



U.S. Department  
of Transportation

**Federal Aviation  
Administration**

# Advisory Circular

---

**Subject:** Change 5 to AIRPORT DESIGN

**Date:** 2/14/97

**AC No:** 150/5300-13

**Initiated by:** AAS-100

**Change:** 5

**1. PURPOSE.** This Change provides guidance to assist airport sponsors in their evaluation and preparation of the airport landing surface to support instrument approach procedures and incorporates change 4 criteria into the airport layout plan preparation guidance.

The Change number and date of the changed material are located at the top of the page. Substantively revised text is identified by a | (vertical line) adjacent to the left margin. Page ii provides the Page Control Chart.

**2. PRINCIPAL CHANGES.**

a. Paragraph 3 drops the definition of relocated threshold.

b. Paragraphs 207 and 208 revise the metric unit conversions.

c. Paragraph 208 adds the new separation standard for authorized dual simultaneous precision instrument approaches utilizing separations down to a minimum of 3,000 feet; previously 3,400 feet.

d. Appendix 7 and Figure A6-1 have been revised to reflect the changes specified in change 4.

e. Appendix 16 has been added to assist airport sponsors in their evaluation and preparation of the airport landing surface to support instrument approach procedures.

f. Appendices 16 and 17 add new entries and have been renumbered as Appendix 17 and Appendix 18, respectively.

g. Figure A5- has been redrawn to emphasize aircraft nose-to-nose separation requirements for parked aircraft within tiedown areas.

David L. Bennett  
Director, Office of Airport Safety and Standards

## PAGE CONTROL CHART

Remove Pages	Dated	Insert Pages	Dated
iii through xi 3 and 4 11 through 14	11/10/94 11/10/94 11/10/94	iii through xi 3 and 4 11 through 13 14	2/14/97 2/14/97 2/14/97 11/10/94
Appendix 5 119 120	9/29/89 6/5/91	Appendix 5 119 120	9/29/89 2/14/97
Appendix 6 129 (and 130)	9/29/89	Appendix 6 129 (and 130)	2/14/97
Appendix 7 131 132 and 133 134 135 through 137 (and 138)	9/29/89 9/1/93 6/5/91 9/29/89	Appendix 7 131 through 138	2/14/97
		Appendix 16 (new) 291 through 295 (and 296)	2/14/97
Appendix 16 291 (and 292)	11/10/94	Appendix 17 (renumbered) 297 (and 298)	2/14/97
Appendix 17 293 through 296	11/10/94	Appendix 18 (renumbered) 299 through 302	2/14/97

## CONTENTS

Paragraph Page

### Chapter 1. REGULATORY REQUIREMENTS AND DEFINITION OF TERMS

1.	GENERAL .....	1
2.	DEFINITIONS .....	1
3.	RELATED/REFERENCED READING MATERIAL.....	3
4.	AIRPORT REFERENCE CODE (ARC) .....	4
5.	AIRPORT LAYOUT PLAN.....	5
6.	MODIFICATION OF AIRPORT DESIGN STANDARDS TO MEET LOCAL CONDITIONS .....	5
7.	NOTICE TO THE FAA OF AIRPORT DEVELOPMENT .....	5
8.	NOTICE TO THE FAA OF PROPOSED CONSTRUCTION.....	6
9.	FAA STUDIES.....	6
10.	FEDERAL ASSISTANCE.....	6
11.	ENVIRONMENTAL ASSESSMENTS.....	6
12.	STATE ROLE .....	6
13.	LOCAL ROLE.....	6
14. to 199.	RESERVED .....	6

### Chapter 2. AIRPORT GEOMETRY

200.	INTRODUCTION .....	9
201.	PRINCIPLES OF APPLICATION .....	9
202.	RUNWAY LOCATION AND ORIENTATION.....	9
203.	ADDITIONAL RUNWAYS .....	10
204.	TAXIWAY SYSTEM.....	10
205.	AIRPORT APRONS .....	10
206.	SEPARATION STANDARDS.....	10
207.	PARALLEL RUNWAY SEPARATION--SIMULTANEOUS VFR OPERATIONS.....	11
208.	PARALLEL RUNWAY SEPARATION--SIMULTANEOUS IFR OPERATIONS .....	11
209.	RUNWAY TO PARALLEL TAXIWAY AND TAXILANE SEPARATION.....	12
210.	BUILDING RESTRICTION LINE (BRL).....	12
211.	OBJECT CLEARING CRITERIA .....	12
212.	RUNWAY PROTECTION ZONE (RPZ).....	13
213. to 299.	RESERVED .....	13

### Chapter 3. RUNWAY DESIGN

300.	INTRODUCTION .....	21
301.	RUNWAY LENGTH.....	21
302.	RUNWAY WIDTH.....	21
303.	RUNWAY SHOULDERS .....	21
304.	RUNWAY BLAST PAD.....	21
305.	RUNWAY SAFETY AREA (RSA).....	21
306.	OBSTACLE FREE ZONE (OFZ) .....	21
307.	RUNWAY OBJECT FREE AREA.....	22
308.	CLEARWAY STANDARDS .....	22
309.	STOPWAY STANDARDS .....	23
310.	RESCUE AND FIREFIGHTING ACCESS.....	23
311. to 399.	RESERVED .....	23

### Chapter 4. TAXIWAY AND TAXILANE DESIGN

400.	INTRODUCTION .....	33
------	--------------------	----

401.	DIMENSIONAL STANDARDS .....	33
402.	TAXIWAY SHOULDERS .....	33
403.	TAXIWAY SAFETY AREA (TSA).....	33
404.	TAXIWAY AND TAXILANE OBJECT FREE AREA (OFA).....	33
405.	PARALLEL TAXIWAY.....	33
406.	TAXIWAY INTERSECTIONS.....	34
407.	ENTRANCE TAXIWAYS.....	34
408.	BYPASS TAXIWAYS.....	34
409.	HOLDING BAYS.....	34
410.	TURNAROUNDS.....	35
411.	DUAL PARALLEL TAXIWAYS .....	35
412.	TAXIWAY BETWEEN PARALLEL RUNWAYS.....	35
413.	EXIT TAXIWAYS.....	35
414.	APRON TAXIWAYS AND TAXILANES.....	35
415. to 499.	RESERVED .....	35

