1/15/70

ADVISORY CIRCULAR

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

SUBJECT: HELIPORT DESIGN GUIDE

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1. PURPOSE. This advisory circular announces the availability of the new Heliport Design Guide.

2. CANCELLATION. This circular supersedes the material contained in AC 150/5390-1, Heliport Design Guide, dated November 1964, and AC 150/5230-2, Guide Specification for Fire Extinguishing System (Foam) for Heliports, dated April 1965.

3. BACKGROUND. One of the major functions of the Federal Aviation Administration (FAA) is to encourage and foster the development of civil aviation. The Heliport Design Guide is a step in this continuing effort and contains guidance for the planning, design, and construction of heliports for both public and private use. It is intended to provide an understanding of the need for heliports and to encourage their development as a part of the national transportation system. It will also help to acquaint planners and developers of heliports with the Federal Government's responsibility in this field.

4. HOW TO OBTAIN THIS PUBLICATION. This publication may be obtained by sending a check for $ .75 to the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. No c.o.d. orders are accepted.

Clyde W. Pace, Jr.
Acting Director
Airports Service

Initiated by: AS-560

ERRATA SHEET

Advisory Circular 150/5390-1A, titled Heliport Design Guide, dated November 1969, requires the following corrections to be made to the publication:

TITLE PAGE	-	Additional copies of the Heliport Design Guide, AC 150/5390-1A, may be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, at $.75 per copy.
PAGE 38	-	Add Figure 19. Examples of Elevated Heliports.
PAGE 61	-	**Bell 212**
Line L		**Change to 2 engines**
PAGE 64	-	Kaman K-700 (Proposed)
Line U		Change 11,000 to 2,800
Line Y		Change 5,600 to 8,400
PAGE 70	-	Edge of Landing Area to Building Line
Class I		Varies - Building should not penetrate transitional surface.
Class II		50 feet - Assumes parking apron between building and landing area.
Class III		150 feet - Predicated upon ILS requirements.
PAGE 70	-	Edge of Landing Area to Property Line (Non-terminal Side)
Class I		Varies - Building at property line should not penetrate transitional surface.
Class II		50 feet - Provides clearance for two-story building at property line.
Class III		150 feet - Predicated upon ILS requirements.

HELIPORT DESIGN GUIDE

November 1969

Department of Transportation

FEDERAL AVIATION ADMINISTRATION

Airports Service

PREFACE

This publication is directed primarily toward those communities and individuals who desire to establish a heliport and are seeking guidance before they begin such an undertaking. It presents information and criteria for the planning and development of heliports intended for private use as well as for public transportation.

It should be noted that this advisory circular is an assembly of many different parts which are discussed individually. However, they must be considered as a whole in the design of the facility.

The FAA wishes to express its appreciation for the excellent cooperation received from all of the numerous organizations and individuals contacted during the preparation of this document. As a result of this cooperative spirit, seven ad hoc groups were formed in the initial phase of the project to review specific technical areas of interest. Participants on these groups came from various industry and government organizations. Their comments and suggestions have been very helpful, particularly in the development and application of new ideas for heliport design.

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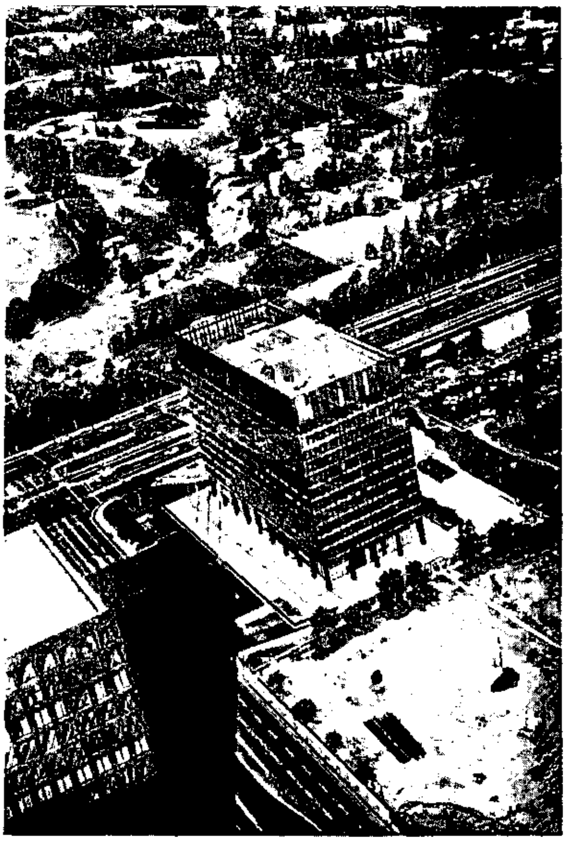
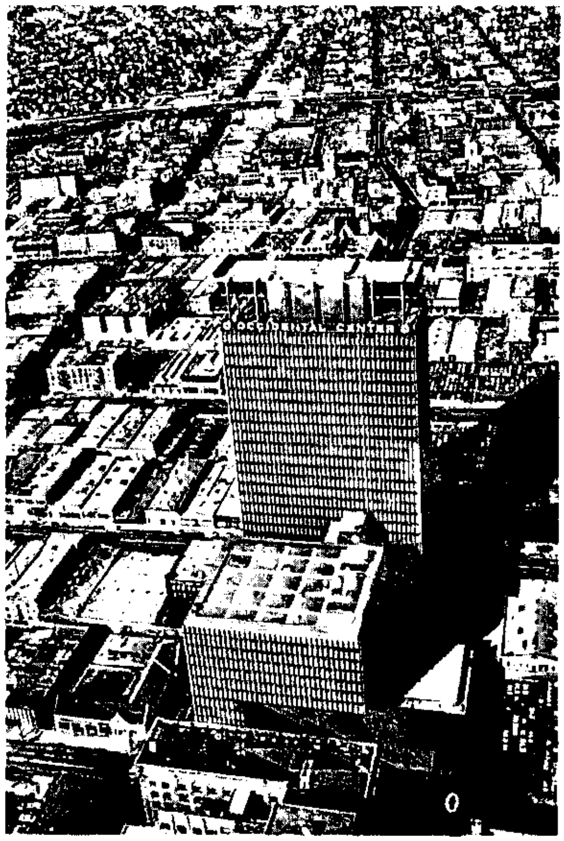
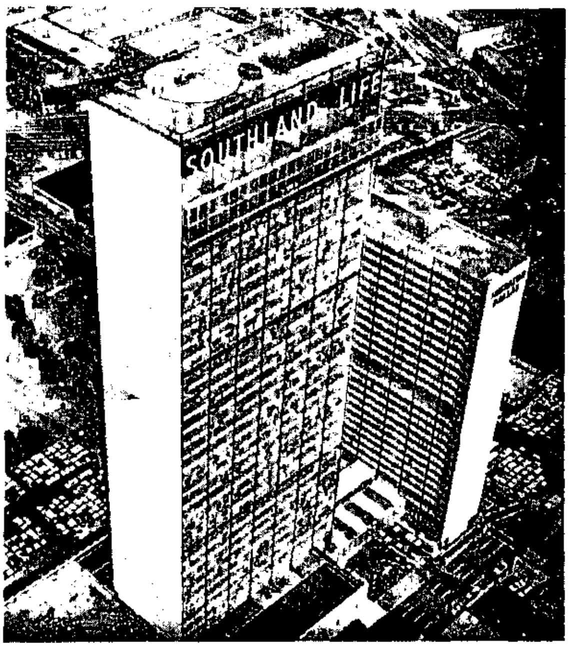
ILLUSTRATIONS



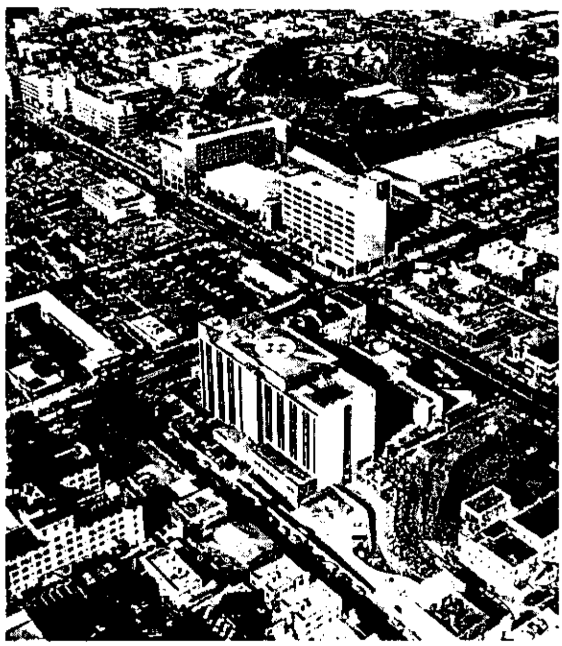
CENTURY CITY, LOS ANGELES



OCCIDENTAL CENTER, LOS ANGELES



SOUTHLAND LIFE, DALLAS



CHILDREN'S HOSPITAL, LOS ANGELES

FIGURE 1. Examples of Metropolitan Heliports.

CHAPTER 1. INTRODUCTION

1. GENERAL. One of the major functions of the Federal Aviation Administration (FAA) is to encourage and foster the development of civil aeronautics. This guide is a step in this continuing effort and contains guidance for the planning, design, and construction of heliports for both public and private use. It is intended to provide an understanding of the need for heliports and to encourage their development as a part of the national transportation system. The FAA has prepared this material in cooperation with governmental, civil, military, and industry groups in order to establish recommended criteria for heliport design on a national basis. It will also help to acquaint heliport owners and developers with the Federal Government's responsibilities in this field.

2. SCOPE.

a. The guide outlines the basic physical, technical, and public interest factors which should be considered in planning and establishing heliport sites. Heliports range from modest, exclusive-use types (the vast majority in use today) to fully developed facilities suitable for multiple operations. The information is based on known helicopter performance and sound operating practices. It is a summation of many years' experience at helicopter landing sites representing the various types in use in the United States.

b. THE INFORMATION PROVIDED IS ADVISORY IN NATURE AND DOES NOT ESTABLISH REGULATORY REQUIREMENTS, EXCEPT WHERE FEDERAL FUNDS ARE USED FOR THE DEVELOPMENT OF A HELIPORT. In order to permit flexibility of application and future changes in the guide, local authorities are discouraged from adopting the guide verbatim as a local code or law. Furthermore, the specific recommendations presented are for the average or usual situation and may not be appropriate in every case. Accordingly, the specific criteria of this guide must be applied with judgment. To assist in the interpretation of the criteria, it is suggested that technical advice be obtained from helicopter operators, helicopter manufacturers, and FAA technical personnel. Through consultations, the community can be assured of professional assistance in developing a heliport that is safe, practical, and useful. Information about many of the items mentioned throughout the circular is referenced in Appendix 5, Bibliography.

3. BACKGROUND.

a. Helicopter Operations. The first practical helicopter was developed in the United States just prior to World War II and was placed into operation by the military services in 1943. FAA certificated civilian helicopters were introduced in 1946 and immediately found their way into a wide range of uses. Helicopter operations have expanded rapidly since that time, and a large part of this activity is performed by commercial operators. The versatility of the helicopter has resulted in an impressive list of activities. Some of these are:

(1) *Police Patrol.* The helicopter is now used in traffic control and crime abatement activities in more than 50 cities.

(2) *Air Ambulance.* Experience to date indicates the helicopter ambulance should become an integral part of the emergency medical system in many metropolitan areas.

(3) *Search and Rescue.* The U.S. Coast Guard, police, fire, commercial operators, and the military services have proved the value of the helicopter innumerable times on land and at sea.

(4) *Civil Emergencies.* In times of natural disasters, such as floods and snowstorms, the helicopter is often the only vehicle capable of rescue work and allevating the situation.

(5) *Executive and Business.* Time-conscious firms are turning more and more to the helicopter for intra-city transportation of its executives and also for its own operations; e.g., real estate firms and banking institutions have recently discovered the benefits of helicopters.

(6) *Forestry.* State and Federal Forest Services use the helicopter for fire fighting, reseeding, and spraying. The U.S. Forest Serv-

ice maintains approximately 300 permanent heliports and 10,000 emergency landing areas.

(7) *Aerial Application.* The helicopter provides effective application services to control insect and weed pests in farming, industrial, and community activities.

(8) *Development of Resources.* For years, the petroleum industry has operated helicopters in connection with its offshore site activities. In some areas, the helicopter is the only practical means for oil and mineral exploration.

(9) *Construction Support.* The hoisting and placement of power poles, high-voltage powerlines, and pipelines by helicopters is now commonplace. The helicopter is also used for line patrol.

(10) *Public Transportation Service.* At present, scheduled helicopter service exists in four major cities of the U.S.—Los Angeles, San Francisco, New York, and Chicago. Passenger transportation is also being provided by helicopter air taxi operators in many cities and towns throughout the country on a charter or contract basis.

b. Potential Uses. The tremendous expansion in the use of the helicopter by the military in recent years portends the future growth of civil helicopter utilization. In this light, research of new methods for increasing business efficiency has brought attention to such possible functions as unloading of ships by helicopter and air transport of fish direct from the boat to the processing plant. Extension of helicopter (VTOL) public transportation from intracity to intercity is continuing to be studied by Government, manufacturers, and airlines.

c. Heliport Development. The helicopter's growing position as an important element in the national transportation system has brought about a keen awareness of the potential of this versatile aircraft. A major factor in developing this potential is the provision of an adequate system of heliports.

(1) By January 1969, approximately 1,900 heliports in the United States and its possessions had been listed in industry publications, and hundreds of temporary or occasional landing sites are being used. In selecting future locations for helicopter landing sites, it must be borne in mind that the functions served by helicopters are much more diverse than those of other aircraft.

(2) For passenger transportation, the helicopter cannot serve effectively if it is limited to edge-of-town heliports but should have landing areas near the actual origins and destinations of traffic. This means that heliports, whether for private, commercial, or airline use, will be needed in certain congested and highly developed areas of a community.

(3) Heliport facilities do not require a large area and usually are inexpensive to construct because they need not be elaborate installations. Experience has shown that safe and useful heliports can be established by using a small sod or paved plot, fenced to exclude unauthorized personnel, and marked as to use. Rooftop or elevated heliports can be economically advantageous and usually do not involve high additional structural expense, especially if included in the original structural design of the building.

4. TERMINOLOGY.

The following are definitions of terms as they are used herein:

a. Airport. An area that is used or intended to be used primarily for the landing and takeoff of fixed-wing aircraft.

b. Approach-Departure Path. A clear path selected for flight, extending upward and outward from the edge of the landing and takeoff area.

c. Autorotation. A power-off flight condition when the engine is not driving the main and tail rotor systems. The main rotor is driven only by the action of the relative wind, providing a means to maneuver to a safe, low speed landing after engine failure or certain other emergencies.

d. Downwash. A variable volume of air moved downward by the rotating main rotor, resulting in a flow or airblast spilling outward as the air strikes the ground.

e. Ground Cushion. An improvement in flight capability that develops whenever the helicopter flies or hovers near the ground or other surface. It results from the cushion of denser air built up between the ground and the helicopter by the air displaced downward by the rotor. The effective height of ground effect is usually about one rotor diameter.

f. Helicopter. A rotary wing aircraft that depends principally upon the lift generated by one or more power-driven rotors rotating on substantially vertical axes for its support and motion in the air. It can hover, fly backward and sideways, in addition to forward flight.

g. Heliport. An area, either at ground level or elevated on a structure, that is used for the landing and takeoff of helicopters.

h. Helistop. A minimum facility heliport, either at ground level or elevated on a structure, without such auxiliary facilities as waiting room, hangar, parking, fueling, and maintenance.

i. Landing and Takeoff Area. That specific area in which the helicopter actually lands and takes off, including the touchdown area.

j. Off-Heliport Landing Site. That takeoff and landing area intended for temporary or occasional helicopter use but not formally designated as a heliport.

k. Obstruction Clearance Slopes. Imaginary planes leading outward and upward from the takeoff and landing area at angles compatible with the flight characteristics of the helicopter and the type of operations anticipated.

l. Peripheral Area. A safety zone that provides an obstruction-free area on all sides of the landing and takeoff area.

m. Taxiing. A powered movement of an aircraft from one area to another, usually just before takeoff or after landing. Helicopters equipped with skid-type landing gear are taxied in a hovering position a few feet above the ground; this is known as air or hover taxiing. Larger helicopters are usually equipped with wheel landing gear; such ships can ground taxi as well as hover taxi.

n. Taxiway. A pathway for hover taxiing or ground taxiing of helicopters connecting the takeoff and landing area with a separate terminal or service area.

o. Touchdown Area. That part of the landing or takeoff area where it is preferred that the helicopter alight.

p. VTOL. Aircraft that have the capability of vertical takeoff and landing. VTOL aircraft include, but are not limited to, helicopters and may utilize any of a number of concepts to obtain its propulsion, such as tilt wing, jet lift, etc.

FIGURE 2. Wall Street Heliport, New York.

CHAPTER 2. THE ROLE OF GOVERNMENT

5. FEDERAL AND LOCAL GOVERNMENTS. Federal and local governments have similar objectives in the field of heliport development, not only to insure that public interests are protected but also to assist the public in understanding helicopter operations as an important part of the transportation system. The Federal Government, through the FAA, has established safety rules for airplane and helicopter operations. These regulations concern such matters as minimum safe altitudes, ceiling and visibility weather limitations, right-of-way, and related standards needed for safety of persons and property both in the air and on the ground. The Federal safety regulations are comprehensive. The purpose for such broad Federal regulation of the navigable airspace is to achieve safety through uniform and centralized control of aviation operations. Most state and local jurisdictions find their safety-of-flight requirements covered by the Federal regulations. It is quite common, however, for state and local authorities to have detailed rules governing the establishment and licensing of heliports.