**Chapter 5. SURFACE GRADIENT AND LINE OF SIGHT**

500.	INTRODUCTION .....	49
501.	BACKGROUND.....	49
502.	SURFACE GRADIENT STANDARDS .....	49
503.	LINE OF SIGHT STANDARDS.....	56
504. to 599.	RESERVED .....	56

**Chapter 6. SITE REQUIREMENTS FOR  
NAVAID AND ATC FACILITIES**

600.	GENERAL .....	59
601.	MICROWAVE LANDING SYSTEM.....	59
602.	INSTRUMENT LANDING SYSTEM .....	61
603.	NONDIRECTIONAL BEACON.....	63
604.	VERY HIGH FREQUENCY OMNIRANGE.....	64
605.	APPROACH LIGHTING SYSTEMS.....	64
606.	OMNIDIRECTIONAL APPROACH LIGHTING SYSTEMS .....	65
607.	LEAD-IN LIGHTING SYSTEMS.....	65
608.	AIRPORT ROTATING BEACONS.....	65
609.	AIRPORT TRAFFIC CONTROL TOWERS .....	65
610.	AIRPORT SURVEILLANCE RADAR .....	66
611.	AIRPORT SURFACE DETECTION EQUIPMENT.....	66
612.	RUNWAY VISUAL RANGE FACILITIES .....	66
613.	AUTOMATIC WEATHER OBSERVATION STATIONS (AWOS).....	66
614.	PHYSICAL SECURITY .....	67
615.	CABLE PROTECTION .....	67
616. to 699.	RESERVED .....	67

**Chapter 7. RUNWAY AND TAXIWAY BRIDGES**

700.	INTRODUCTION .....	69
701.	SITING PRECEPTS .....	69
702.	DIMENSIONS.....	69
703.	LOAD CONSIDERATIONS.....	69
704.	DECK DESIGN.....	69
705.	MARKING AND LIGHTING.....	69
706.	OTHER CONSIDERATIONS.....	69
707.	PASSENGER AND BAGGAGE TUNNELS.....	70
708. to 799.	RESERVED .....	70

**709. Chapter 8. THE EFFECTS AND TREATMENT OF JET BLAST**

800.	INTRODUCTION .....	77
801.	JET BLAST EFFECTS .....	77
802.	BLAST FENCES .....	77
803.	SHOULDERS AND BLAST PADS .....	78

**Appendix 1. WIND ANALYSIS**

1.	OBJECTIVE .....	87
2.	CROSSWINDS .....	87
3.	COVERAGE AND ORIENTATION OF RUNWAYS .....	87
4.	ASSEMBLING WIND DATA .....	87
5.	ANALYZING WIND DATA .....	88
6.	CONCLUSIONS .....	88
7.	PRESUMPTIONS .....	88
8.	COMPUTER WIND ANALYSIS .....	88

**Appendix 2. THRESHOLD SITING REQUIREMENTS**

1.	PURPOSE .....	101
2.	APPLICATION .....	101
3.	LIMITATIONS .....	101
4.	EVALUATION CONSIDERATIONS .....	101
5.	LOCATING, DISPLACING, OR RELOCATING THE THRESHOLD .....	102

**Appendix 3. AIRPORT REFERENCE POINT**

1.	DISCUSSION .....	107
2.	SAMPLE COMPUTATION .....	107
3.	ACCURACY .....	107

**Appendix 4. COMPASS CALIBRATION PAD**

1.	PURPOSE .....	111
2.	BACKGROUND .....	111
3.	APPLICATION .....	111
4.	DESIGN OF COMPASS CALIBRATION PAD .....	111
6.	CONSTRUCTION OF COMPASS CALIBRATION PAD .....	112
7.	VOR CHECKPOINT .....	113

**Appendix 5. SMALL AIRPORT BUILDINGS,  
AIRPLANE PARKING, AND TIEDOWNS**

1.	GENERAL .....	117
2.	TRANSIENT APRON .....	117
3.	APRON FOR BASED AIRPLANES .....	117
4.	TIEDOWNS .....	118
5.	OTHER CONSIDERATIONS .....	118
6.	HANGARS .....	118
7.	ADMINISTRATION BUILDING .....	118
8.	AIRPORT SURVEY .....	122
9.	BUILDING PLAN .....	122
10.	EXPANSION .....	122
11.	CIRCULATION .....	122
12.	WAITING ROOM .....	122
13.	MANAGER'S OFFICE .....	123
14.	EATING FACILITIES .....	123

15. PUBLIC RESTROOMS ..... 123  
 16. ROADS AND AUTO PARKING ..... 123

**Appendix 6. METRIC CONVERSION  
 AND TYPICAL AIRPORT LAYOUT PLAN**

1. GENERAL ..... 125  
 2. TYPICAL AIRPORT LAYOUT PLAN ..... 126

**Appendix 7. AIRPORT LAYOUT PLAN  
 COMPONENTS AND PREPARATION**

1. NARRATIVE REPORT ..... 131  
 2. AIRPORT LAYOUT DRAWING ..... 132  
 3. AIRPORT AIRSPACE DRAWING ..... 134  
 4. INNER PORTION OF THE APPROACH SURFACE DRAWING ..... 135  
 5. TERMINAL AREA DRAWING ..... 136  
 6. LAND USE DRAWING ..... 136  
 7. AIRPORT PROPERTY MAP ..... 137