6. FEDERAL AVIATION REGULATIONS (FAR). The FAA does not license heliports. However, the agency does prescribe, through its regulations, various requirements that must be observed by the user, which indirectly affect the heliport design. Specific matters of interest to heliport developers are as follows:

a. FAR Part 157, Notice of Construction, Alteration, Activation, and Deactivation of Airports. The Federal Aviation Act of 1958, Section 309, states in part that no airport or landing area, not involving expenditure of Federal funds, shall be established, or constructed, or any runway layout substantially altered unless reasonable prior notice thereof is given the Administrator, pursuant to regulations prescribed by him, so that he may advise as to the effects of such construction on the use of airspace by aircraft. FAR Part 157 was promulgated to carry out the intent of this section.

b. FAA Form 7480–1, Notice of Landing Area Proposal. This is used for reporting those heliport projects subject to the notice requirements under the provisions of FAR Part 157. A reproduction of this form is presented in Figure 3, including an example of a hypothetical heliport. Forms may be obtained from any FAA area or regional office.

c. FAR Part 77, Objects Affecting Navigable Airspace. This sets forth the requirements for notice to the FAA Administrator for certain proposed construction or alteration of structures that would affect the navigable airspace. Part 77 requires persons intending to erect certain structures near a heliport or airport to notify the FAA of their intentions. The FAA then conducts an aeronautical study of the proposed structure to determine whether or not it would be a hazard to operations at the heliport. The FAA advises all interested parties of its findings. FAA Form 7460–1, Notice of Proposed Construction or Alteration, Figure 4, is used in connection with this regulation.

d. FAR Parts 27 and 29. These parts set forth the airworthiness standards for the manufacture of helicopters. Part 27 (formerly CAR 6) covers rotorcraft airworthiness for normal category, and Part 29 (formerly CAR 7) covers rotocraft airworthiness for transport category.

e. Operating Regulations. FAR Part 91 prescribes general operating rules for all aircraft. FAR Parts 121, 133, and 135 set forth the requirements for various types of commercial operations; and FAR Part 127 contains the operating rules for scheduled air carrier service by helicopters. FAR Part 61 pertains to certification requirements of pilots and flight instructors.

f. FAR Part 151, Federal-Aid to Airports. This sets forth the policies and procedures for administering the Federal-aid Airports Program (FAAP) under the Federal Airport Act. This program assists in the development of a nationwide system of public airports (including heliports) through grants of funds to public agencies, referred to as "sponsors." The sponsor must be a public agency such as a state, territory, municipality, or other political subdivision, or a tax-supported organization such as an airport authority or transportation authority. A

Form Approved: Budget Bureau No. 04-R0094

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
NOTICE OF LANDING AREA PROPOSAL

☒ ESTABLISHMENT OR ACTIVATION
☐ ALTERATION
☐ DEACTIVATION OR ABANDONMENT
☐ CHANGE OF STATUS

OF ☐ AIRPORT ☒ HELIPORT ☐ SEAPLANE BASE

NAME OF PROPONENT, INDIVIDUAL OR ORGANIZATION	ADDRESS *(No., Street, City, State, Zip Code)*
L. da Vinci	800 Main Street, Rotor, Virginia 00001

A. LOCATION OF LANDING AREA

1. NEAREST CITY OR TOWN	2. COUNTY	3. STATE	4. DIST. & DRCT TO NEAREST CITY OR TOWN FROM LANDING AREA	
Rotor, Virginia	FAR	Virginia		
5. NAME OF LANDING AREA	**6. LATITUDE**	**7. LONGITUDE** / **8. ELEVATION**	**MILES**	**DIRECTION**
Rotor Hospital Heliport	37° 35' 30"	76° 25' 30" / 101 ft. msl	0.5	N

B. PURPOSE *(List, below, localities to be served if new facilities, if change in status or alteration, briefly describe change & purpose).*

TYPE USE		CONSTRUCTION DATES
☐ PUBLIC ☒ PRIVATE ☐ PERSONAL	Rotor and surrounding area including freeway will have air ambulance service.	TO BEGIN / BEGAN: 1 April 1970 EST. COMPLETION: 1 May 1970

C. OTHER LANDING AREAS

	DRCT. FROM "A" ABOVE	DIST. *(Miles)*
Rotor Municipal Airport	SE	3 mi.

D. LANDING AREA DATA

		EXISTING *(If any)*	PROPOSED
1. AIRPORT OR SEAPLANE BASE	BEARING OF RUNWAY(S) OR SEALANE(S)		
	LENGTH OF RUNWAY(S) OR SEALANE(S)		
	WIDTH OF RUNWAY(S) OR SEALANE(S)		
	PRIMARY LANDING DIRECTION		
	TYPE OF RUNWAY SURFACE		
2. HELIPORT	DIMENSIONS OF LANDING AND TAKEOFF AREA		90' x 90'
	DIMENSIONS OF TOUCHDOWN AREA		50' x 50'
	INGRESS / EGRESS DIRECTION		N-S
	TYPE OF SURFACE *(Turf, rooftop, etc.)*		Asphalt
3. ALL	DESCRIPTION OF LIGHTING *(If any)*: Perimeter and floodlighting	DIRECTION OF PREVAILING WIND	NW

E. OBSTRUCTIONS

TYPE	HEIGHT ABOVE LANDING AREA	DRCT. FROM "A" ABOVE	DIST. *(Miles)*
Building	50 ft.	East	100 ft

F. OPERATIONAL DATA

		PRESENT *(If est. indicate by letter "E")*	ANTICIPATED 5 YRS. HENCE
1. EST. OR ACTUAL NO. BASED ACFT.			
AIRPORTS	MULTIENGINE		
	SINGLE-ENGINE		
HELIPORTS	UNDER 3500 LBS. MGW	E 1	2
	OVER 3500 LBS. MGW		
2. AVERAGE NO. MONTHLY LANDINGS			
	AIR CARRIER		
	GENERAL AVIATION	E 50	150
	OTHER *(Military, glider, etc.)*		

3. ARE IFR OPERATIONS ANTICIPATED ☒ NO ☐ YES WITHIN ________ YEARS

G. NOISE CONSIDERATIONS

IDENTIFICATION	DRCT. FROM "A" ABOVE	DIST. *(Miles)*
Operations will be over river to extent feasible.		

H. APPLICATION FOR AIRPORT LICENSING

☒ HAS BEEN MADE ☐ NOT REQUIRED ☐ COUNTY
☐ WILL BE MADE ☒ STATE ☒ MUNICIPAL AUTHORITY

I. CERTIFICATION: *I hereby certify that all of the above statements made by me are true and complete to the best of my knowledge.*

SIGNATURE	TITLE	TELEPHONE NO.	DATE
L. da Vinci	Engineer	411	1 Jan. 1970

FAA FORM 7480-1 (5-67) SUPERSEDES FAA FORM 2681

FIGURE 3. Example of FAA Form 7480–1, Notice of Landing Area Proposal.

Form Approved. Budget Bureau No. 04-R0001.

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

NOTICE OF PROPOSED CONSTRUCTION OR ALTERATION

TO BE COMPLETED BY FAA

AERONAUTICAL STUDY NO.

FAA WILL COMPLETE AND RETURN THIS FORM IF ONE OR MORE OF THE FOLLOWING IS APPLICABLE, OTHERWISE SEPARATE ACKNOWLEDGEMENT WILL BE ISSUED.

A. A STUDY OF THIS PROPOSAL HAS DISCLOSED THAT THE PROPOSED STRUCTURE:

- ☐ DOES NOT REQUIRE A NOTICE TO FAA.
- ☐ WOULD NOT EXCEED ANY STANDARD OF PART 77 AND WOULD NOT BE A HAZARD TO AIR NAVIGATION.
- ☐ SHOULD BE MARKED AND LIGHTED PER FAA "OBSTRUCTION MARKING AND LIGHTING" ADVISORY CIRCULAR 70/7460-1.
- ☐ REQUIRES SUPPLEMENTAL NOTICE. NOTICE FORM (FAA FORM 117-1) ENCLOSED.

B. COPY SENT TO FCC? ☐ YES ☐ NO

REVIEWING OFFICER	DATE

1. NATURE OF STRUCTURE *(Complete both A and B below)*

A. *(Check one)*
☐ NEW CONSTRUCTION ☐ ALTERATION

B. *(Check one)*
☐ PERMANENT ☐ TEMPORARY *(State length of time)* ________ Mos.

2. NAME AND ADDRESS OF INDIVIDUAL, COMPANY, CORPORATION, ETC. PROPOSING THE CONSTRUCTION OR ALTERATION *(Number, Street, City, State and Zip Code)*

TO

3. TYPE AND COMPLETE DESCRIPTION OF STRUCTURE

4. LOCATION OF STRUCTURE

A. COORDINATES *(To nearest second)*						B. NEAREST CITY OR TOWN, AND STATE	
LATITUDE			LONGITUDE				
°	'	"	°	'	"	(1) DISTANCE FROM 4B MILES	(2) DIRECTION FROM 4B

C. NAME OF NEAREST AIRPORT, HELIPORT, OR SEAPLANE BASE	(1) DISTANCE FROM NEAREST POINT OF 4C	(2) DIRECTION FROM AIRPORT

D. *DESCRIPTION OF LOCATION OF SITE WITH RESPECT TO HIGHWAYS, STREETS, AIRPORTS, PROMINENT TERRAIN FEATURES, EXISTING STRUCTURES, ETC. (Attach a highway, street, or any other appropriate map or scaled drawing showing the relationship of construction site to nearest airport(s). If more space is required, continue on a separate sheet of paper and attach to this notice.)*

5. HEIGHT AND ELEVATION *(Complete A, B and C to the nearest foot)*	
A. ELEVATION OF SITE ABOVE MEAN SEA LEVEL	
B. HEIGHT OF STRUCTURE INCLUDING APPURTENANCES AND LIGHTING *(if any)* ABOVE GROUND, OR WATER IF SO SITUATED	
C. OVERALL HEIGHT ABOVE MEAN SEA LEVEL *(A + B)*	

6. WORK SCHEDULE DATES
A. WILL START
B. WILL COMPLETE

7. OBSTRUCTION MARKINGS – The completed structure will be:	YES	NO
A. MARKED AS SPECIFIED IN THE FAA ADVISORY CIRCULAR 70/7460-1, OBSTRUCTION MARKING AND LIGHTING		
B. LIGHTED AS SPECIFIED IN THE FAA ADVISORY CIRCULAR 70/7460-1, OBSTRUCTION MARKING AND LIGHTING		

I HEREBY CERTIFY that all of the above statements made by me are true, complete, and correct to the best of my knowledge.

8. NAME AND TITLE OF PERSON FILING THIS NOTICE *(Type or Print)*	9. SIGNATURE *(In ink)*	
	10. DATE OF SIGNATURE	11. TELEPHONE NO. *(Precede with area code)*

Persons who knowingly and willfully fail to comply with the provisions of the Federal Aviation Regulations Part 77 are liable to a fine of $500 for the first offense, with increased Penalties thereafter as provided by Section 902(a) of the Federal Aviation Act of 1958 as amended.

FAA Form 7460-1 (11-68) SUPERSEDES FAA Form 117.

FIGURE 4. FAA Form 7460-1, Notice of Proposed Construction or Alteration.

project for heliport development may be approved by the FAA only if it is reasonably necessary and consistent with existing plans of public agencies for the development of the area in which the heliport is to be located, and provided it is within the scope of the current National Airport Plan. Federal participation in the allowable cost of such development is about 50 percent. To be eligible, the land comprising the site of the heliport must be publicly owned and under the control of a public agency. Additionally, the site must be evaluated by the FAA from an airspace utilization standpoint and be found compatible. Use of the criteria in this guide is required for Federal participation.

7. OTHER FEDERAL PROGRAMS. Limited financial assistance is available for establishment of air ambulance, traffic patrol, and police patrol services. Information on an air ambulance program (as part of the emergency medical service) may be obtained from the Federal Highway Administration, National Highway Safety Bureau, 400 6th Street, S.W., Washington, D.C. 20591. Information on the police patrol program may be obtained from the Law Enforcement Assistance Administration of the Department of Justice, 633 Indiana Avenue, N.W., Washington, D.C. 20530.

8. STATE REQUIREMENTS. The establishment of a heliport usually will require prior approval, or the issuance of a license, from the appropriate state aeronautics commission or similar authority. In some states, the licensing requirements apply only to airports and heliports open to the public; in others, however, they apply to all airports and heliports within the state.

9. LOCAL REQUIREMENTS. Some local jurisdictions have rules and regulations governing the establishment of a heliport. Zoning laws and the related provisions of building codes, fire regulations, and similar ordinances should be taken into account by the heliport planner.

a. Local Authority.

(1) In communities where a heliport facility is proposed, a careful study should be made of the community's local laws, rules, and regulations to determine whether they permit or properly provide for the establishment of a permanently located heliport. It is important that regulations also permit off-heliport landings on a temporary or occasional basis. Since helicopters do not require prepared runways, etc., landings can be made safely in a variety of clear sites without formally declaring the site a "heliport." Federal Aviation Regulations and most state jurisdictions permit this type of operation in order to allow for accomplishment of many valuable helicopter services. For example, rescue and ambulance missions often require such off-heliport landings.

(2) The main difference between a heliport and an off-heliport landing site is that the heliport has been formally approved for continual use at the permanent location; whereas, the off-heliport site is for limited time or infrequent use.

10. GOVERNMENT ASSISTANCE. In view of the above, it is apparent that heliport developers should seek the cooperation and assistance of the FAA, state, and local authorities in the early stages of planning in order to proceed with full knowledge of both the regulatory and economic needs. The FAA is prepared to give technical advice and assistance on request. Preliminary coordination may be accomplished with the FAA Airports office. (See Appendix 1 for location of local FAA offices.) Most state aviation authorities have established procedures for handling airport and heliport applications. Local government authorities often do not have an established procedure for handling heliport applications, and it may be necessary to explain the special nature of helicopter operations. In some communities, education of the public, particularly the immediate neighbors of the heliport, may be needed to point out the advantages of helicopter services to a community and to clarify any misunderstandings related to the services.

11. SUMMARY. Heliport developers may find the following checklist helpful in pursuing their objectives. All of the steps listed may not be necessary because circumstances vary in different parts of the country. In certain cases, additional steps may be necessary.

a. Review local rules and regulations (city and county) regarding zoning, city planning, building requirements, ordinances, etc., to determine local compliances required.

b. Select a suitable heliport site.

c. Contact a local helicopter operator, helicopter manufacturer's representative, or aviation consultant to check the operational feasibility of the site being considered.

d. Submit prior notice of heliport development to the nearest FAA Airports Area or Regional office on FAA Form 7480–1, Notice of Landing Area Proposal. (See Figure 3.)

e. Refer to subsequent chapters of this guide for information on the technical criteria for con-

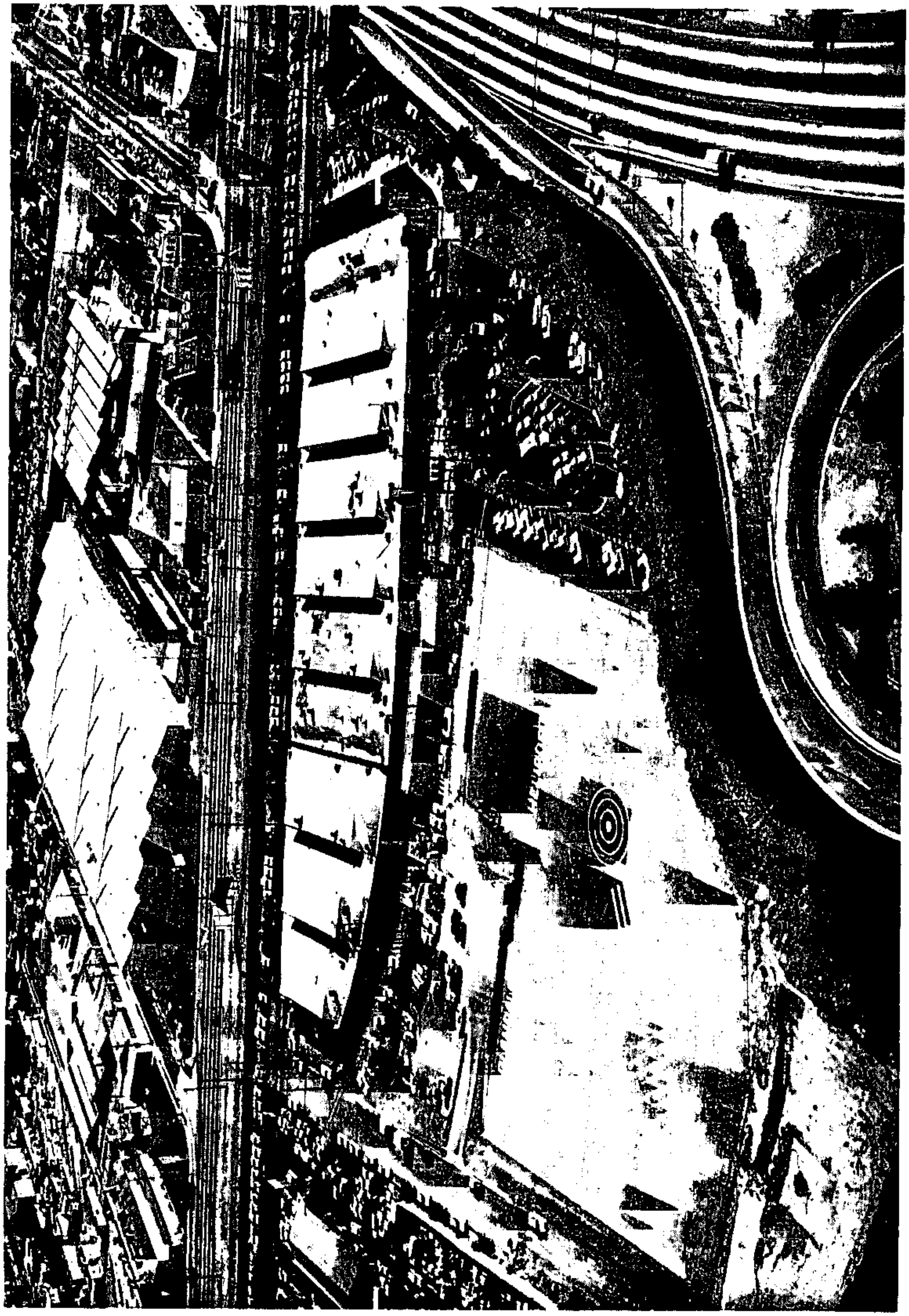


FIGURE 5. Glendale Heliport, California.

struction of heliports. Discuss with helicopter operators and FAA representatives the selection of routes and operating procedures.

f. Submit application with information summary on proposed operating procedures to state and/or local authorities for license or approval of heliport, including request for local rezoning, if needed. Provide sufficient detail to answer pertinent questions about intended heliport operations.