**Appendix 8. RUNWAY DESIGN RATIONALE**

1. SEPARATIONS ..... 139  
 2. OBSTACLE FREE ZONE (OFZ) ..... 139  
 3. RUNWAY SAFETY AREA ..... 139  
 4. RUNWAY OBJECT FREE AREA (ROFA) ..... 139  
 5. RUNWAY SHOULDERS AND BLAST PADS ..... 139  
 6. CLEARWAY ..... 139  
 7. STOPWAY ..... 139  
 8. RUNWAY PROTECTION ZONE (RPZ) ..... 140

**Appendix 9. TAXIWAY AND TAXILANE  
 DESIGN RATIONALE**

1. INTRODUCTION ..... 141  
 2. BACKGROUND AND RATIONALE ..... 141  
 3. EXIT TAXIWAY LOCATION ..... 142  
 4. WINGTIP TRACE ..... 146

**Appendix 10. TAXIWAY FILLET DESIGN**

1. INTRODUCTION ..... 149  
 2. EXAMPLE NO. 1, JUDGMENTAL OVERSTEERING ..... 150  
 3. EXAMPLE NO. 2, MAINTAINING COCKPIT OVER CENTERLINE ..... 150

**Appendix 11. COMPUTER PROGRAM**

1. AIRPORT DESIGN (FOR MICROCOMPUTERS) VERSION 4.1 ..... 153  
 2. HOW TO OBTAIN A COPY OF AIRPORT DESIGN (FOR MICROCOMPUTERS) VERSION 4.1 ..... 153  
 3. REQUIREMENTS ..... 153  
 4. SETUP ON A MICROCOMPUTER ..... 153  
 5. RUN AIRPORT DESIGN PROGRAM ..... 153  
 6. HOT KEYS ..... 153  
 7. RUNWAY AND TAXIWAY WIDTH AND CLEARANCE STANDARD DIMENSIONS ..... 154  
 8. RECOMMENDED RUNWAY LENGTHS ..... 154  
 9. STANDARD WIND ANALYSIS ..... 154  
 10. TAXIWAY DESIGN ..... 155

11.	AIRPORT CAPACITY AND DELAY FOR LONG RANGE PLANNING.....	156
12.	DECLARED DISTANCE LENGTHS.....	156
13.	INPUT AIRPLANE DATA AVAILABILITY.....	156

**Appendix 12. AIRPLANE DATA**

1.	BACKGROUND.....	165
2.	EXPLANATORY INFORMATION.....	166

**Appendix 13. AIRPLANES ARRANGED BY AIRPLANE MANUFACTURER AND AIRPORT REFERENCE CODE (24 pages)**

Section 1. Alphabetical Listing (U.S. customary units)

Section 2. Alphabetical Listing (SI units)

Section 3. Listing Small Airplanes by Airport Reference Code (U.S. customary units)

Section 4. Listing Large Airplanes by Airport Reference Code (U.S. customary units)

Section 5. Listing Small Airplanes by Airport Reference Code (SI units)

Section 6. Listing Large Airplanes by Airport Reference Code (SI units)

**Appendix 14. DECLARED DISTANCES**

1.	APPLICATION.....	275
2.	BACKGROUND.....	275
3.	FAA APPROVAL FOR APPLYING DECLARED DISTANCES IN AIRPORT DESIGN.....	275
4.	RUNWAY SAFETY AREA (RSA) AND RUNWAY OBJECT FREE AREA (ROFA) LENGTHS.....	276
5.	RUNWAY PROTECTION ZONE (RPZ) LOCATION AND SIZE.....	276
6.	CLEARWAY LOCATION.....	276
7.	NOTIFICATION.....	276

**Appendix 15. TRANSFER OF ELECTRONIC DATA**

1.	INTRODUCTION.....	283
2.	BACKGROUND.....	283
3.	DEFINITIONS.....	283
4.	APPLICATION.....	283
5.	CADD FILE DELIVERABLES.....	284
6.	DATABASES DELIVERABLES.....	286
7.	PHOTOGRAMMETRY DELIVERABLES.....	286
8.	FEATURES AND OBJECTS CODE.....	287
9.	MEDIA.....	289
10.	FAA POINT OF CONTACT.....	289

**Appendix 16. NEW INSTRUMENT APPROACH PROCEDURES**

1.	BACKGROUND.....	291
2.	RUNWAY DESIGNATION.....	291
3.	REQUIREMENTS.....	291

**Appendix 17. ACRONYMS (1 page)**

**Appendix 18. INDEX (4 pages)**

Table	Page
1-1.	Increases in airport design standards associated with an upgrade in the first component (aircraft approach category) of the airport reference code ..... 7
1-2.	Increases in airport design standards to provide for lower approach visibility minimums..... 8
2-1.	Runway separation standards for aircraft approach categories A & B ..... 14
2-2.	Runway separation standards for aircraft approach categories C & D ..... 15
2-3.	Taxiway and taxilane separation standards..... 16
2-4.	Runway protection zone (RPZ) dimensions ..... 19
3-1.	Runway design standards for aircraft approach category A & B visual runways and runways with not lower than 3/4-statute mile (1 200 m) approach visibility minimums..... 24
3-2.	Runway design standards for aircraft approach categories A & B runways with lower than 3/4-statute mile (1 200 m) approach visibility minimums..... 25
3-3.	Runway design standards for aircraft approach categories C & D..... 26
4-1.	Taxiway dimensional standards..... 36
4-2.	Taxiway fillet dimensions ..... 38
4-3.	Wingtip clearance standards..... 38
A9-1.	Exit taxiway cumulative utilization percentages ..... 142
A16-1.	Instrument approach requirements ..... 292
A16-2.	Airport information for minimums of $\geq 1$ -statute mile and $\geq 400$ foot ..... 293
A16-3.	Airport information for lower minimums ..... 294
A16-4.	OFZ and threshold siting surface for minimums of $\geq 1$ -statute mile and $\geq 400$ foot ..... 295