CHAPTER 3. HELICOPTER CHARACTERISTICS

12. HELICOPTER DESIGN. Helicopter designs vary considerably, but all helicopters achieve flight by approximately the same means. The rotor blades serve as a rotary wing for the helicopter, eliminating the need for a fixed wing such as is used on airplanes. The helicopter gains direct, upward lift from the rotor blade system. Change in direction is achieved by tilting the rotor disc (tip-path-plane) in the desired direction of turn and/or applying turning torque to a tail rotor.

a. Helicopter Airworthiness. All civil helicopters manufactured or operated in the United States must meet the airworthiness requirements of the FAA before being certified for operation. A flight manual or equivalent is supplied by the manufacturer for every approved helicopter model certificated. In addition, every operating aircraft must at all times possess a valid Airworthiness Certificate indicating that the aircraft continues to meet the safety standards prescribed by the regulations. Airworthiness Certificates are re-validated periodically by FAA authorized mechanics and inspectors following an inspection of the aircraft. The FAA maintains field offices in numerous locations throughout the country to provide adequate inspection and surveillance of the civil aircraft fleet.

b. Helicopter Types. Helicopters currently in civil use vary in the number of main rotors, in the number and type of engines, and in size and weight. Appendix 2 lists data for numerous helicopters.

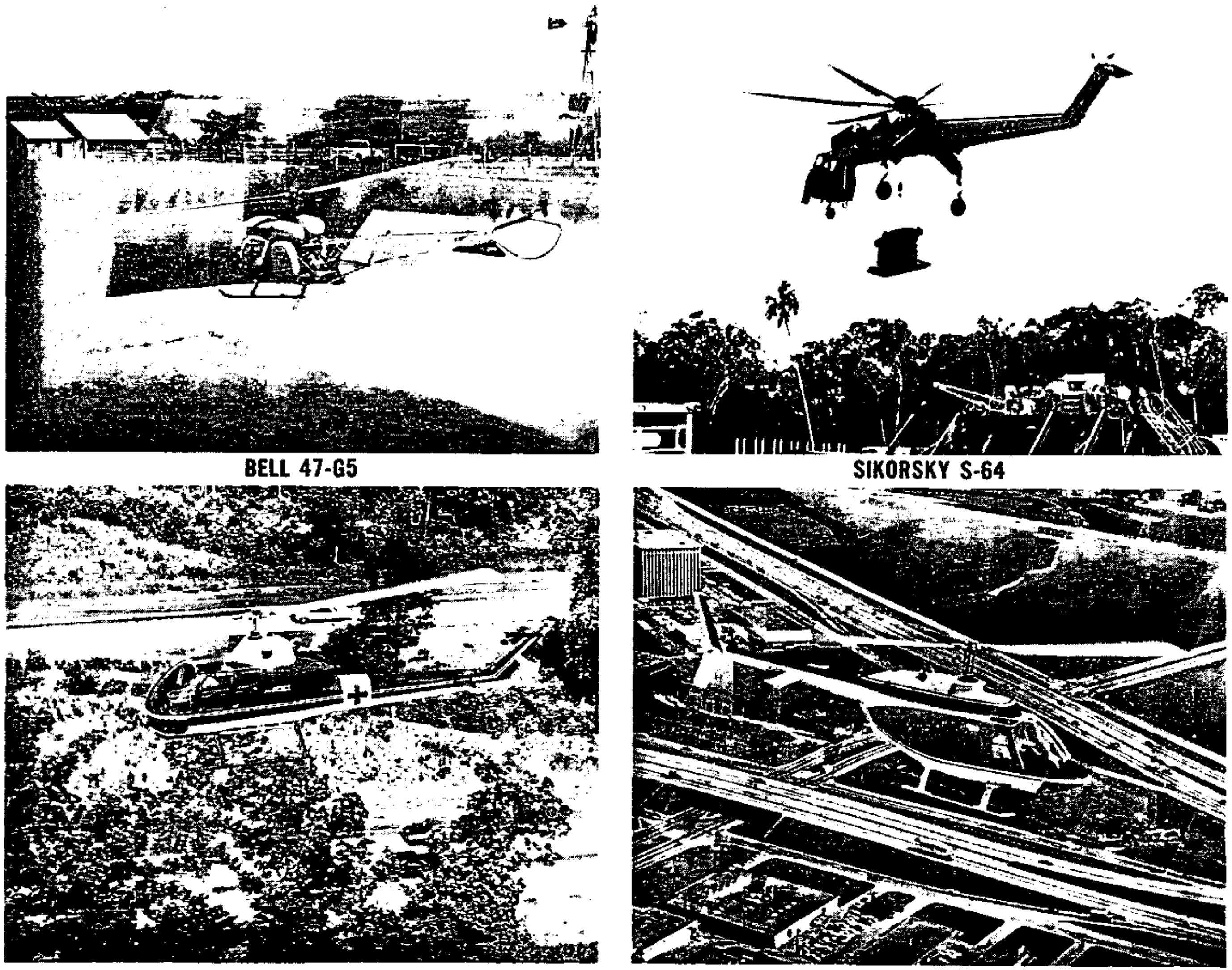
c. Helicopter Configuration. Helicopter photographs appear in Figures 6, 7, and 8. Dimensions are given in Appendix 2. Although subject to change whenever modifications are made or new models are introduced, this information is helpful in providing a general picture of the size and configuration of helicopters. It should be noted that the 2- to 5-place helicopters currently comprise about 95 percent of the civil helicopter fleet, and that the large transport type helicopters are used primarily by the scheduled helicopter airlines. Commercial helicopter services and private and business helicopter owners are located in nearly every state and comprise the bulk of helicopter activity; scheduled helicopter airline services constitute a small portion of the total activity.

13. HELICOPTER PERFORMANCE.

a. Operation. The characteristics of helicopters with their capability of essentially vertical flight make it possible for them to takeoff safely from clear areas not much larger than the craft itself. On takeoff, the helicopter usually rises vertically a few feet above the helicopter surface, then accelerates forward and upward on a sloping path to climb-out speed, and on to the en route altitude. On landing, the helicopter descends from en route altitude at reduced speed to a hovering condition (zero forward speed) several feet above the surface. The actual landing is made by a slow vertical descent from 3 or 4 feet to a selected point on the heliport. Sideward flight can be performed during the final landing phase to place the helicopter in the most desirable position.

b. Speeds. Normal speeds for the helicopter range from zero (in hovering flight) up to 175 m.p.h., depending on the type of helicopter. Future compound helicopters may attain speeds up to 350 m.p.h. Helicopters seldom have need to fly more than 1,000 up to 1,500 feet above the ground, although many have the ability to fly more than 10,000 feet above sea level.

c. Safety Features. The helicopter has several unique safety features—a major one being the ability to hover a few feet above the ground and perform a number of important safety checks prior to committing the helicopter to full takeoff. A helicopter uses considerable power in hover, allowing the engine and other accessories to be checked for proper functioning. A check can be made of all flight controls and a determination made that the aircraft is loaded within safe control limits of weight and balance. Another safety feature of the helicopter is that a precautionary landing can be safely made almost anywhere in case a component is not functioning properly. In the event of engine stoppage or other emergency conditions in flight, the single engine helicopter can glide to a safe landing by



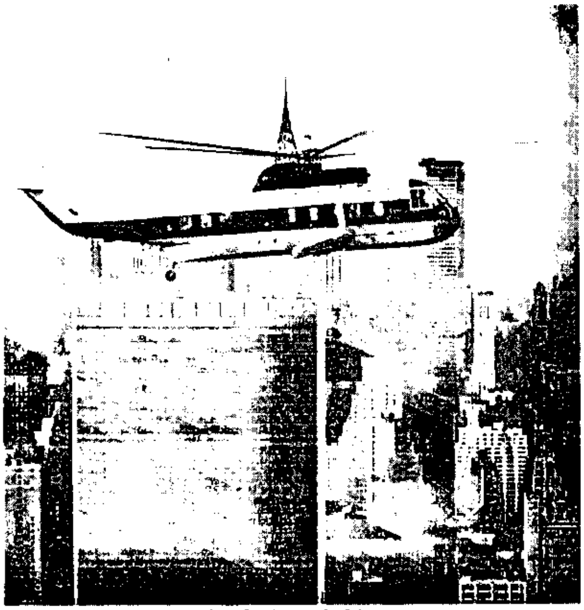
BELL 47-G5

SIKORSKY S-64

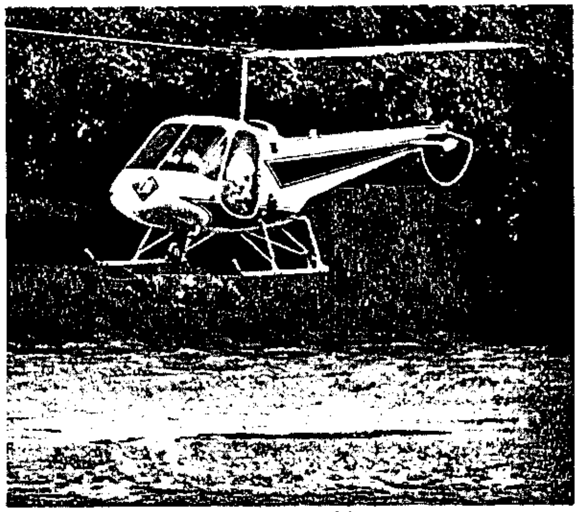
FAIRCHILD-HILLER 1100

BELL 206A JETRANGER

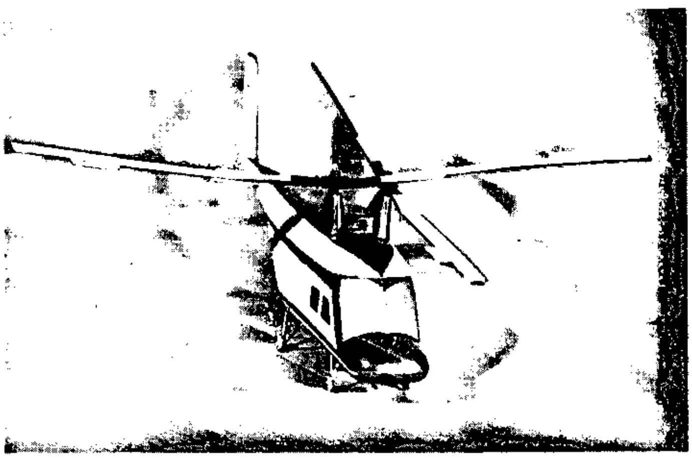
FIGURE 6. Typical Helicopters.



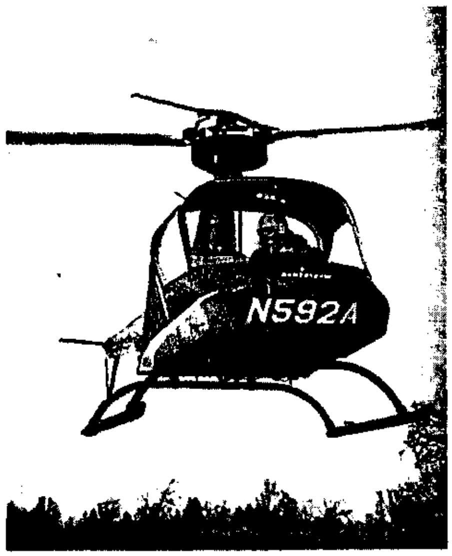
SIKORSKY S-61



ENSTROM F-28 A

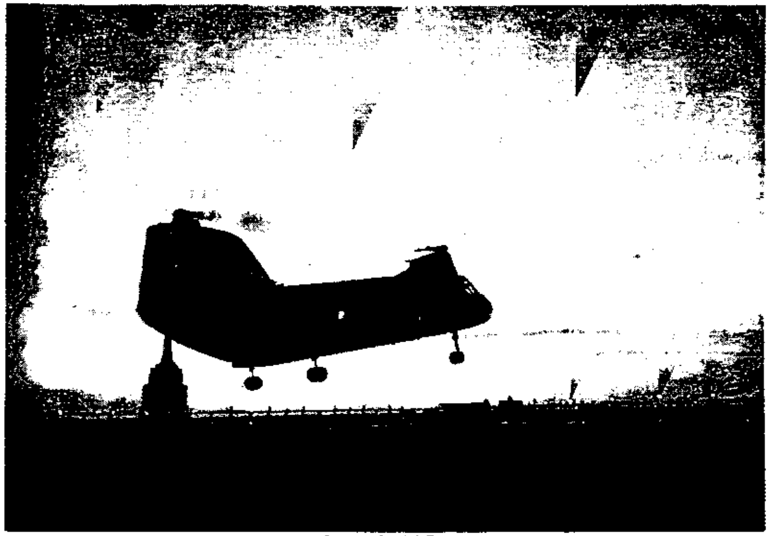


KAMAN K-700 (PROPOSED)

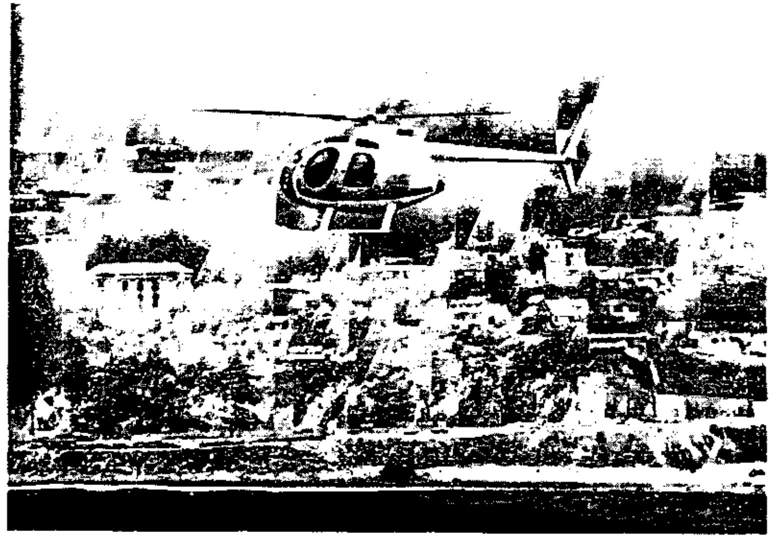


SCHEUTZOW MODEL B

FIGURE 7. Typical Helicopters.

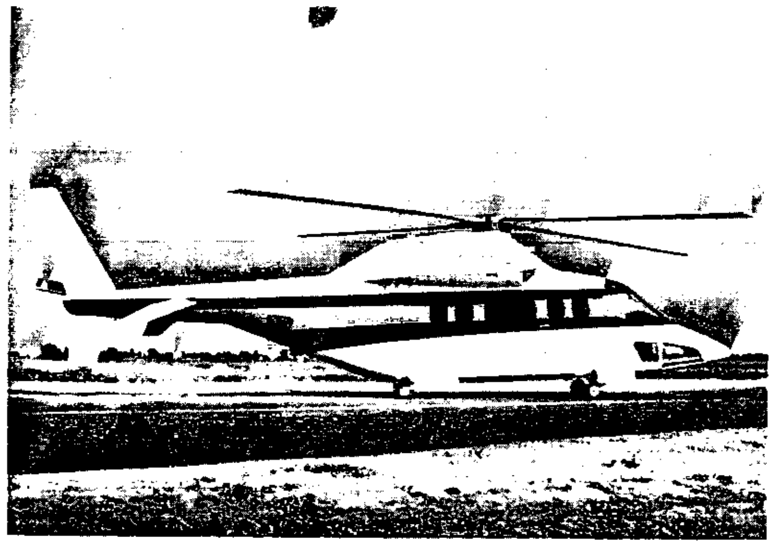


BOEING 107-II



HUGHES 500

BELL 212

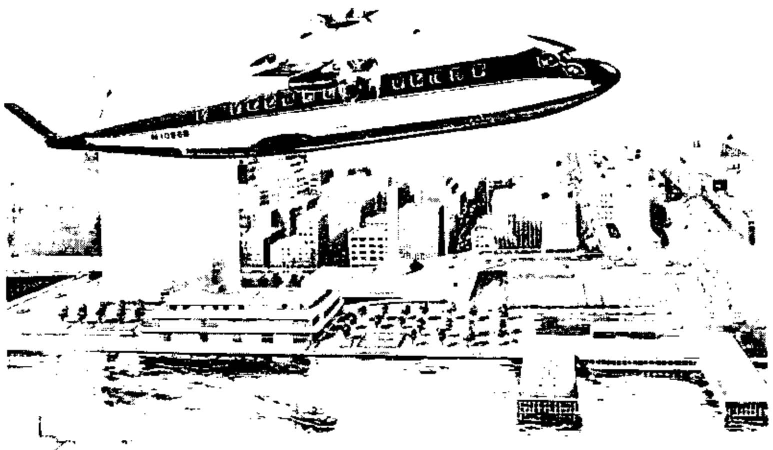


GATES TWINJET (PROPOSED)

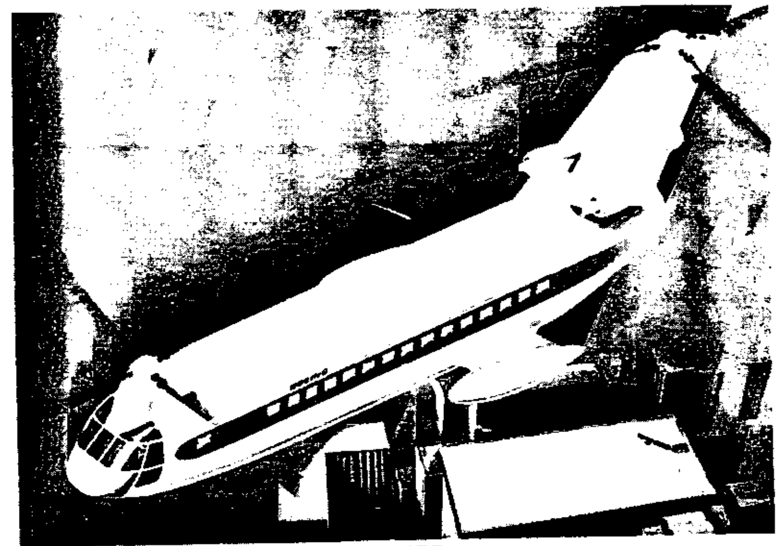
FIGURE 8. Typical Helicopters.

means of autorotation. During this maneuver, the main rotor continues to turn free of the engine and produces sufficient lift for the helicopter to glide to a satisfactory landing.