Figure	Page
2-1.	Typical airport layout ..... 17
2-2.	Parallel runway separation ..... 18
2-3.	Runway protection zone ..... 20
3-1.	Runway safety area..... 27
3-2.	Obstacle free zone (OFZ) for visual runways and runways with not lower than 3/4-statute mile (1 200 m) approach visibility minimums..... 28
3-3.	Obstacle free zone (OFZ) for runways serving small airplanes exclusively with lower than 3/4-statute mile (1 200 m) approach visibility minimums..... 29
3-4.	Obstacle free zone (OFZ) for runways serving large airplanes with lower than 3/4-statute mile (1 200 m) approach visibility minimums..... 30
3-5.	Obstacle free zone (OFZ) for runways serving large airplanes with lower than 3/4-statute mile (1 200 m) approach visibility minimums and displaced threshold ..... 31
3-6.	Clearway..... 32
3-7.	Stopway ..... 32
4-1.	Taxiway intersection details ..... 37
4-2.	Maintaining cockpit over centerline ..... 39
4-3.	Judgmental oversteering..... 40
4-4.	Example of pavement fillet computer program printout..... 41
4-5.	Entrance taxiway..... 42
4-6.	Bypass taxiway..... 42
4-7.	Dual parallel taxiway entrance ..... 43
4-8.	Typical holding bay configurations..... 44
4-9.	Taxiway turnaround..... 44
4-10.	Crossover taxiway ..... 45
4-11.	Right-angled exit taxiway..... 45
4-12.	Acute-angled exit taxiway ..... 46
4-13.	Example of acute-angled exit taxiway computer layout data page 1 ..... 47
4-14.	Example of acute-angled exit taxiway computer layout data page 2 ..... 48
5-1.	Longitudinal grade limitations for aircraft approach categories A & B ..... 50
5-2.	Transverse grade limitations for aircraft approach categories A & B ..... 51



5-3.	Longitudinal grade limitations for aircraft approach categories C & D.....	52
5-4.	Transverse grade limitations for aircraft approach categories C & D.....	53
5-5.	Runway safety area grade limitations beyond 200 feet (60 m) from the runway end.....	55
5-6.	Runway visibility zone.....	57
6-1.	AZ antenna siting.....	59
6-2.	Typical NAVAID placement.....	60
6-3.	AZ antenna critical area.....	61
6-4.	EL antenna siting.....	61
6-5.	EL antenna critical area.....	61
6-6.	ILS LOC siting and critical area.....	62
6-7.	GS siting and critical area.....	62
6-8.	Marker beacon site.....	63
6-9.	NDB site.....	63
6-10.	A TVOR installation.....	64
7-1.	Full width runway-taxiway bridge.....	71
7-2.	Cross-section full width runway-taxiway bridge.....	72
7-3.	Minimum width taxiway bridge with positive edge protection, O'Hare Airport, Chicago, IL.....	73
7-4.	Example structural deck and depressed roadway, O'Hare Airport, Chicago, IL.....	74
7-5.	Suggested shoulder marking of minimum width taxiway bridge.....	75
7-6.	Controlled use service road, Los Angeles International Airport, Los Angeles, CA.....	76
8-1.	Velocity distance curves, DC-8.....	79
8-2.	Velocity distance curves, B-727.....	80
8-3.	Velocity distance curves, B-747.....	81
8-4.	Velocity distance curves, DC-10.....	82
8-5.	Blast velocities of business jet airplanes.....	83
8-6.	Typical blast deflector fences, metal.....	84
8-7.	Typical blast deflector fences, concrete.....	85
A1-1.	Wind vector diagram.....	89
A1-2.	Typical environmental data service wind summary.....	90
A1-3.	Windrose blank showing direction and divisions.....	91
A1-4.	Completed windrose using figure A1-2 data.....	92
A1-5.	Windrose analysis.....	93
A1-6.	Windrose analysis--estimating area not included.....	94
A1-7.	Computer printout page 1.....	95
A1-8.	Computer printout page 2.....	96
A1-9.	Computer printout page 3.....	97
A1-10.	Lotus cell-formulas page 1.....	98
A1-11.	Lotus cell-formulas page 2.....	99
A2-1.	Dimensional standards for locating thresholds.....	104
A2-2.	Approach slopes.....	105
A2-3.	Approach slopes--offset localizer.....	106
A3-1.	Sample layout.....	108
A3-2.	Sample computation - airport reference point.....	109
A4-1.	Marking layout and details of wheel block.....	114
A4-2.	Type I. compass calibration pad.....	115
A4-3.	Type II. compass calibration pad.....	116
A5-1.	Parking apron area.....	119
A5-2.	Tiedown layouts.....	120
A5-3.	T-hanger layout.....	121
A6-1.	Typical airport layout plan.....	129
A8-1.	Approximate distance airplanes undershoot and overrun the runway end.....	140
A9-1.	Wingtip clearance - parallel taxiways.....	143
A9-2.	Wingtip clearance from taxiway.....	144
A9-3.	Wingtip clearance from apron taxiway.....	144
A9-4.	Wingtip clearance from taxilane.....	145

A9-5.	Pavement edge clearance on tangent .....	146
A9-6.	McDonnell-Douglas MD-88 wingtip clearance trace for a 100-foot (30.5 m) radius centerline .....	147
A9-7.	McDonnell-Douglas MD-88 wingtip clearance trace for a 120-foot (36.5 m) radius offset centerline .....	147
A9-8.	Boeing 727-200 wingtip clearance trace for a 120-foot (36.5 m) radius offset centerline.....	148
A9-9.	Boeing 727-100 wingtip clearance trace for a 120-foot (36.5 m) radius offset centerline.....	148
A10-1.	Taxiway intersection details .....	151
A10-2.	Depiction of symbols.....	152
A11-1.	<b>THIS FIGURE INTENTIONALLY LEFT BLANK.....</b>	<b>156</b>
A11-2.	Estimated airplane data elements for input in the computer program.....	157
A11-3.	Example of the airport design airplane and airport data window .....	158
A11-4.	Example printout of width and clearance standard dimensions page 1.....	158
A11-5.	Example printout of width and clearance standard dimensions page 2.....	159
A11-6.	Example printout of wind analysis (two bi-directional runways).....	160
A11-7.	Example printout of windrose (two bi-directional runways).....	161
A11-8.	Example printout of wind analysis (one uni-directional runway) .....	162
A11-9.	Example printout of windrose (one uni-directional runway) .....	163
A11-10.	Nomenclature used in the taxiway design task.....	164
A11-11.	Nomenclature used in the declared distance task .....	164
A12-1.	Single engine, high wing, tailwheel airplanes 8,000 lb. (3,628 Kg) or less .....	167
A12-2.	Single engine, high wing, tailwheel airplanes 8,000 lb. (3,628 Kg) or less (cont'd).....	168
A12-3.	Single engine, high wing, tricycle gear airplanes 8,000 lb. (3,628 Kg) or less .....	169
A12-4.	Single engine, low wing, tricycle gear airplanes 8,000 lb. (3,628 Kg) or less.....	170
A12-5.	Single engine, low wing, tricycle gear airplanes 8,000 lb. (3,628 Kg) or less (cont'd) .....	171
A12-6.	Twin engine, low or mid wing, tricycle gear airplanes 8,000 lb. (3,628 Kg) or less .....	172
A12-7.	Twin engine, low or mid wing, tricycle gear airplanes 8,000 lb. (3,628 Kg) or less (cont,d) .....	173
A12-8.	Twin engine, high or mid wing, tricycle gear airplanes 8,000 lb. (3,628 Kg) or less .....	174
A12-9.	Aérospatiale Nord 262 .....	175
A12-10.	Aérospatiale/Sud SE-210 Caravelle .....	176
A12-11.	Airbus Industries A300, 310, and 320 .....	177
A12-12.	Avions de Transport Regional ATR-42 & -72 .....	178
A12-13.	Avions Marcel Dassault Mystère 20 (Fan Jet Falcon) .....	179
A12-14.	BAe 1-11 .....	180
A12-15.	B.A.C./SNIAS Concorde.....	181
A12-16.	B.A.C./Vickers VC-10 .....	182
A12-17.	B.A.C./Vickers Viscount.....	183
A12-18.	Beech Starship .....	184
A12-19.	Beechcraft Airliner.....	185
A12-20.	Beechcraft King Air.....	186
A12-21.	Beechcraft Model 18 and Conversions.....	187
A12-22.	Beechcraft Queen Air.....	188
A12-23.	Boeing B-52 Stratofortress .....	189
A12-24.	Boeing KC-97L.....	190
A12-25.	Boeing KC-135A .....	191
A12-26.	Boeing 707-720.....	192
A12-27.	Boeing 727.....	193
A12-28.	Boeing 737.....	194
A12-29.	Boeing 747.....	195
A12-30.	Boeing 757.....	196
A12-31.	Boeing 767.....	197
A12-32.	British Aerospace 146.....	198
A12-33.	Canadiar CL-44 .....	199
A12-34.	Canadiar CL-66 .....	200
A12-35.	Cessna Citation .....	201
A12-36.	Construcciones Aeronauticas CASA C-212 and 235.....	202
A12-37.	Convair-liner and Turboprop Conversions.....	203

A12-38.	De Havilland Canada C-7 Caribou .....	204
A12-39.	De Havilland Canada DASH 7 & DASH 8 .....	205
A12-40.	Douglas C-124 Globemaster.....	206
A12-41.	De Havilland Canada DHC-6 Twin Otter .....	207
A12-42.	Dornier Gmb H .....	208
A12-43.	Douglas DC-3 .....	209
A12-44.	Douglas DC-4/6/7 .....	210
A12-45.	Embraer EmB 110 .....	211
A12-46.	Embraer EmB 120 .....	212
A12-47.	Fairchild C-119K Flying Boxcar .....	213
A12-48.	Fairchild C-123K Provider.....	214
A12-49.	Fairchild F-27 .....	215
A12-50.	Fokker F-27 .....	216
A12-51.	Fokker F-28 .....	217
A12-52.	Gates Learjet.....	218
A12-53.	General Dynamics/Convair 880/990.....	219
A12-54.	Grumman Gulfstream I.....	220
A12-55.	Grumman Gulfstream II.....	221
A12-56.	Grumman G-64/G-III.....	222
A12-57.	Grumman G-73.....	223
A12-58.	Hamburger-Flugzeugbau HFB-320 Hansa .....	224
A12-59.	Hawker Siddeley DH. 104 Dove .....	225
A12-60.	Hawker Siddeley DH. 114 Heron.....	226
A12-61.	Hawker Siddeley HS-125 .....	227
A12-62.	Hawker Siddeley HS-748 .....	228
A12-63.	Ilyushin IL-62 .....	229
A12-64.	Israel Aircraft Industries Westwind.....	230
A12-65.	Lockheed Constellation and Super Constellation .....	231
A12-66.	Lockheed C-5B Galaxy .....	232
A12-67.	Lockheed C-141 Starlifter .....	233
A12-68.	Lockheed L-188 Electra II.....	234
A12-69.	Lockheed L-100 Hercules.....	235
A12-70.	Lockheed L-1011 Tristar.....	236
A12-71.	Lockheed L-1329 Jetstar .....	237
A12-72.	Martin 404.....	238
A12-73.	McDonnell-Douglas DC-8 .....	239
A12-74.	McDonnell-Douglas DC-9 and MD-80.....	240
A12-75.	McDonnell-Douglas DC-10.....	241
A12-76.	McDonnell-Douglas MD-11.....	242
A12-77.	Mitsubishi MU-2.....	243
A12-78.	Nihon/N.A.M.C. YS-11A .....	244
A12-79.	Rockwell International NA-265 Sabreliner.....	245
A12-80.	SAAB SF 340 .....	246
A12-81.	Short Brothers.....	247
A12-82.	Shorts SC. 5/10 Belfast .....	248
A12-83.	Swearingen Merlin.....	249
A12-84.	Swearingen Metro.....	250
A14-1.	Takeoff run available (TORA).....	277
A14-2.	Takeoff distance available (TODA).....	278
A14-3.	Accelerate-stop distance available (ASDA) .....	279
A14-4.	Landing distance available (LDA).....	280
A14-5.	Example of a runway extended to 7000 feet.....	281
A14-6.	Example of a runway with threshold displaced for runway safety area .....	282



**Runway Safety Area (RSA).** A defined surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway.

**Shoulder.** An area adjacent to the edge of paved runways, taxiways, or aprons providing a transition between the pavement and the adjacent surface; support for aircraft running off the pavement; enhanced drainage; and blast protection.