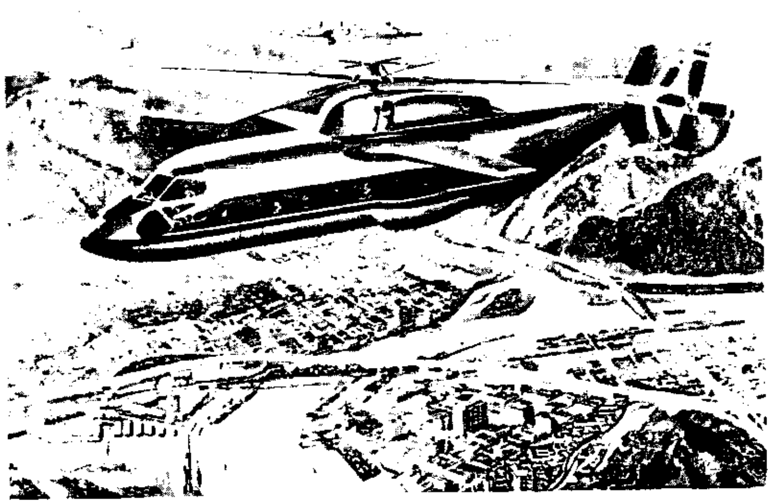
d. Future VTOL Aircraft. Considerable time and expense have been expended by industry and the Federal Government in various VTOL aircraft research and development programs. Manufacturers and airlines have been looking at certain commercially feasible designs to determine their prospects in penetrating or developing new markets. Some of these are shown in Figure 9. A number of studies on the potential uses of VTOL aircraft has been published. These are listed in Appendix 5.



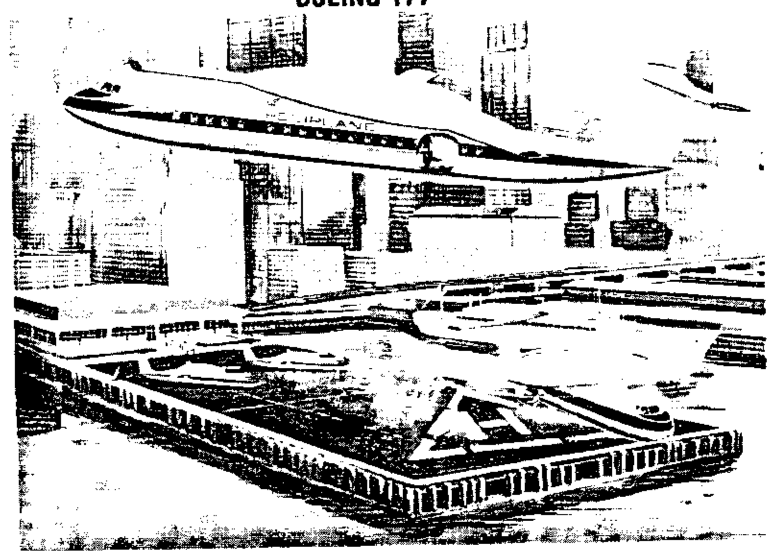
SIKORSKY S-65 COMPOUND



BOEING 177



LOCKHEED 1026



HUGHES HELIPLANE

FIGURE 9. Examples of Future Helicopters (VTOL).

CHAPTER 4. CLASSES OF HELIPORTS

14. GENERAL. Classification of heliports is provided to indicate the major differences in kinds of installations for helicopter operations. The differences lie mainly in use, types of helicopters served, and the nature of supporting facilities included on the heliport. Classification is helpful in planning and zoning for heliports and serves to relate the operational factors involved in land use considerations.

a. Use. A heliport is considered public or private, depending upon whether or not it is used for public transportation. The type of ownership has no influence on the classification of the heliport; only the type of helicopter operation determines the classification. For example, a heliport having scheduled air taxi operations would be considered a public class heliport, even if it were privately owned. Further, a police heliport would be classed as private, even though publicly owned, since it is a special-use facility.

b. Size. A heliport may be any size down to the minimum recommended in this guide. Size and dimensions of private heliports are given in Chapter 6; for public heliports, in Chapter 7.

c. Helicopter Types. Helicopter types refer to those in the NORMAL category as defined in FAR Part 27 or those in the TRANSPORT category as defined in FAR Part 29.

d. Supporting Facilities. These facilities may include passenger and/or cargo facilities, helicopter parking, fueling, and maintenance provisions on the heliport.

15. HELIPORT CLASSIFICATION. Heliports are classified according to use, as follows:

Class I—Private
Class II—Public (Small)
Class III—Public (Large)

They are further subclassified according to their available support facilities, as follows:

Subclass A—Minimum support facilities—no buildings, maintenance, or fueling.
Subclass B—Limited support facilities—no maintenance or fueling.
Subclass C—Complete support facilities including maintenance and fueling.

16. DESIGNATION OF HELIPORTS. A heliport is recognized and defined as an area for the landing and takeoff of helicopters, but not every site used for this purpose need be designated a heliport. Many clear areas normally used for other purposes can accommodate occasional or infrequent helicopter operations. To differentiate these sites from heliports, they are termed "off-heliport landing areas." The distinction is explained to emphasize that it is neither necessary nor feasible to establish a heliport for all helicopter operations. To restrict helicopters solely to areas officially designated as heliports would limit unnecessarily the usefulness of these versatile aircraft.

a. Application. It is impractical to recommend criteria for landing sites that would be used infrequently. This guide applies only to sites that are developed to serve helicopters regularly during the foreseeable future.

b. Stage Development. Stage development of heliports is encouraged when it is deemed unnecessary or uneconomical to construct a facility to its full potential in the beginning. Heliports developed on a modest scale for present needs can usually be enlarged or modified to meet increased future requirements provided sufficient ground space is available. For the national system of heliports, the greatest anticipated need is for more new sites.

17. SPECIAL SERVICE HELIPORTS. In many metropolitan areas, local governments have established heliports to provide special services to the community. These services include police patrol, traffic surveillance, fire suppression, and emergency air ambulance transportation. The potential benefits of such operations are just beginning to be recognized. It is anticipated that a multitude of heliports will soon be developed for special services in cities across the country. An example of this type is the hospital heliport.

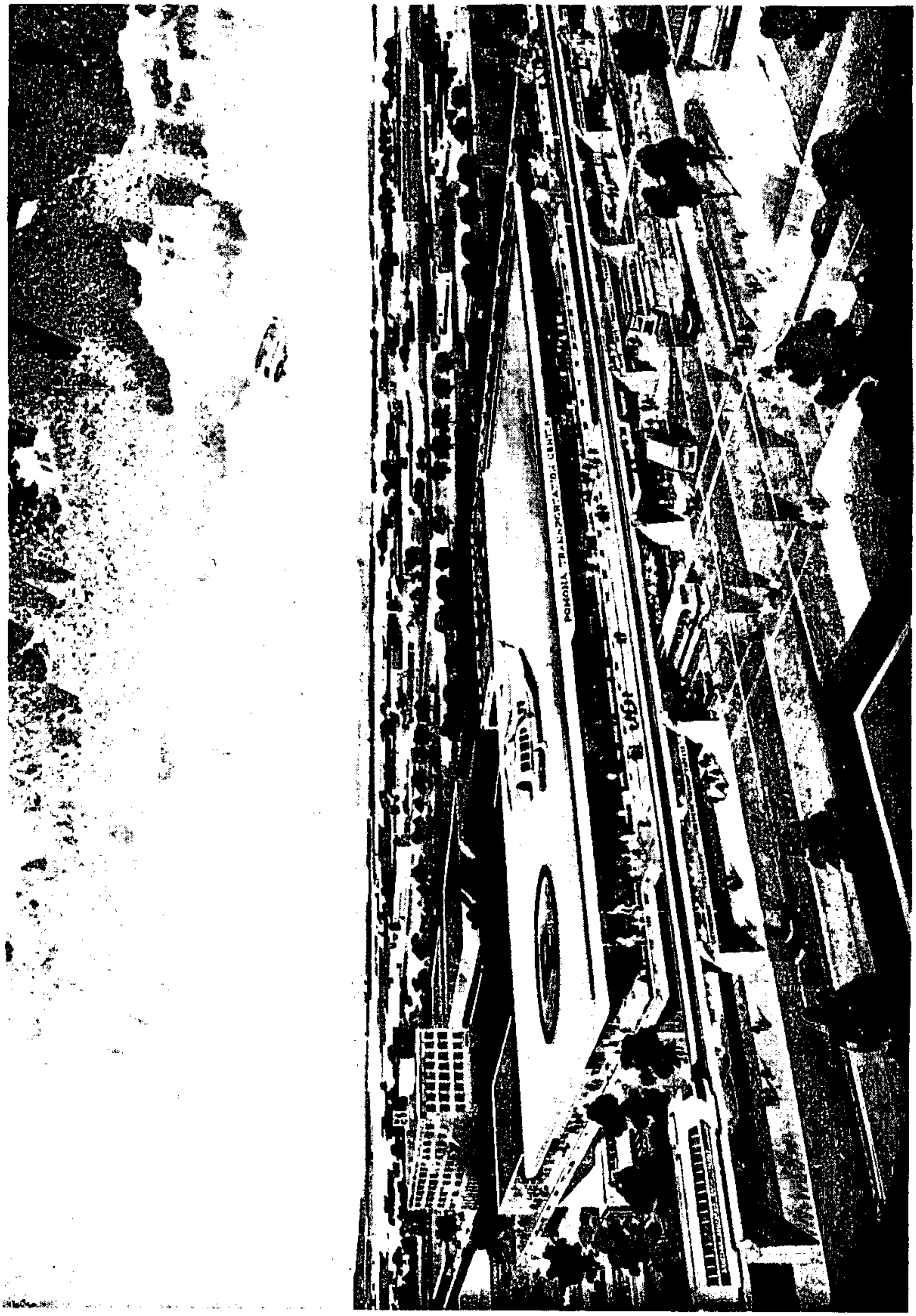


FIGURE 10. Proposed Transportation Center at Pomona, California.

CHAPTER 5. SITE SELECTION

18. GENERAL. The selection of a heliport site involves four major considerations: (1) The desired location and physical layout; (2) operational safety; (3) the effect on navigable airspace; and (4) the effect on the surrounding community. Each of these considerations is discussed briefly to provide a general background for site selection.

19. LOCATION AND PHYSICAL LAYOUT.

a. Heliports may be located on the ground or on suitable structures on land or over water. Ground level sites usually are the least costly to prepare and normally provide the most convenient access for individuals using the heliport. In comparison, rooftop or other elevated structures can reduce or eliminate land acquisition and frequently provide better flight access to the heliport.

b. The layout of the heliport is primarily dependent on the operating characteristics of the helicopters and the type of support facilities desired. Thus, if a minimum landing facility for one helicopter is desired and no support facilities are required, a relatively small site will suffice. The layout should be in accordance with provisions of Chapter 6 or 7, as appropriate.

c. Short-haul markets demand that majo, consideration be given to time-saving and convenience for passengers; otherwise, the benefits of the helicopter mode of transportation will not be fully realized. Site selection requires the determination of the geographic sources of the traffic demand. Comparison of total travel time with other modes is necessary for informed decision-making.

d. Prior to making site selection studies for public heliports, determine if other studies have been made, such as a metropolitan airport system plan. Also, the site selection study should relate to the comprehensive general plan and the transportation plan for the entire area. These latter plans will be helpful in heliport site selection, in that they may contain information about projected land uses and surface travel origin-destination data. This procedure may provide a means of comparing helicopter travel times with projected travel times of other modes of transportation.

20. OPERATIONAL SAFETY. A major safety consideration of a heliport lies in the availability of suitable approach-departure paths leading to and from the heliport. These paths should be over terrain which affords emergency landing areas in relation to the proposed altitude of the helicopter and its autorotative performance. This provision is necessary for all but multiengine helicopters capable of continued flight on one engine. Heliport approach-departure paths usually are sought over waterways, beaches, parks, golf courses, industrial areas, or vacant land. Other recommended paths are over highways, freeways, and open land with a minimum of obstructions. The objective is to provide adequate emergency landing spots in case of propulsion failure. Usually avoided are approach-departure paths over residential developments, playgrounds, shopping districts, or highly populated areas. An accurate evaluation of a heliport site, and possible obstacles to flight, is best determined by a helicopter flight check coupled with a detailed on-site inspection. When a heliport operation has been found acceptable, based on specific emergency landing spots, then concerted action should be taken to insure the continued existence of these emergency areas. Several heliports have been forced to cease operations due to elimination of emergency landing areas by construction or change in land use. The above comments do not apply to helicopter en route operations.

21. EFFECT ON THE USE OF AIRSPACE. It is necessary to study most proposed heliport sites to determine what effect their utilization will have on the safe and efficient use of airspace. This type of study is conducted by the FAA following the submission of FAA Form 7480-1, Notice of Landing Area Proposal, pursuant to the notice requirements of FAR Part 157. This element of site selection is extremely important, particularly when the site is near an active airport or other established aeronautical activity. Heliport sites that would interfere with the landing and takeoff operations at an established airport, conflict with an established instrument flight procedure, or otherwise adversely affect the safe and efficient use of airspace by aircraft would normally be found objectionable unless procedures could be developed to insure compatibility of operations.

22. EFFECT ON SURROUNDING COMMUNITY. The fact that helicopters can operate safely at sites of limited size means that heliports frequently will be planned for areas that previously have not experienced any degree of aviation activity. Consequently, if the heliport plan is to be successful, the developer most likely will have to take a substantial part in educating the public, especially the neighboring property owners about the specialized characteristics of the helicopter that make it acceptable at close-in locations. Further, the overall master plan for a community should recognize the need for heliports and should provide for their use. Urban renewal often can accommodate with little difficulty the establishment of new heliports.

a. Local Laws.

(1) Zoning laws bear a very significant relationship to the heliport. A review of existing zoning and related municipal rules, regulations, and practices (collectively called local laws) of a number of cities indicates that local laws are largely inadequate for heliports. Some zoning ordinances deal with airports, but these normally provide more restrictive zoning criteria than are appropriate for heliports. Consequently, a revision of the zoning regulations is frequently necessary to give recognition to this unique facet of modern transportation. Questions also arise with respect to other aspects of regulation of these activities, such as building codes and fire laws. It is not advocated that all communities revise local laws. However, they should be re-examined with the heliport in mind. In those cases where zoning excludes heliports and there is a possibility of helicopter operations, then the need for revision is immediate. Local laws should not be negative merely to protect the status quo but should be the result of evaluating the long-term benefits to the community. Further, counsel should be sought from recognized heliport authorities within the FAA and state and local agencies before laws regulating heliports are initiated or changed.

(2) In general, zoning regulations should treat heliports as a PERMITTED USE in industrial, commercial, manufacturing, agricultural, or unzoned areas. Some heliports (especially those without support facilities or with limited facilities) could be either a permitted or conditional use in certain residential, retail, or business districts. Provisions for the occasional or infrequent use of off-heliport landing sites on short notice also should be covered in a reasonable manner by appropriate ordinances.

b. Height Restriction Zoning. For public heliports, the selection of approach-departure paths and establishment of height-restriction zoning to protect them are important steps in the site selection process. Guidance for preparing a heliport ordinance can be obtained from the local FAA Airports office. The heliport zoning ordinance should include a map with the appropriate imaginary surfaces for the heliport. This map should identify height limitations on any property in the vicinity of the heliport.

c. Sound Levels. Sound caused by helicopter operations within or adjacent to populated areas is an important factor in planning for heliports. A heliport should be located so that the noise generated by helicopters will not cause undue disturbance to surrounding neighbors. Helicopter sound is greatest directly underneath the flight path on takeoff and landing. Many people will give special notice to helicopter sound initially since it is a different type of sound than they are accustomed to hearing. Sound levels are normally measured in overall decibel levels, a measure which gives equal weighting to all frequencies within the range of hearing. Since the ear and human interpretation does not respond this way, scales have been devised in terms of "loudness" or "noisiness" to weigh sound frequency and sound intensity in accordance with human response. The individual loudness or noisiness of each frequency contribution of a sound is summed up in a prescribed manner so as to result in a single number representative of a person's total relative aural assessment of that sound. When noisiness is the descriptor, the assessment unit, converted to a decibel level, is termed the perceived noise level (PNL). Figure 11 shows a comparison of PNL values at given distances for typical transportation and other noise sources. Usually, the greatest attention to helicopter sound is in the immediate area surrounding the heliport. It is within this adjacent area, therefore, that consideration must be given to the sound levels involved. Evaluate each situation according to its particular circumstances.

d. Noise Reduction. Government and industry have launched, in the past several years,

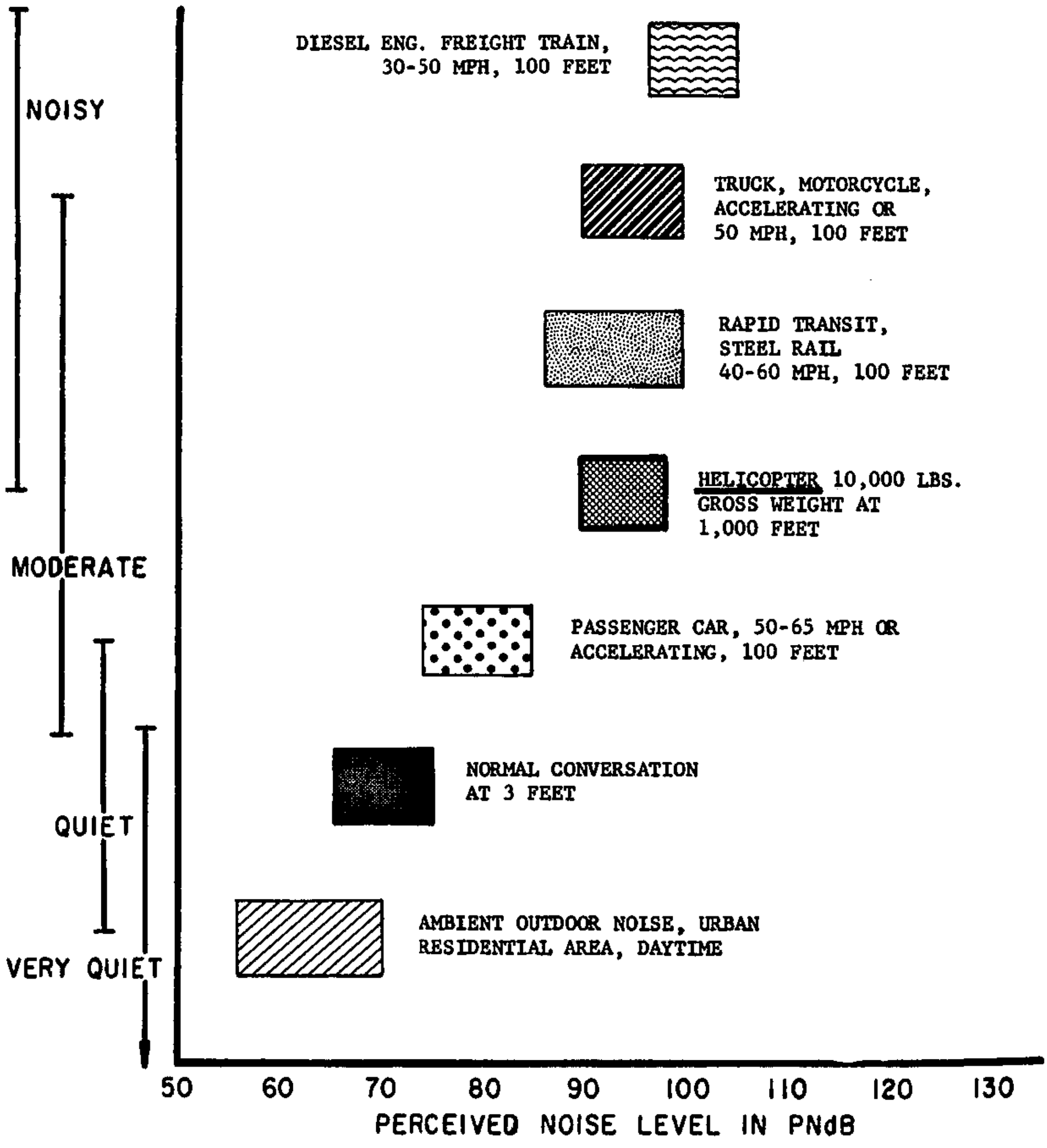


FIGURE 11. Perceived Noise Levels Related to Subjective Ratings.

large scale programs designed to reduce the noise generated by conventional types of transport aircraft through engine/aircraft design and acoustic treatment application. The results from these programs are already beginning to show promise of substantial noise reduction. These benefits should be, to a large degree, applicable to future helicopters and their powerplants.

e. Esthetics. Community acceptance of ground level heliports will be enhanced if they are pleasing in appearance. The money spent on landscaping and obtaining service buildings that are compatible with the architecture of the area should add little to the overall cost of the heliport development.

23. HELIPORTS AT AIRPORTS.

a. As the number of helicopter operations into an airport increases, designated heliport areas should be established at the airport. The helicopters shuttling traffic to and from downtown areas and the surrounding communities should land and takeoff at locations convenient to the terminal facilities.

b. The landing and takeoff area should be located to:

(1) Obtain approach-departure routes free of obstructions.

(2) Provide adequate separation from airplane traffic. The clearance between the centerline of the airport runway and the heliport should be determined on the basis of the criteria for the classification of the airport.

(3) Be close to passenger check-in areas for airplanes.

(4) Avoid the mixing of taxiing airplanes and helicopters.

c. Potential locations for heliports at an airport include:

(1) The roof of the terminal building.

(2) The apron adjacent to the terminal building used by airplanes.

(3) A roof over the automobile parking area.

(4) Other ground-level areas near the terminal building, separated from the airplane apron.

d. There are advantages and disadvantages to all the aforementioned locations. Normally, a ground-level site is the easiest to establish. An inexpensive way to obtain this type of site is to reserve a part of the airplane terminal apron for the landing and takeoff of helicopters. Another plan is to build a special pad for helicopter operations on the air side of the terminal building.

24. ORIENTATION. Although helicopters can maneuver in relatively high crosswinds, the landing and takeoff areas should be oriented to permit operation into the wind. Other considerations affecting orientation are adjacent populated areas, restricted areas, topography, and obstructions.

CHAPTER 6. PRIVATE HELIPORTS

25. GENERAL.

a. Private-use heliports constitute the majority of heliports now in operation. They are used for a variety of purposes but are generally related to private enterprise activities. The helicopters utilizing these heliports are predominantly small, single-engine aircraft. However, several corporations have recently become interested in the larger single-engine and medium size twin-engine helicopters for executive transportation. This trend is expected to continue, particularly in the major metropolitan areas.

b. The immediate availability of air transportation may be a decisive factor in keeping a business in a downtown area versus relocating to a suburban site or to a different community. Efficient transportation is vital to every community; aviation, both public and private, must be considered in this context. It should be noted that private heliports can have a substantial impact on the economic health of a city.

26. HELIPORT LAYOUT. The size, shape, and appurtenances of heliports are determined by a variety of interrelated factors—principally the nature of the site available, size and performance of the helicopter, and the buildings or other objects in the surrounding area. Although heliports may be square, rectangular, or circular, an irregular-shaped site may be equally functional. Minimum operational safety requirements will not vary from one design to another.

27. HELIPORT DIMENSIONS. The dimensions of the operational elements of the heliport are keyed to the size of the helicopter(s) expected to use the heliport and the degree of activity anticipated. The owner of the facility should plan as far into the future as is practicable. Premature obsolescence of a heliport could prove very costly.

a. Landing and Takeoff Area. The size of the landing and takeoff area is determined by the owner. However, the determination should be based on the overall length of the helicopter. The recommended minimum length of the area should be at least 1.5 times the overall length of the helicopter; the width of the area should also be 1.5 times the overall length of the helicopter. For example, if the largest helicopter anticipated has an overall length of 60 feet, the minimum dimensions would be 90 feet by 90 feet. (See Figure 12.)

(1) *Heliports at Elevations More Than 1,000 Feet Above Sea Level.* Generally, no increase in size is necessary for heliports at more than 1,000 feet elevation if the helicopters are either sufficiently supercharged to provide adequate performance or are off-loaded to obtain this performance.

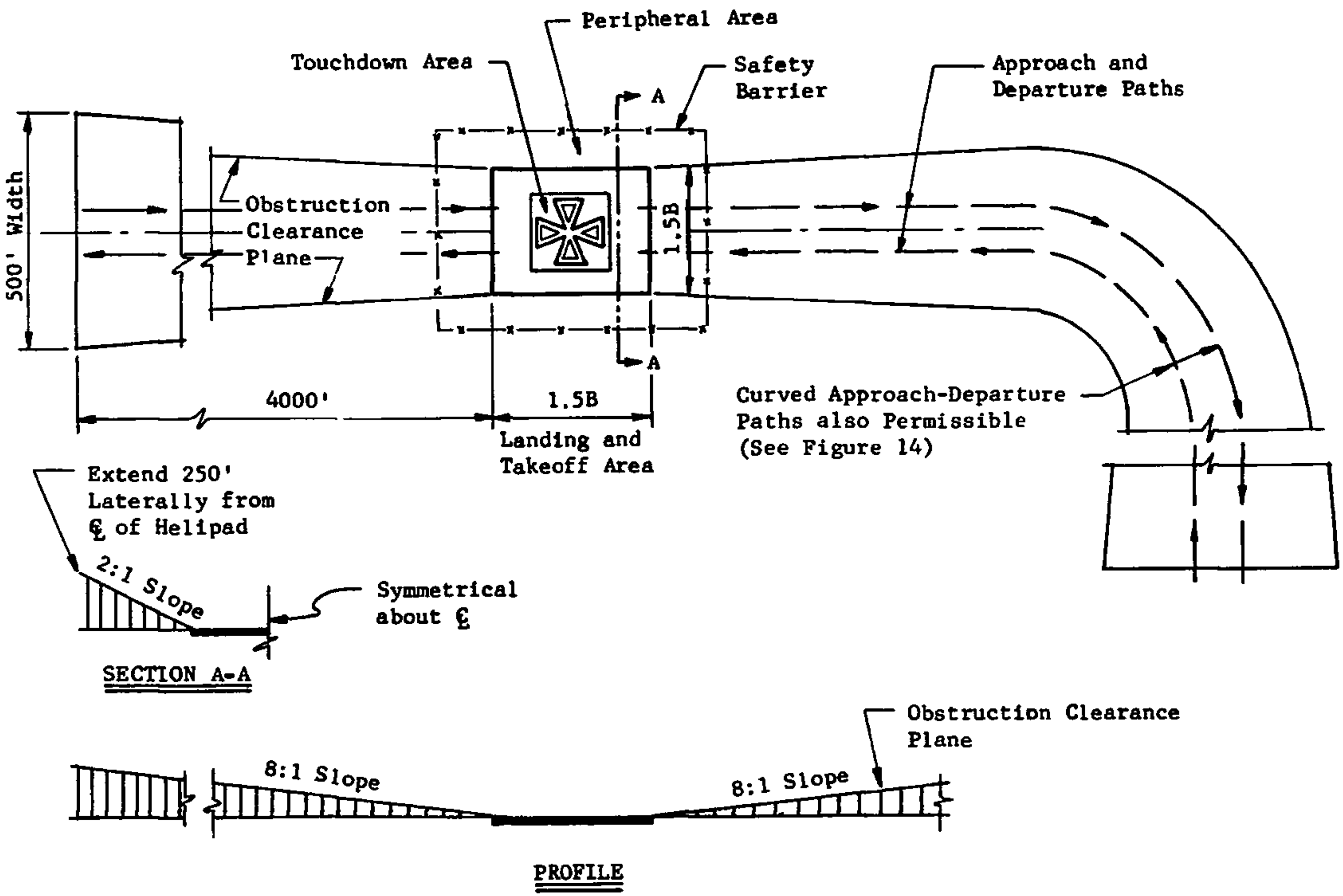
(2) *Site Limitations.* At some sites, including elevated, the areas available for the heliport will be less than the recommended dimensions. An example of such a heliport is a waterfront pier that projects out into the water and has unobstructed approaches on three sides. However, the site should be thoroughly evaluated before any commitment is made.

(3) *Elevated Surfaces.* See Chapter 8, Elevated Heliports.

(4) *Touchdown Area.* The dimensions of the touchdown area should be equal to the rotor diameter of the helicopter. However, for small helicopters, a touchdown area 20′ x 20′ has been found feasible. The strength of the surface in this area should be designed to accommodate the dynamic wheel loads of the helicopter.

b. Peripheral Area. A peripheral area surrounding the landing and takeoff area, with a minimum width of one-fourth the overall length of the helicopter but not less than 10 feet, is recommended as an obstruction-free safety zone. A safety barrier along the outside edge of the peripheral area is recommended to exclude unauthorized persons from the helicopter operational surface. The area should be kept free of hazardous objects and operations not compatible with the safe conduct of the helicopters maneuvering on the heliport. Navigational aids fixed by their functions are permitted here.

28. APPROACH-DEPARTURE PATHS. Approach-departure paths are selected to provide



NOTE: Dimension B Equals Overall Length of Helicopter

FIGURE 12. Example of Private Heliport Layout.

the most advantageous lines of flight to and from the landing and takeoff area. These paths begin at the edge of the landing and takeoff area and are aligned as directly as possible into the prevailing winds. It is desirable to have at least two paths which should be seperated by an arc of at least 90 degrees (Figure 13). Curved paths are quite practical and are necessary in many cases to provide a suitable route. Figure 14 shows one example of this. The radius of the curved path will vary according to the performance of individual helicopters and the angle of bank used. On the assumption that the angle of bank will be shallow, the radius of the curved path would be approximately 700 feet. Emergency landing areas are necessary along the approach-departure paths for all heliports, except those serving multiengine helicopters that are able to continue flight and meet climb performance criteria with one engine inoperative.

29. OBSTRUCTION CLEARANCES.

a. General. Imaginary obstruction clearance planes are established for each helicopter that is subject to FAR Part 77 (See Chapter 2) for the purpose of identifying those objects that may be obstructions to helicopter flight. These planes define vertical and transitional clearances above the ground surface in the vicinity of the heliport (Figure 13). They are predicated upon VFR operations only.

b. Approach-Departure Clearance Surfaces. Obstruction clearance planes, aligned with the direction of the approach-departure paths, extend outward and upward from the edge of the landing and takeoff area to the en route altitude at an angle of 8 feet horizontally to 1 foot vertically (8:1). The width of the sloping plane surface coincides with the dimension of the landing and takeoff area at the heliport boundary (but not to exceed 300 feet) and flares uniformly to a width of 500 feet at 4,000 feet from the landing area. The planes are symmetrical about the centerlines of the approach-departure paths. However, these paths may be curved as shown in Figure 14.

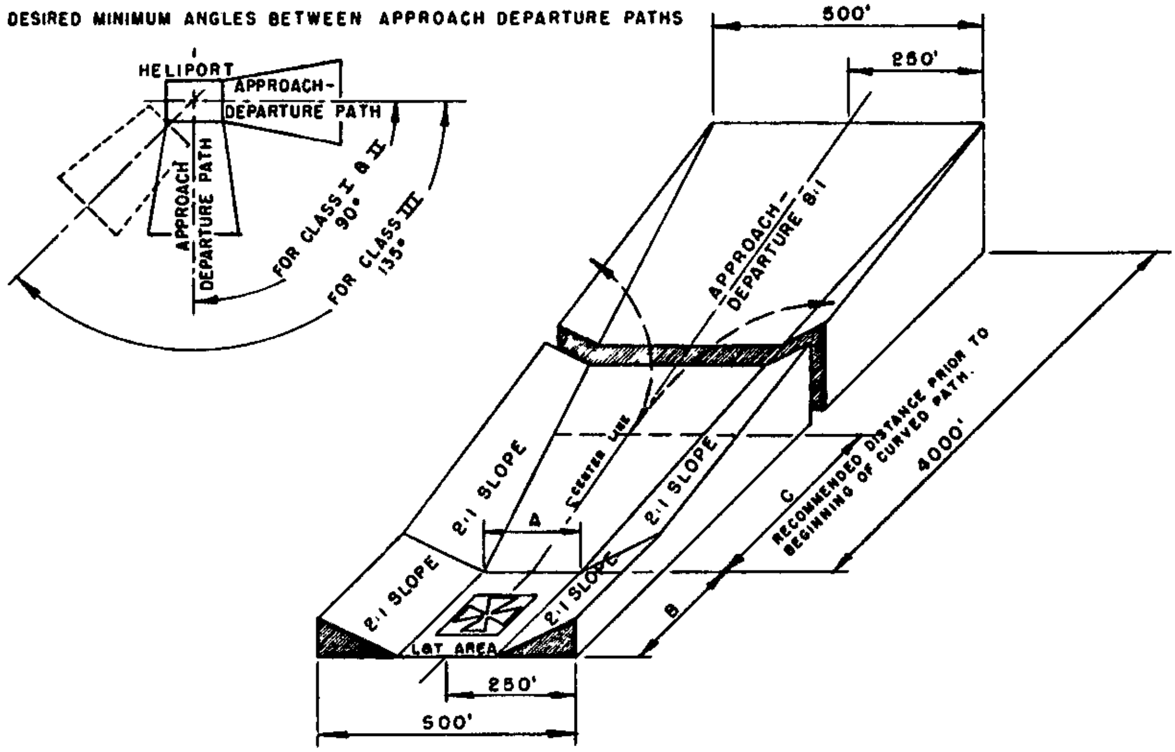
c. Transitional Surfaces. Obstruction clearance planes adjacent to the landing area and the approach-departure clearance surfaces are transitional surfaces or "side slopes" established to identify those objects that penetrate the planes as obstructions. Such obstructions may or may not be compatible with safety of flight, depending upon a study of the site. The side slopes extend outward and upward from the edges of the landing and takeoff area and approach-departure clearance planes at an angle of 2 feet horizontally to 1 foot vertically (2:1) to a distance of 250 feet from the center of the landing and takeoff area and 250 feet from the centerline of the approach-departure clearance surfaces.