**Small Airplane.** An airplane of 12,500 pounds (5 700 kg) or less maximum certificated takeoff weight.

**Stopway (SWY).** A defined rectangular surface beyond the end of a runway prepared or suitable for use in lieu of runway to support an airplane, without causing structural damage to the airplane, during an aborted takeoff.

**Taxilane (TL).** The portion of the aircraft parking area used for access between taxiways and aircraft parking positions.

**Taxiway (TW).** A defined path established for the taxiing of aircraft from one part of an airport to another.

**Taxiway Safety Area (TSA).** A defined surface alongside the taxiway prepared or suitable for reducing the risk of damage to an airplane unintentionally departing the taxiway.

**Threshold (TH).** The beginning of that portion of the runway available for landing. In some instances the landing threshold may be displaced.

**Displaced Threshold.** The portion of pavement behind a displaced threshold may be available for takeoffs in either direction and landings from the opposite direction.

**Visual Runway.** A runway without an existing or planned straight-in instrument approach procedure.

**3. RELATED/REFERENCED READING MATERIAL.** The following is a listing of documents referenced in other parts of this advisory circular. Advisory Circulars 00-2 and 00-44 may be obtained by writing to: The U.S. Department of Transportation; Utilization and Storage Section, M-443.2; Washington, D.C. 20590. Instructions for obtaining these publications are found in AC 00-2 and AC 00-44.

- a. AC 00-2, Advisory Circular Checklist.
- b. AC 00-44, Status of Federal Aviation Regulations.
- c. AC 20-35, Tie-Down Sense.
- d. AC 70-2, Airspace Utilization Considerations in the Proposed Construction, Alteration, Activation, and Deactivation of Airports.
- e. AC 70/7460-1, Obstruction Marking and Lighting.
- f. AC 70/7460-2, Proposed Construction or Alteration of Objects That May Affect The Navigable Airspace.
- g. AC 107-1, Aviation Security-Airports.
- h. AC 120-29, Criteria for Approving Category I and Category II Landing Minima for FAR Part 121 Operators.
- i. AC 150/5000-3, Address List for Regional Airports Divisions and Airports District/Field Offices.
- j. AC 150/5060-5, Airport Capacity and Delay.
- k. AC 150/5070-3, Planning the Airport Industrial Park.
- l. AC 150/5070-6, Airport Master Plans.
- m. AC 150/5190-1, Minimum Standards for Commercial Aeronautical Activities on Public Airports.
- n. AC 150/5190-4, A Model Zoning Ordinance to Limit Height of Objects Around Airports.
- o. AC 150/5200-XX, Airport Wildlife Hazard Management.
- p. AC 150/5220-16, Automated Weather Observing Systems (AWOS) for Non-Federal Applications.
- q. AC 150/5230-4, Aircraft Fuel Storage, Handling, and Dispensing on Airports.

- r.** AC 150/5320-5, Airport Drainage.
  - s.** AC 150/5320-6, Airport Pavement Design and Evaluation.
  - t.** AC 150/5320-14, Airport Landscaping for Noise Control Purposes.
  - u.** AC 150/5325-4, Runway Length Requirements for Airport Design.
  - v.** AC 150/5340-1, Marking of Paved Areas on Airports.
  - w.** AC 150/5340-5, Segmented Circle Marker Systems.
  - x.** AC 150/5340-14, Economy Approach Lighting Aids.
  - y.** AC 150/5340-18, Standards for Airport Sign Systems.
  - z.** AC 150/5340-21, Airport Miscellaneous Lighting Visual Aids.
  - aa.** AC 150/5340-24, Runway and Taxiway Edge Lighting System.
  - bb.** AC 150/5340-28, Precision Approach Path Indicator (PAPI) Systems.
  - cc.** AC 150/5345-52, Generic Visual Slope Indicators (GVGI).
  - dd.** AC 150/5360-13, Planning and Design Guidelines for Airport Terminal Facilities.
  - ee.** AC 150/5370-10, Standards for Specifying Construction of Airports.
  - ff.** AC 150/5390-2, Heliport Design.
  - gg.** 14 CFR Part 23, Airworthiness Standards: Normal, Utility, and Acrobatic Category Airplanes.
  - hh.** 14 CFR Part 25, Airworthiness Standards: Transport Category Airplanes.
  - ii.** 14 CFR Part 77, Objects Affecting Navigable Airspace.
  - jj.** 14 CFR Part 97, Standard Instrument Approach Procedures.
  - kk.** 14 CFR Part 135, Air Taxi Operators and Commercial Operators of Small Aircraft.
  - ll.** 14 CFR Part 139, Certification and Operations: Land Airports Serving Certain Air Carriers.
  - mm.** 14 CFR Part 151, Federal Aid to Airports.
  - nn.** 14 CFR Part 152, Airport Aid Program.
  - oo.** 14 CFR Part 153, Acquisition of U.S. Land for Public Airports.
  - pp.** 14 CFR Part 154, Acquisition of Land for Public Airports Under the Airport and Airway Development Act of 1970.
  - qq.** 14 CFR Part 157, Notice of Construction, Alteration, Activation, and Deactivation of Airports.
  - rr.** Order 1050.1, Policies and Procedures for Considering Environmental Impacts.
  - ss.** Order 5050.4, Airport Environmental Handbook.
  - tt.** Order 5100.38, Airport Improvement Program (AIP) Handbook.
  - uu.** Order 7400.2, Procedures for Handling Airspace Matters.
  - vv.** Order 8200.1, United States Standard Flight Inspection Manual.
  - ww.** Order 8260.3, United States Standard for Terminal Instrument Procedures (TERPS).
- 4. AIRPORT REFERENCE CODE (ARC).** The ARC is a coding system used to relate airport design criteria to the operational and physical characteristics of the airplanes intended to operate at the airport.
- a. Coding System.** The airport reference code has two components relating to the airport design aircraft. The first component, depicted by a letter, is the *aircraft approach category* and relates to aircraft approach speed (operational characteristic). The second component, depicted by a Roman numeral, is the *airplane design group* and relates to airplane wingspan (physical characteristic). Generally, runways standards are related to aircraft approach speed, airplane wingspan, and designated or planned approach visibility minimums.

computer program cited in appendix 11 may be used to determine the increase to these separation distances for elevation.

**207. PARALLEL RUNWAY SEPARATION--SIMULTANEOUS VFR OPERATIONS.**

**xx. Standard.** For simultaneous landings and takeoffs using visual flight rules (VFR), the minimum separation between centerlines of parallel runways is  
700 feet (214 m).

**yy. Recommendations.** The minimum runway centerline separation distance recommended for Airplane Design Group V and VI runways is 1,200 feet (366 m). Air traffic control practices, such as holding airplanes between the runways, frequently justify greater separation distances. Runways with centerline spacings under 2,500 feet (762 m) are treated as a single runway by ATC when wake turbulence is a factor.

**208. PARALLEL RUNWAY SEPARATION--SIMULTANEOUS IFR OPERATIONS.**

To attain instrument flight rule (IFR) capability for simultaneous (independent) landings and takeoff on parallel runways, the longitudinal (in-trail) separation required for single runway operations is replaced, in whole or in part, by providing lateral separation between aircraft operating to parallel runways. Subparagraphs a and b identify the minimum centerline separations for parallel runways with operations under instrument flight rules (IFR). Where practical, parallel runway centerline separation of at least 5,000 feet (1 525 m) is recommended. Placing the terminal area between the parallel runways minimizes taxi operations across active runways and increases operational efficiency of the airport. Terminal area space needs may dictate greater separations than required for simultaneous IFR operations.

**a. Simultaneous Approaches.** Precision instrument operations require electronic navigational aids and monitoring equipment, air traffic control, and approach procedures.

**(1) Dual simultaneous precision instrument approaches** are normally approved on parallel runway centerline separation of 4,300 feet (1 310 m). Further on a case-by-case basis, the FAA will consider proposals utilizing separations down to a minimum of 3,000 feet (915 m) where a 4,300 foot (1 310 m) separation is impractical. This reduction of separation requires special high update radar, monitoring equipment, etc..

**(2) Triple simultaneous precision instrument approaches** for airports below 1,000 feet (305 m) elevation normally require parallel runway centerline separation of 5,000 feet (1 525 m) between adjacent runways. Triple simultaneous precision instrument approaches for airport elevations at and above 1,000 feet (305 m) and reduction in separation are currently under study by the FAA. In the interim, the FAA, on a case-by-case basis, will consider proposals utilizing separations down to a minimum of 4,300 feet (1 310 m) where a 5,000-foot (1 525 m) separation is impractical or the airport elevation is at or above 1,000 feet (305 m). Reduction of separation may require special radar, monitoring equipment, etc..

**(3) Quadruple simultaneous precision instrument approaches** are currently under study by the FAA. In the interim, the FAA, on a case-by-case basis, will consider proposals utilizing separations down to a minimum of 5,000 feet (1 525 m). Quadruples may require special radar, monitoring equipment, etc..

**b. Simultaneous Departures or Approaches and Departures.** Simultaneous departures do not always require radar air traffic control facilities. The following parallel runway centerline separations apply:

**(1) Simultaneous Departures.**

**(a)** Simultaneous nonradar departures require a parallel runway centerline separation of at least 3,500 feet (1 067 m).

**(b)** Simultaneous radar departures require a parallel runway centerline separation of at least 2,500 feet (762 m).

**(2) Simultaneous Approach and Departure.** Simultaneous radar-controlled approaches and departures require the following parallel runway centerline separations:

**(a)** When the thresholds are not staggered, at least 2,500 feet (762 m).

**(b)** When the thresholds are staggered and the approach is to the near threshold, the 2,500-foot (762 m) separation can be reduced by 100 feet (30 m) for each 500 feet (150 m) of threshold stagger to a minimum separation of 1,000 feet (305 m). For Airplane Design Groups V and VI runways, a separation of at least 1,200 feet (366 m) is recommended. See figure 2-2 for a description of "near" and "far" thresholds.

(c) When the thresholds are staggered and the approach is to the far threshold, the minimum 2,500-foot (762 m) separation requires an increase of 100 feet (30 m) for every 500 feet (152 m) of threshold stagger.

## **209. RUNWAY TO PARALLEL TAXIWAY AND TAXILANE SEPARATION.**

a. **Standards.** Tables 2-1 and 2-2 present the runway centerline to parallel taxiway/taxilane centerline separation standard. This distance is such to satisfy the requirement that no part of an aircraft (tail tip, wing tip) on taxiway/taxilane centerline is within the runway safety area or penetrates the obstacle free zone (OFZ). The computer program cited in appendix 11 may be used to determine the increase to these separation distances for elevation.

b. **Recommendations.** To have room for the acute-angled exit taxiway, provide a runway centerline to parallel taxiway centerline of at least 400 feet (120 m) for Airplane Design Groups I and II, 500 feet (150 m) for Airplane Design Group III, and 600 feet (180 m) for Airplane Design Groups IV, V, and VI.