30. TAXIING.

Where the helicopter hover-taxis from the landing area to a parking position, a lateral clearance equal to one rotor radius should be provided between the tip of the rotor and any object. Where the helicopter taxis on the ground, a taxiway 20 feet in width should be provided, and lateral clearances should provide a minimum of 10 feet between the rotor tip and any object. NOTE: Recommended criteria for geometric layout and lateral clearances are summarized in Appendix 3.

31. HELICOPTER PARKING AREA.

The need for a parking area depends on the operational requirement of a particular heliport and the needs of the users. Helicopter parking positions normally are adjacent to the peripheral area. The length (and width) of each position is equal to the overall length of the helicopter, with 10-foot clearance between adjacent positions suggested.



PERSPECTIVE OF APPROACH-DEPARTURE PATH

HELIPORT CLASS	FAR CATEGORY HELICOPTER	A	B	C	DESIRED MINIMUM ANGLE BETWEEN APPROACH DEPARTURE PATHS.	RADIUS OF CURVED PATH.
I PRIVATE	PARTS 27, 29 (CAR 6 & 7)	1.5	1.5	300'	90°	APPROX. 700 FT.
II SMALL PUBLIC	PART 27 (CAR 6)	1.5	2.0	300'	90°	APPROX. 700 FT.
III LARGE PUBLIC	PARTS 27, 29 (CAR 6 & 7)	* 1.5	* 2.0	400'	135°	APPROX. 1,500 FT.

DIMENSIONS A AND B:

(1) ARE EXPRESSED AS MULTIPLES OF OVERALL HELICOPTER LENGTH.

(2) MAY BE INCREASED OR DECREASED UPON EVALUATION OF THE SITE BY FAA.

* FOR SCHEDULED AIRLINE OPERATIONS, THE SPECIFIC SITE MUST BE APPROVED BY THE FAA (FAR PART 127).

FIGURE 13. VFR Obstruction Clearance Diagram.

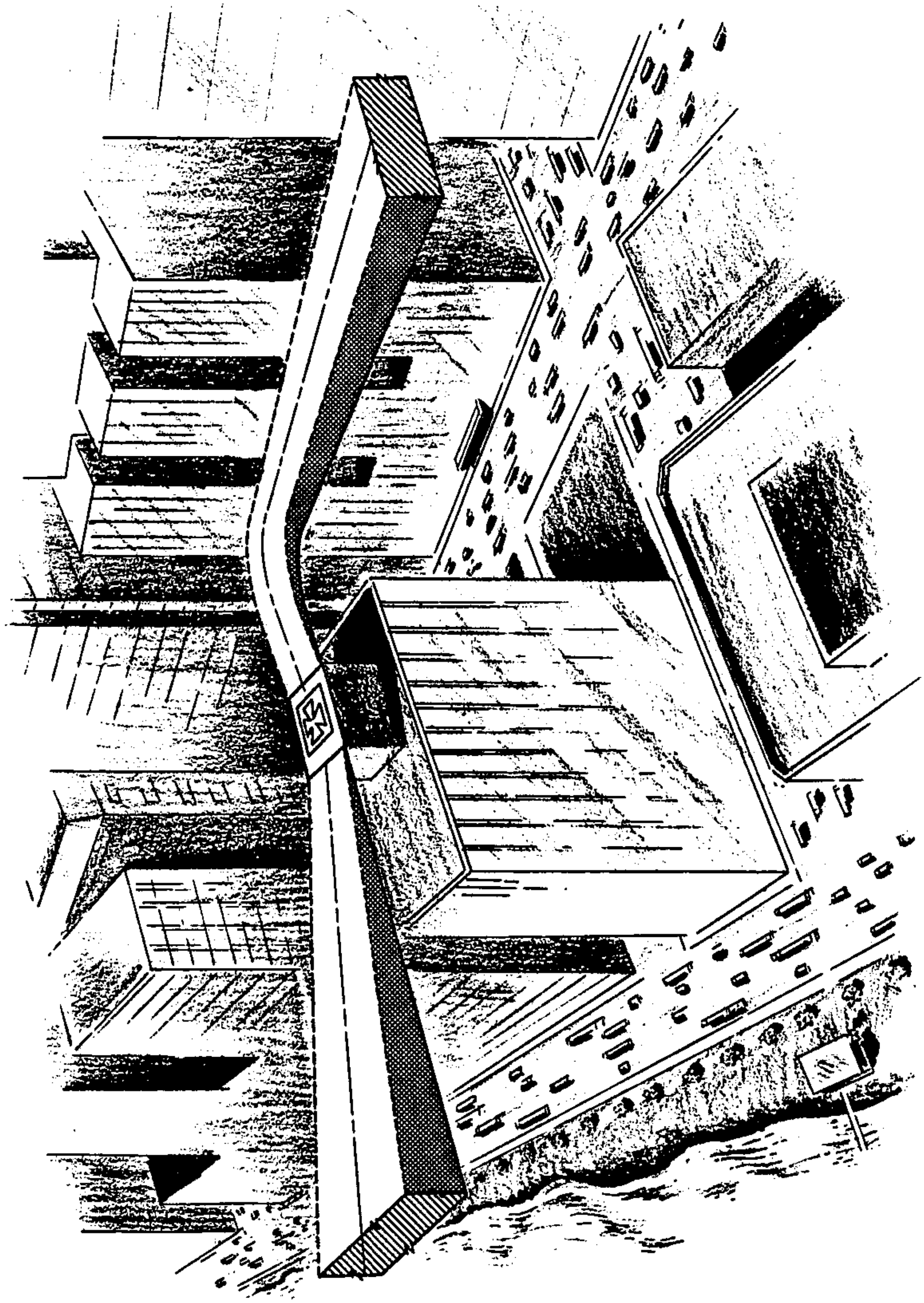


FIGURE 14. Example of Curved Approach-Departure Surface.

CHAPTER 7. PUBLIC HELIPORTS

32. GENERAL.

a. The development of scheduled helicopter services for public transportation has been limited to the largest metropolitan areas of the country: New York, Chicago, Los Angeles, and San Francisco. Such services have all been in intracity operations, city center to airport and airport to airport. This situation probably will prevail until the next generation of helicopter or VTOL aircraft becomes available.

b. Two of the primary benefits expected of this mode of short-haul transportation are:

(1) The establishment of better service to the public.

(2) The relief of airspace and/or ground congestion at large (long-haul) airports.

33. HELIPORT LAYOUT.

a. Public-use heliports are termed Class II (Small) or Class III (Large) depending on the scope of services provided and the type of helicopters used.

b. The size, shape, and appurtenances of public heliports are determined by a variety of interrelated factors—principally the nature of the site available, size and performance of the helicopters, and the buildings or other objects in the surrounding area. Although heliports may be square, rectangular, or circular, an irregular-shaped site may be equally functional. Minimum operational safety requirements will not vary appreciably from one design to another.

34. HELIPORT DIMENSIONS. The dimensions of the operational elements of the heliport are keyed to the helicopter(s) expected to use the heliport, and the degree and scope of activity anticipated. The local heliport authority should conduct a comprehensive master planning study and look as far into the future as is practical. Premature obsolescence could prove very costly.

a. Landing and Takeoff Area for a Public Class II (Small) Heliport. The landing and takeoff area dimensions should be sufficient to accommodate any of the various models of helicopters in the normal category, the airworthiness requirements of which are defined in FAR Part 27 (formerly CAR 6). These heliports should have a minimum landing and takeoff area length of 2.0 times the overall length of the helicopter and a width of 1.5 times the overall helicopter length (See Figures 13 and 15).

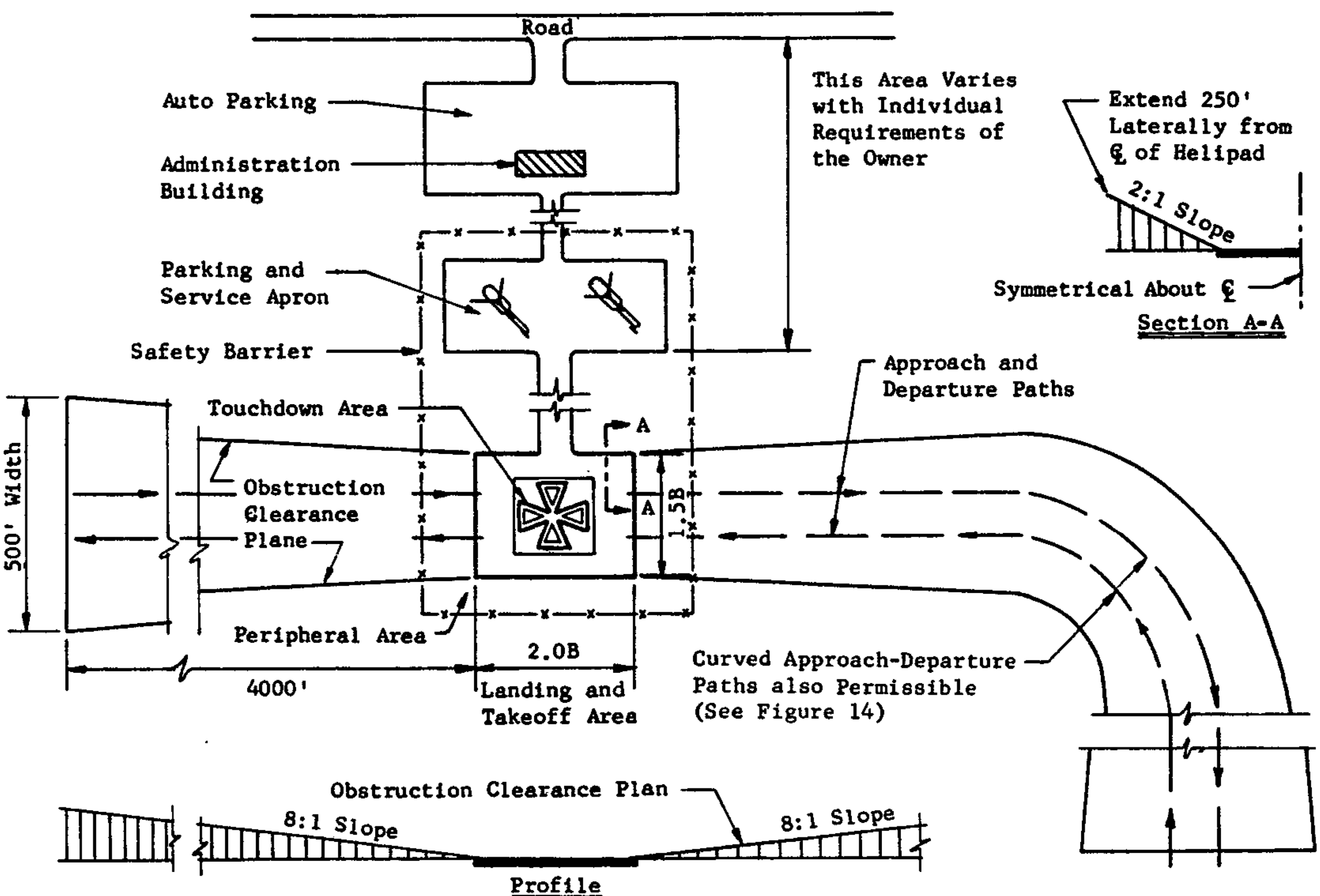
b. Landing and Takeoff Area for a Public Class III (Large) Heliport. The landing and takeoff area dimensions should be sufficient to accommodate any model helicopter in the normal and transport categories, the airworthiness requirements of which are defined in FAR Parts 27 and 29 (formerly CAR's 6 and 7). These heliports should have a minimum landing and takeoff area length of 2.0 times the overall length of the helicopter and a width of 1.5 times the overall helicopter length.

c. Exceptions to Landing and Takeoff Area Recommendations. Lesser dimensions than are indicated for the two classes of heliports described above may be acceptable upon thorough FAA evaluation of the proposed site if it is one where an unusually extensive peripheral area surrounds the heliport. An example of such a heliport is a waterfront pier which projects out into the water and has unobstructed approaches on three sides. On the other hand, for an elevated heliport a longer length may be needed for the takeoff area if there are no emergency landing sites available along the departure route.

d. Circular Heliports. For circular heliports, the diameter of the landing and takeoff area should be equal to the larger dimension recommended above for each of the heliport classes.

e. Heliports at Elevations More Than 1,000 Feet Above Sea Level. Generally, no increase in size is necessary for heliports at more than 1,000 feet elevation if the helicopters are either sufficiently supercharged to provide adequate performance or if they are off-loaded to obtain this performance.

f. Peripheral Area. A peripheral area surrounding the landing and takeoff area, with a minimum width of one-quarter the overall length of the helicopter, but not less than 10 feet, is



NOTE: Dimension B Equals Overall Length of Helicopter

FIGURE 15. Example of Public Heliport Layout.

recommended for Class II heliports as an obstruction-free safety zone. A minimum width of one-half the overall length of the helicopter is recommended for Class III heliports. A safety barrier along the outside edge of the peripheral area is recommended to exclude unauthorized persons from the helicopter operational surface. The area should be kept free of objects and activities to the maximum extent possible. Navigational aids fixed by their functions are permitted here.

g. Touchdown Area. The dimensions of the touchdown area should be equal to the rotor diameter of the helicopter. The landing surface in this area should be designed to accommodate the dynamic wheel loads of the helicopter.

35. APPROACH-DEPARTURE PATHS.

a. General. Approach-departure paths are selected to provide the most advantageous lines of flight to and from the landing and takeoff area. These paths begin at the edge of the landing and takeoff area and usually are aligned as directly as possible into the prevailing winds. It is desirable to have at least two paths which should be separated by an arc of at least 90° for Class II heliports and 135° for Class III heliports (Figure 13). Curved paths are quite practical and are necessary in many cases to provide a suitable route (See Figure 14). Emergency landing areas are necessary along the approach-departure paths for all heliports, except those heliports serving multiengine helicopters that are able to continue flight and meet certain climb performance with one engine inoperative.

b. FAA Study. An FAA airspace review of all Class II and Class III heliports will usually be required. If there is any doubt as to emergency landing area availability along the proposed approach-departure paths, contact the FAA or an experienced helicopter operator in the early stages of planning. The location of suitable emergency areas may be a determining factor in planning not only approach-departure paths but the site of the heliport itself.

c. Type of Operations. The type of aircraft operations planned for may be either visual flight rules (VFR) or instrument flight rules (IFR). If IFR operations are anticipated, the characteristics of the approach-departure paths will be considerably different. For this reason, the following discussion treats IFR and VFR separately.

36. OBSTRUCTION CLEARANCES FOR PRECISION IFR OPERATIONS.

a. General. Currently, IFR operations by civil operators are very limited. As of this writing, no civil heliport has the necessary instrumentation for precision instrument landings. However, for a heliport to function as a transportation center in a major metropolitan area, it should have the same operational reliability as a major airport. This means the capability should exist for instrument approaches at very low ceiling or visibility. Accordingly, criteria are recommended for planning and designing a heliport with precision IFR capability. These criteria are not to be interpreted as operational regulations. They are intended strictly to allow a major heliport to be planned and built with the best guidance available now. Use of these criteria is intended to preclude operational restrictions in the future when precision approaches for heliports become a reality.

b. Approach-Departure Clearance Surfaces. The obstruction clearance plane in the direction of the precision IFR approach extends outward and upward from the edge of the landing area at a slope of 15 feet horizontally to 1 foot vertically (15:1). The width of the sloping plane at the landing area is the same as the primary surface, 300 feet, and flares uniformly to a 3,400-foot width at 10,000 feet out from the landing area. The plane is symmetrical about the centerline of the approach-departure path. Figure 16 shows these surfaces.

c. Primary Surface. The primary surface is an imaginary plane centered on the landing and takeoff area. Its length coincides with the length of the landing area. Its width is 300 feet. The elevation of the plane is the same as the highest elevation on the landing area. (See Figure 16.)

d. Transitional Surfaces. Obstruction clearance planes adjacent to the primary surface and the approach-departure clearance surfaces are transitional surfaces or "side slopes." The side slopes extend outward and upward from the edges of the primary surface and the approach-departure surface at an angle of 4 feet horizontally to 1 foot vertically (4:1). The transitional surface extends to a distance of 200 feet from the edge of the primary surface and 350 feet from the centerline of the approach-departure surface. (See Figure 16.)

37. OBSTRUCTION CLEARANCES FOR VFR OPERATIONS.

The imaginary

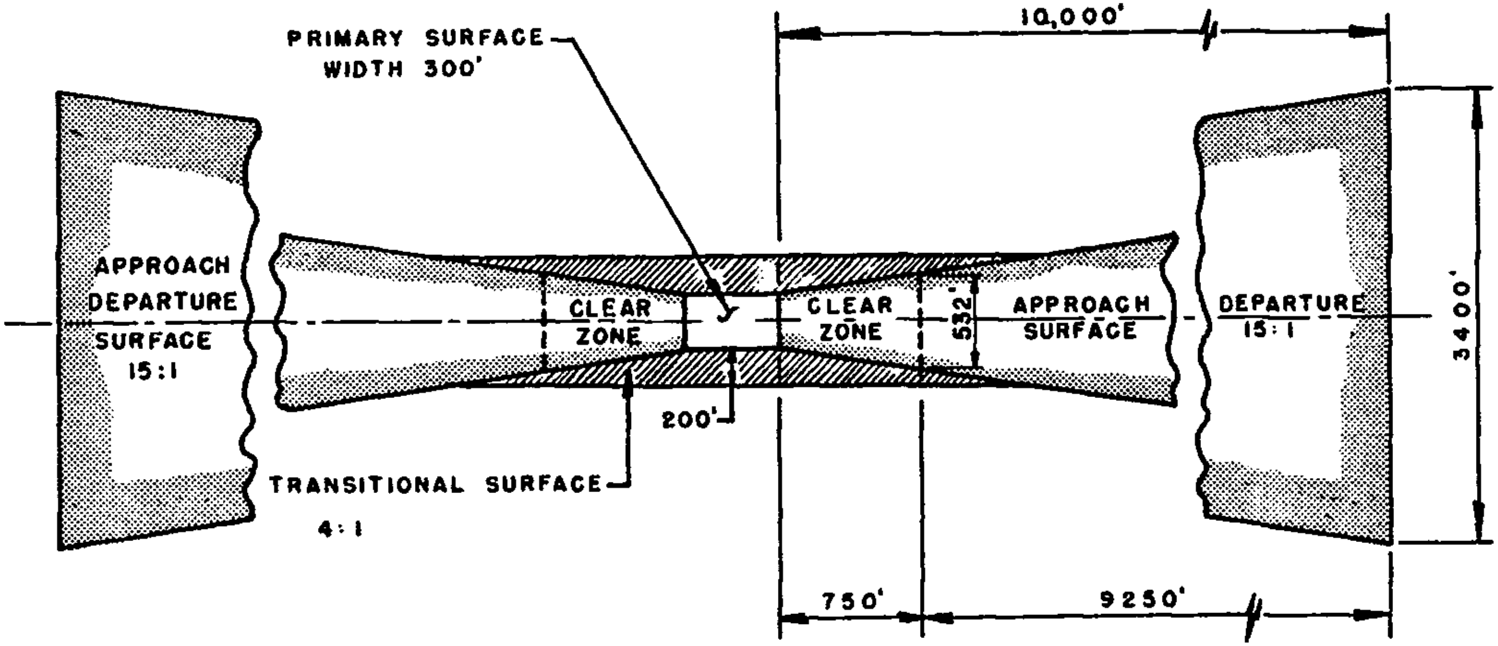


FIGURE 16. Precision IFR Obstruction Clearance Surfaces.

obstruction clearance planes for VFR would be the same as described for private heliports in Chapter 6 (See Figure 13). However, considerable study should be made of the future role of the heliport before determining that VFR operations will suffice.

38. AIRSPACE PROTECTION. To adequately protect the heliport, the imaginary surfaces described above should be controlled by local authority. Height-restriction zoning (See Chapter 5) may suffice for some portions of these surfaces. However, the innermost area of the approach is critical and ideally should be owned by local authority. To encourage control of this area, "clear zones" have been designated for the initial 750 feet of IFR approach surfaces and 400 feet for VFR approach surfaces. (These lengths are based on the imaginary surface attaining a height of 50 feet above the ground.) Local authority should acquire control of clear zone by fee title or by easement. In the case of an elevated heliport, "airspace rights" may be adequate if control equal to an easement is obtained. Control to a height of 50 feet above ground is recommended.

39. HELICOPTER PARKING AREA. The size of the parking area is determined by the anticipated size of the helicopter and the average peak period traffic (as related to number of positions). The length and width of each position should be equal to the overall length of the helicopter. The clearance between positions will vary according to the size of aircraft, but 10 feet is considered minimum clearance. The minimum number of parking positions normally would be two.

40. ADMINISTRATION BUILDING AND SERVICE AREAS. An administration building and service area, if needed, includes an apron which provides space for helicopter maneuvering and parking. In some locations, service and storage hangars and a maintenance building also may be required. The need for these various facilities, their sizes, and the space required for them depend on the overall purpose of the heliport, the frequency of present and anticipated operations, and the volume of passengers, mail, and cargo.

41. TAXIING. Where the helicopter hover-taxis from the landing area to a parking position, a lateral clearance equal to one rotor radius should be provided between the tip of the rotor and any object. Where the helicopter taxis on the ground, lateral clearances should provide a minimum of 10 feet between the rotor tip and any object. NOTE: The recommended criteria for other lateral clearances are given in Appendix 3.

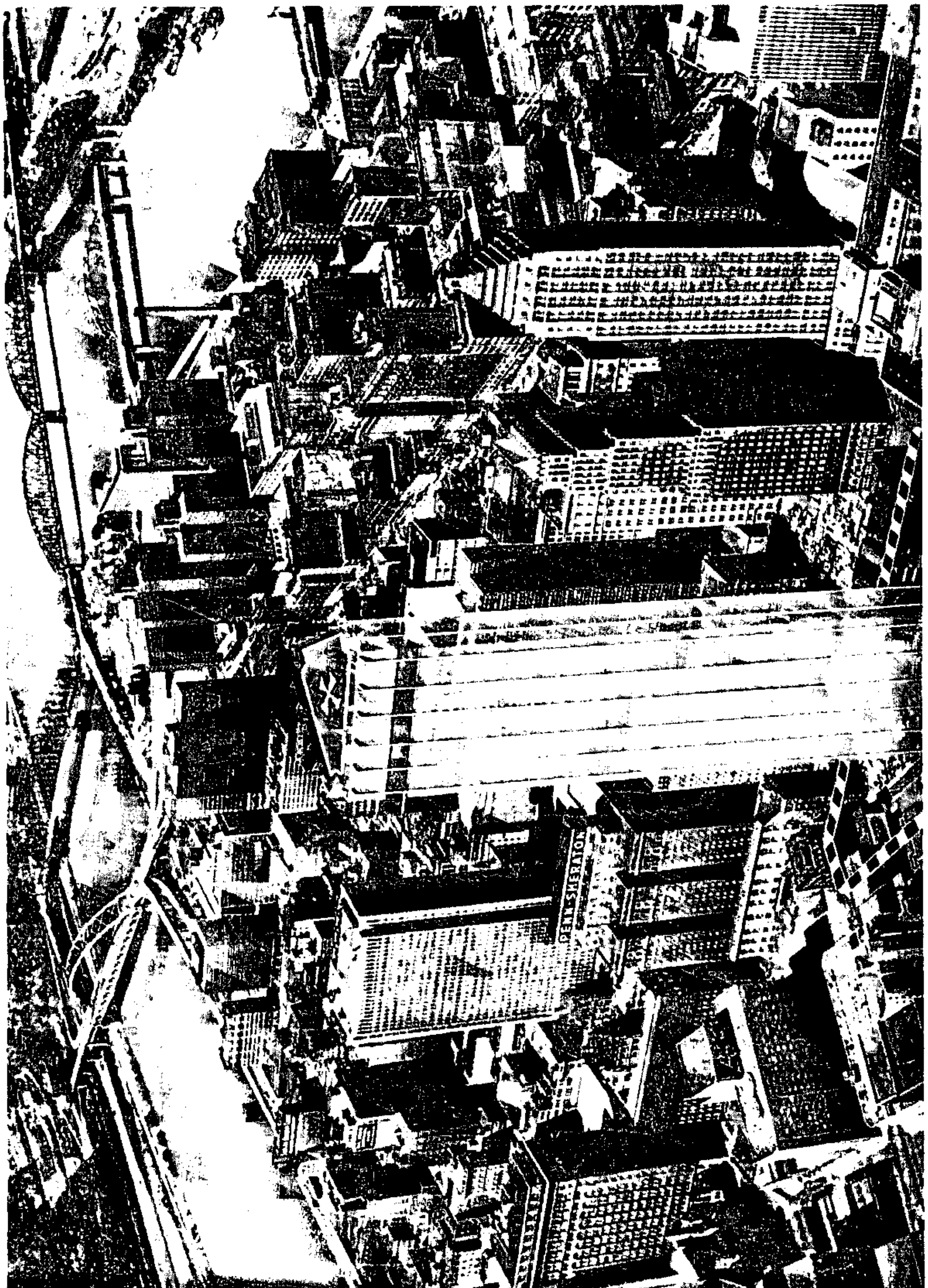


FIGURE 17. Elevated Heliport In Pittsburgh.

CHAPTER 8. ELEVATED HELIPORTS

42. DESIGN CONSIDERATIONS.

a. When ground-level sites are not available or are generally unsuitable, an elevated site may be practical. Privacy of the heliport site, quick access to upper-floor building areas, and more open flight routes are some of the reasons why rooftop or other elevated sites may be preferred. Figure 17 shows a heliport on top of the United States Steel Building, which is under construction in Pittsburgh, Pennsylvania. The design of all elements of this heliport reflects close coordination between industry and government.

b. Elevated heliports may be located on piers or other structures over water, as well as on buildings. As in ground-level heliports, the landing area dimensions are keyed to the size of the helipcopter and the type of operations; but in most cases, the natural open areas around a roof or elevated platform permit smaller elevated landing and takeoff areas without the usual peripheral area associated with ground-level sites. The same requirements for approach-departure paths apply to both elevated and ground-level heliports.

c. In planning rooftop heliports, it is important to consider local building codes regarding construction, occupancy, use, egress, and fire regulations. Furthermore, designers should consider the effect of rooftop construction such as elevator shafts, penthouses, air conditioning towers, etc., on the approaches to the heliport. At any rooftop involving scheduled operations, an FAA study of the site and operational procedures will be necessary in accordance with FAR Part 127.

d. Heliport landing areas, and the supports for them, on the roof of the building should be constructed of fire-retardant material. Landing areas should be designed to confine any flammable liquid spillage to the landing area itself, and provision should be made to drain such spillage away from any exit or stairway serving the helicopter landing area or from a structure housing such exit or stairway (See Chapter 11). In addition, guardrails should be provided in compliance with the applicable handrail provisions of local building codes. However, the guardrails should not penetrate the approach-departure surface. A safety net or fence, as shown in Figure 18, is recommended for a raised landing pad. The net should begin below the surface of the pad and not rise above the surface. The recommended minimum length of the net is 5 feet.

43. LANDING AND TAKEOFF AREA.

a. Area Configuration. The landing and takeoff area may cover the entire surface of the elevated structure or roof or it may be only a part of it. It is desirable to orient the long axis of the landing and takeoff area into the direction of the prevailing winds.

b. Dimensions.

(1) The recommended dimensions of the landing and takeoff areas for elevated or rooftop heliports are the same as for the comparable class of ground heliport (See Chapters 6 and 7).

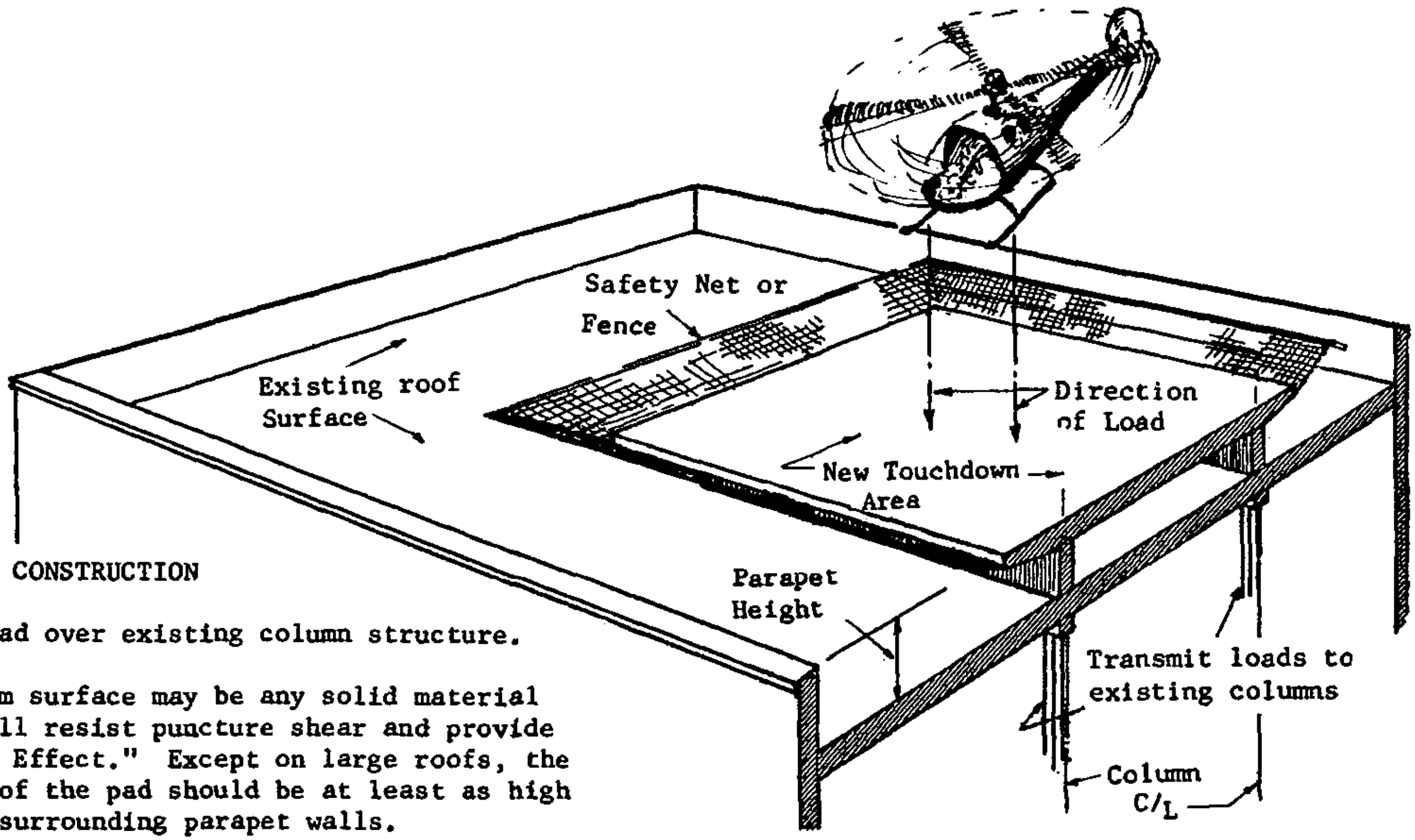
(2) The dimensions referenced above represent minimum clear areas. Where a load distribution pad (See Figure 18) is utilized, the pad (actually the touchdown area) may be smaller, commensurate with the configuration of the landing gear dimensions and spacing, but the clear area recommended above should be maintained.

(3) The minimum length and width of the touchdown area should be equal to the rotor diameter of the largest helicopter expected to use the pad. However, for private heliports serving small helicopters, a touchdown area of 20 feet by 20 feet has been found feasible. (See Paragraph 27.a.(4).)

44. STRUCTURAL DESIGN.

The landing and takeoff area is designed for the largest aircraft that will use it and the added loads incident to the personnel traffic to and from the helicopter. Other types of loads, such as snow, freight, equipment, etc., are considered in the design of the heliport framing and landing pad, when applicable. For Class III heliports, only qualified engineers and architects should design the landing area structure.

a. General Strength Requirements. The strength requirements for a landing surface are



HELIPAD CONSTRUCTION

Erect pad over existing column structure.

Platform surface may be any solid material that will resist puncture shear and provide "Ground Effect." Except on large roofs, the height of the pad should be at least as high as the surrounding parapet walls.

Net or fence should begin below the surface of the touchdown area and not rise above it.

FIGURE 18. Load Distribution On Elevated Surface.

determined through consideration of the helicopters' dynamic and static wheel loads and landing gear configuration. Most small and some medium sized helicopters are equipped with skid- or float-type landing gear. Large helicopters typically are equipped with wheel landing gear consisting of two main gears of one or two wheels each and one tail or nose gear of one or two wheels each. Figure 1 in Appendix 2 shows typical landing gear and landing skid configurations. Sometimes a helicopter is equipped with a four-wheel landing gear assembly. The gross weight of a helicopter is the total static weight of the helicopter fully loaded and for which it is certificated for operation under FAA regulations.

b. Support Considerations.

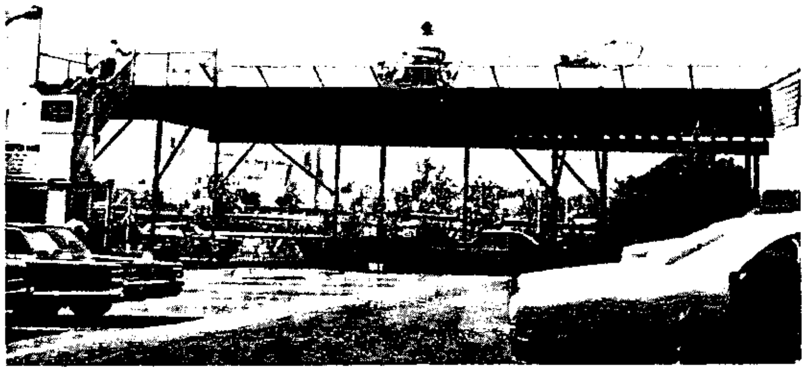
(1) Because the landing of aircraft on top of buildings and other similar type framings involves the absorption of impact by the structure, it is recommended that two classifications of landing pads be considered for elevated heliports. The most critical classification for the landing pads is the rooftop heliport where a high degree of safety must be provided for the building occupants, especially those occupying the top story. This is the roof-level landing pad which is supported directly on top of the roof and roof framing members. The second classification is the rooftop heliport where the raised landing pad is supported above the roof surface by columns or pedestals and framing.

(2) *Roof-Level Landing Pads.* Rooftop heliports in which the landing pad is supported directly on top of the roof should be so designed as to withstand hard landings without permanent damage to the structural roof framing components or to the roof construction from shear failure (landing gear punch-through).

(3) *Raised Landing Pads.* Rooftop heliports, in which the landing pad is a raised platform above the roof elevation, may be designed as an energy-absorbing system to cushion the impact of a hard landing. Subject to applicable building code requirements, this system can use material which will yield to the load as a design feature, provided that complete framing failure does not occur.

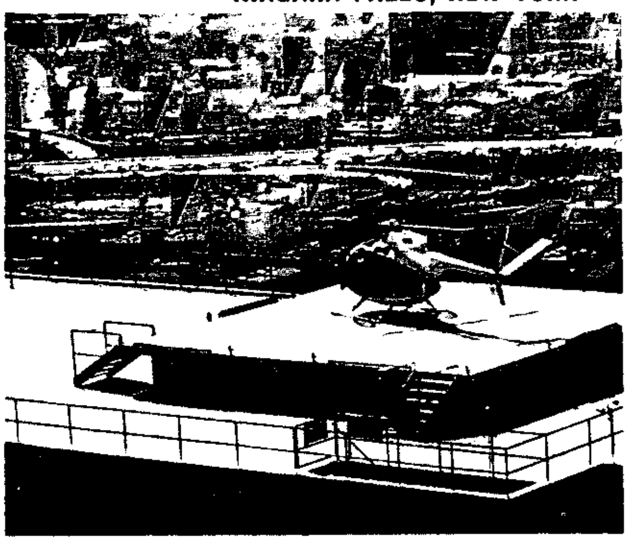
(4) *Small Helicopters.* In general, the operation of small helicopters has not required the modification of existing roof structures, except to strengthen the actual landing surface to resist the concentrated load applied by the landing gear. Existing buildings with roofs designed for normal live loads often can be adapted to receive helicopters by installing a simple pad to spread the concentrated loads over the existing structures. Such a pad may be of wood or metal or a combination of these materials. The superimposed loads will be limited by existing conditions of the building's structure, but most small helicopters can be accommodated in this way without major reconstruction. If a load distribution pad or other platform is constructed, it is recommended that the height of the finished structure be at least as high as the surrounding parapet walls or roof coping to assure adequate clearance for the helicopter on takeoff and landing. In some cases, however, the roof may be sufficiently large to make this unnecessary.

c. Design Loadings. The heliport designer must base his design on the loading and landing characteristics of the helicopter that will utilize the heliport. Appendix 2 lists the maximum gross weight and the maximum static gear load for each type of helicopter. Normal landings and takeoffs impose loads on the roof that are not significantly more than the static loads of the helicopter at rest. In the case of hard landings, however, loads higher than static, but of short duration (one-fifth of a second), may be imposed on the roof. Dynamic (or impact) loading represents the maximum loads that can be expected under service conditions that could develop if a helicopter makes a hard landing. The roof should be designed so that it will not fail under these impact loads. The impact load is expressed in terms of a percent of the gross weight of the helicopter. The landing surface should be designed to support a concentrated load equal to 75 percent of the gross weight of the helicopter at each main landing gear. It is assumed that the helicopter will land so that two separate points of the pad receive impact simultaneously. These forces will be applicable over the footprint area of the tire required to support the load for any given tire pressure, or where applicable, a landing skid. (The larger helicopters equipped with skids have a footprint area of at least 100 square inches for each skid. A typical skid has a length of 8.5 feet.) For roof-level landing pads, it is recommended that the material not be allowed to yield under hard landings, although the designer may take advantage of the energy-absorbing property of the material and frame characteristics. The designer should recognize that the greatest stresses

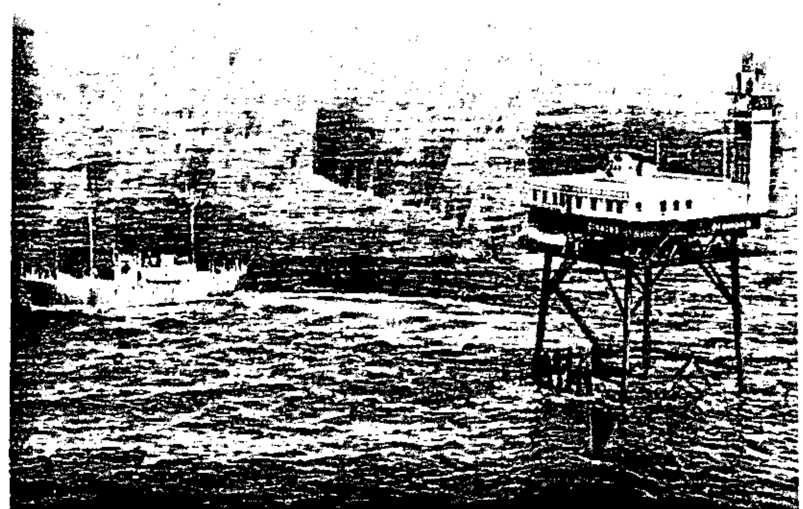


NIAGARA FALLS, NEW YORK

OAKLAND, CALIFORNIA



LOS ANGELES, CALIFORNIA



DIAMOND SHOALS LIGHT STATION, NORTH CAROLINA on the landing platform may be the punching or shear stresses in the area of impact. For operational areas outside of the touchdown area, the design loading can be the maximum static weight listed in Appendix 2.

d. Example of Design Loads. Assume that an elevated heliport is being designed in a major metropolitan area. The critical helicopter that the designer has chosen for the structural design is the Sikorsky S–61L. Referring to Appendix 2, Helicopter Data, it is seen in Line Y that the maximum gross weight is 19,000 lbs. Multiplying this by 75 percent, an impact load of 14,250 lbs. results at each gear, or 7,125 lbs. at each wheel of the gear. Applying the loads as shown in Figure 20A, the structural support members and/or pad can be designed for the area designated as the touchdown area. Next, applying the maximum impact loads for one gear as shown in Figure 20B, the landing pad can be checked for resistance to shear stress. Referring again to Appendix 2, in Line X, it is seen that the maximum static loading on each wheel for the S–61L is 4,225 lbs. Applying the loads as shown in Figure 20C, the structural support members and/or pad can be designed for the operational area *outside of* the touchdown area. It should be emphasized, however, that consideration must be given to future expansion of the touchdown area.

e. Other Loads. Live loads due to snow and traffic of personnel and equipment will be accounted for in accordance with local building codes. Judgment must be exercised in deciding whether these loads are applied simultaneously with the concentrated load due to the helicopter. It is recommended that heavily snow-laden roofs be cleared prior to helicopter operations to eliminate extra weight and guard against reduced visibility due to the blowing of snow.

45. LANDING SURFACE.

a. Elevated heliport surfaces of various kinds of material have been used successfully. Among those most frequently employed are portland cement topping on concrete slab, asphalt, metal, and treated wood. All surfaces should be nonskid or provided with a nonskid coating. Where night operations will be conducted, a light-colored surface is suggested to aid depth perception in landing.

b. If a load-distribution pad or other platform of wood or metal is used, it is recommended that the materials be treated to be weather resistant and noncombustible. Areas used for walkways should have an abrasive or nonskid surface. Except for roof drains, it is preferred that the surface be solid so that the rotor downwash will produce the maximum ground effect or ground cushion. An open metal grating, for example, may cause too great a dissipation of the rotor downwash.

46. TURBULENCE AND VISIBILITY.

a. If a helicopter site is in proximity to other buildings or to other structures on a rooftop, it may be necessary to conduct flight tests to determine whether any adverse turbulence will unduly affect the operation. Occasional high wind conditions may create a flight problem at some elevated sites during certain periods, even though the site may be quite satisfactory most of the time. Under these circumstances, it is suggested that the heliport be approved for use up to a predetermined wind velocity limit. This is a generally accepted procedure in many aviation activities and permits the use of an otherwise acceptable site, except during periods when high winds might produce adverse turbulence.

b. Flight visibility s another factor to consider for sites on buildings 100 feet or more in height. The cloud deck seldom reaches the ground or even down to 100 feet, but at the higher levels, the heliport might be obscured when the ground level is clear.

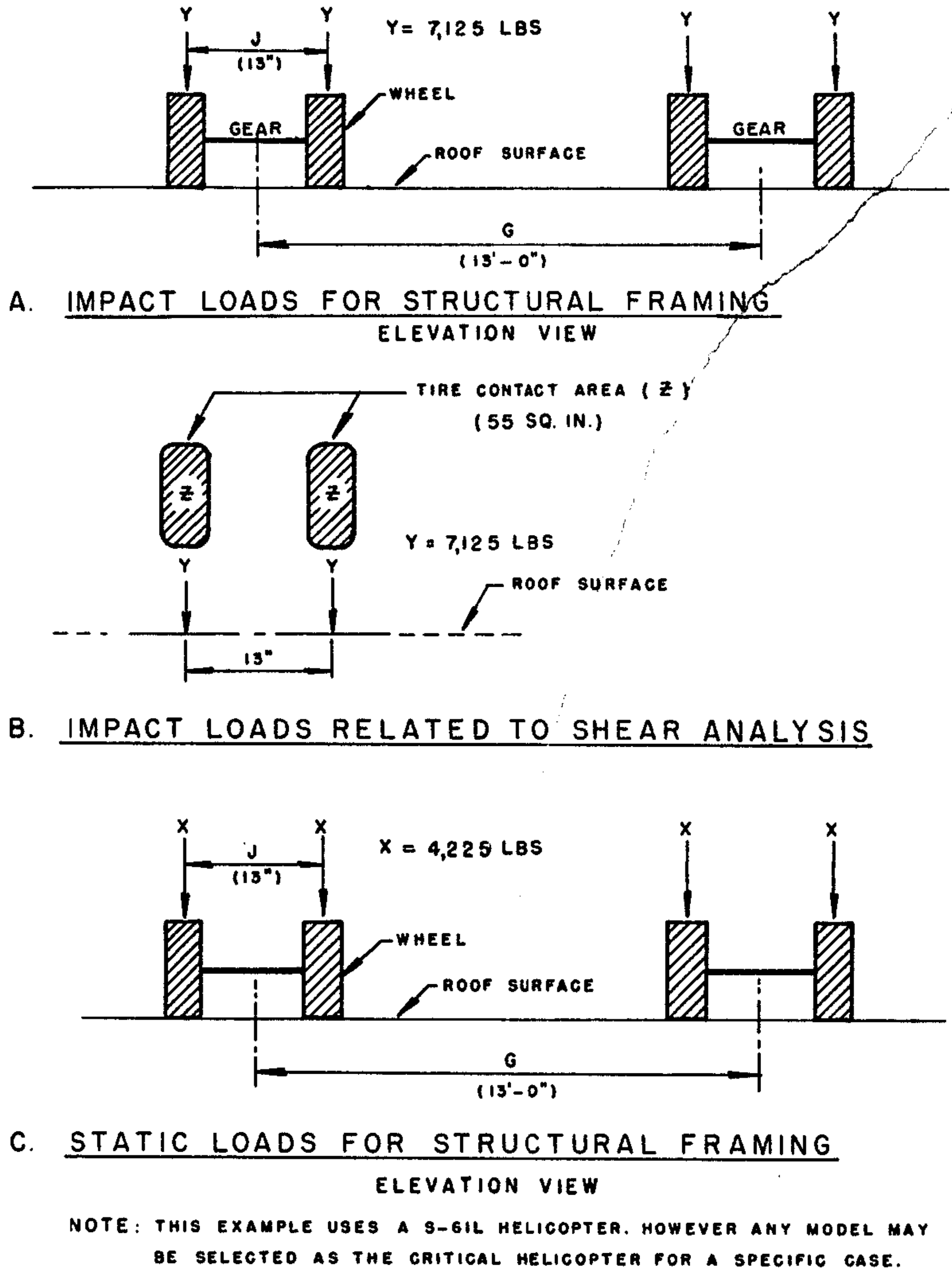


FIGURE 20. Example of Design Loads.

CHAPTER 9. HELIPORT PAVING AND ROTOR DOWNWASH

47. GENERAL. Pavements for surface heliports are constructed to provide adequate support for the loads imposed by aircraft using the heliports and to produce a smooth, all-weather surface, free from dust or other particles that may be blown or picked up by rotor downwash. Some heliports may not require paved operational areas. Conditions at the site may be adaptable for the development of a turf surface adequate for limited operations of small helicopters. It may be possible to construct an aggregate-turf surface by improving the stability of a soil with the addition of aggregate prior to development of the turf. In many areas, however. it is not possible to provide and maintain a stable turf surface because of adverse weather conditions or high-density traffic. Under these conditions, construction of an all-weather pavement is necessary.

48. SOILS.

a. Accurate identification and evaluation of the pavement foundation soils is a basic consideration in the design of pavements. The classification of these soils is discussed in detail in Advisory Circular (AC) 150/5320–6A, Airport Paving.

b. The subgrade soil carries the load imposed by aircraft utilizing the facility. The pavement serves to distribute this load to the subgrade over a greater area than that of the skid or tire contact. Thicker pavements distribute the load over a greater subgrade area. Therefore, the more unstable the subgrade soil, the greater is the required area of load distribution; consequently, the greater is the required thickness of pavement.

49. PAVEMENT THICKNESS.

a. The determination of pavement thickness is based on a theoretical analysis of load distribution through pavements and soils, the analysis of experimental data, and a study of the performance of pavements under actual service conditions. Pavement thickness curves presented in Figure 21 have been developed for flexible pavements from a correlation of the data obtained from these curves. Pavements constructed in accordance with these standards have proved satisfactory.

b. The base course thicknesses given in Figure 21 range from 4 to 7 inches, while the subbase thicknesses vary from zero to 14 inches. The subgrade classes shown are obtained from the corresponding soil group and frost and drainage conditions included in the Circular, Airport Paving.

c. Note, however, that in some cases the loads imposed by ground equipment may be greater than by aircraft. In such cases, the pavement must be designed to support the equipment rather than the aircraft.

50. FLEXIBLE PAVEMENTS. Pavements for helicopters under 20,000 pounds gross weight normally consist of locally available material with a bituminous surface course. To produce such pavements, the coordination of proper design, construction, and inspection is required to assure the best combination of available materials and a high standard of workmanship.

51. RIGID PAVEMENTS.

a. No special design criteria are required for rigid pavements because the FAA standard 6-inch minimum thickness of concrete pavement will satisfactorily serve helicopters with gross weights up to 20,000 pounds.

b. Pavements for helicopters over 20,000 pounds gross weight may be either bituminous or portland cement concrete. Design procedures for pavements for these aircraft may be found in the Circular, Airport Paving.

52. TURF. Turf is generally the most economical surfacing for a heliport serving small helicopters (with limited operations), as well as providing effective protection against wind or water erosion. Local conditions dictate the choice of grass species to be used. Detailed information on the establishment of turf is contained in AC 150/5370–1A, Standards Specifications for Construction of Airports.

53. AGGREGATE-TURF.

a. Aggregate-turf differs from the usual turfed area in that the stability of the soil has been increased by the addition of granular materials

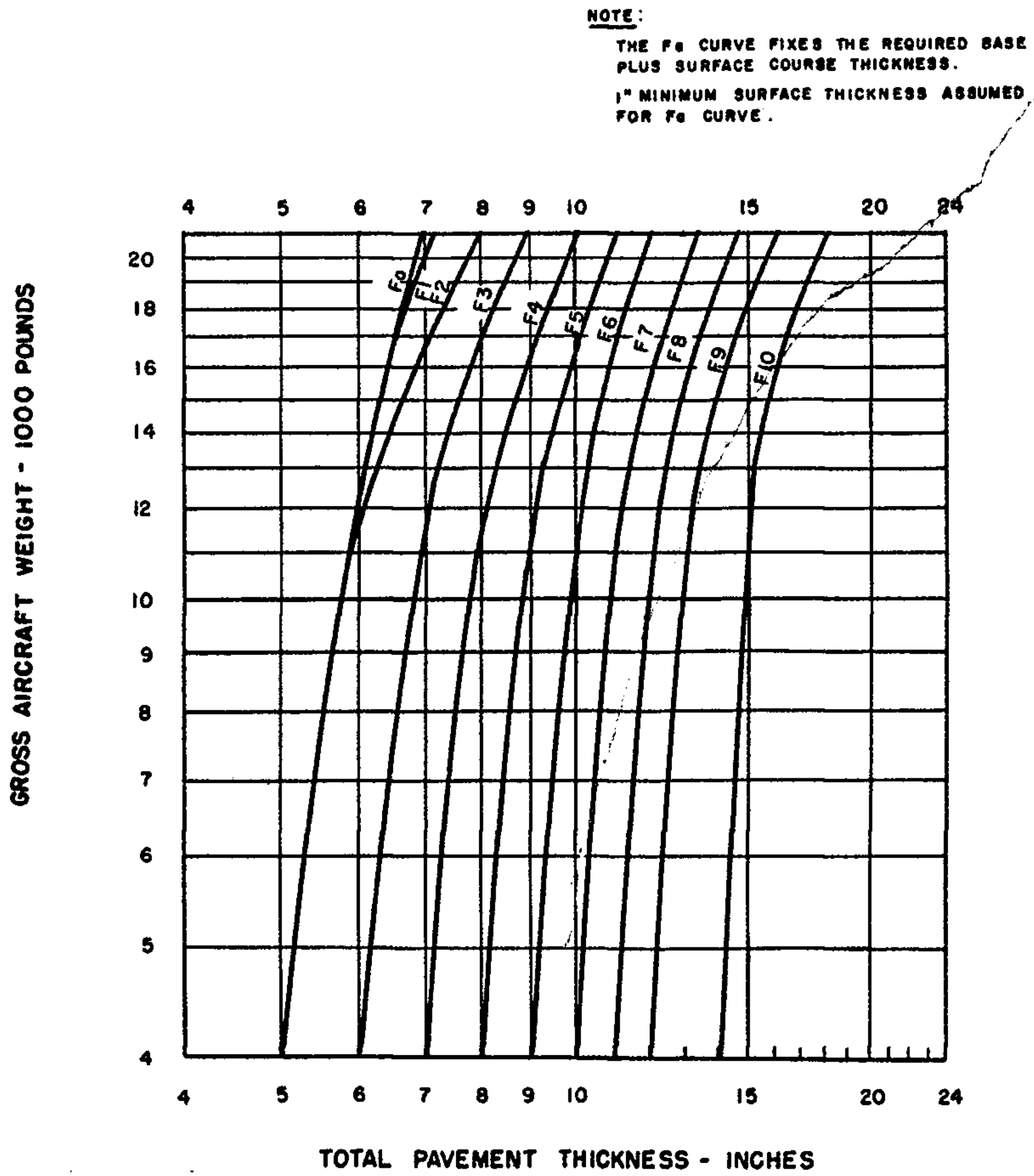


FIGURE 21. Total Pavement Thickness.