## **210. BUILDING RESTRICTION LINE (BRL).**

A BRL should be placed on an airport layout plan for identifying suitable building area locations on airports. The BRL should encompass the runway protection zones, the runway object free area, the runway visibility zone (see paragraph 503), NAVAID critical areas, areas required for terminal instrument procedures, and airport traffic control tower clear line of sight.

**211. OBJECT CLEARING CRITERIA.** Safe and efficient operations at an airport require that certain areas on and near the airport be clear of objects or restricted to objects with a certain function, composition, and/or height. The object clearing criteria subdivides the 14 CFR Part 77, Subpart C, airspace and the object free area (OFA) ground area by type of objects tolerated within each subdivision. Aircraft are controlled by the aircraft operating rules and not by this criteria.

a. **Standards.** Object clearance requirements are as follows:

(1) **Object Free Area (OFA).** Object free areas require clearing of objects as specified in paragraph 307, Runway Object Free Area, and paragraph 404, Taxiway and Taxilane Object Free Area (OFA).

(2) **Runway and Taxiway Safety Areas.** Runway and taxiway safety areas require clearing of objects, except for objects that need to be located in the runway or taxiway safety area because of their function. Objects higher than 3 inches (7.6 cm) above grade should be constructed on low impact resistant supports (frangible mounted structures) of the lowest practical height with the frangible point no higher than 3 inches (7.6 cm) above grade. Other objects, such as manholes, should be constructed at grade. In no case should their height exceed 3 inches (7.6 cm) above grade. Underground fuel storage facilities should not be located within runway and taxiway safety areas (see AC 150/5230-4), Aircraft Fuel Storage, Handling, and Dispensing on Airports). Tables 3-1, 3-2, 3-3, and 4-1 specify runway and taxiway safety area standard dimensions.

(3) **Obstacle Free Zone (OFZ).** Obstacle Free Zones require clearing of object penetrations, except for frangible visual NAVAIDs that need to be located in the OFZ because of their function. Paragraph 306 specifies OFZ standard dimensions.

(4) **Threshold.** The threshold obstacle clearance surfaces, defined in Appendix 2, paragraph 5, require clearing of object penetrations.

(5) **NAVAIDs.** Certain areas require clearing for the establishment and operation of NAVAIDs. These NAVAID critical areas are depicted in chapter 6.

(6) **14 CFR Part 77 Obstructions to Air Navigation.** Obstructions to air navigation must be removed unless an FAA aeronautical study, based on proposed operations, determined otherwise. To determine otherwise, the FAA must find no substantial adverse effect as defined in Order 7400.2, Procedures for Handling Airspace Matters, Chapter 7, Evaluating Aeronautical Effect, Section 1, General. The FAA, normally, limits aeronautical studies of existing objects to obstructions to air navigation which are not included in the criteria cited in paragraphs 211a(1) through (5).

(7) **Runway Protection Zone (RPZ).** The RPZ requires clearing of incompatible objects and activities as specified in paragraphs 212a(1)(a) and 212a(2).

(8) **General.** Other objects which require clearing are those which generally can have an adverse effect on the airport. These include objects in the inner part of the approach area (coinciding with the RPZ) such as fuel handling and storage facilities, smoke and dust generating activities, misleading lights, and those which may create glare or attract wildlife.



**b. Recommendations.** Other objects which are desirable to clear, if practicable, are objects which do not have a substantial adverse effect on the airport but, if removed, will enhance operations. These include objects in the controlled activity area and obstructions to air navigation which are not covered in paragraph 211.a, especially those penetrating an approach surface. On a paved runway, the approach surface starts 200 feet (61 m) beyond the area usable for takeoff or landing, whichever is more demanding. On an unpaved runway, the approach surface starts at the end of the area usable for takeoff or landing.

**212. RUNWAY PROTECTION ZONE (RPZ).** The RPZ's function is to enhance the protection of people and property on the ground. This is achieved through airport owner control over RPZs. Such control includes clearing RPZ areas (and maintaining them clear) of incompatible objects and activities. Control is preferably exercised through the acquisition of sufficient property interest in the RPZ.

**a. Standards.**

**(1) RPZ Configuration/Location.** The RPZ is trapezoidal in shape and centered about the extended runway centerline. The controlled activity area and a portion of the Runway OFA are the two components of the RPZ (see figure 2-3). The RPZ dimension for a particular runway end is a function of the type of aircraft and approach visibility minimum associated with that runway end. Table 2-4 provides standard dimensions for RPZs. Other than with a special application of declared distances, the RPZ begins 200 feet (60 m) beyond the end of the area usable for takeoff or landing. With a special application of declared distances, see Appendix 14, separate approach and departure RPZs are required for each runway end.

**(a) The Runway OFA.** Paragraph 307 contains the location, dimension, and clearing standards for the Runway OFA.

**(b) The Controlled Activity Area.** The controlled activity area is the portion of the RPZ beyond and to the sides of the Runway OFA.

**(2) Land Use.** In addition to the criteria specified in paragraph 211, the following land use criteria apply within the RPZ:

**(a)** While it is desirable to clear all objects from the RPZ, some uses are permitted, provided they do not attract wildlife, are outside of the Runway OFA, and do not interfere with navigational aids. Golf courses (but not club houses) and agricultural operations (other than forestry or livestock farms) are expressly permitted under this proviso. Automobile parking facilities, although discouraged, may be permitted, provided the parking facilities and any associated appurtenances, in addition to meeting all of the preceding conditions, are located outside of the object free area extension (as depicted in figure 2-3). Fuel storage facilities should not be located in the RPZ.

**(b)** Land uses prohibited from the RPZ are: residences and places of public assembly. (Churches, schools, hospitals, office buildings, shopping centers, and other uses with similar concentrations of persons typify places of public assembly.) Fuel storage facilities should not be located in the RPZ.

**b. Recommendations.** Where it is determined to be impracticable for the airport owner to acquire and plan the land uses within the entire RPZ, the RPZ land use standards have recommendation status for that portion of the RPZ not controlled by the airport owner.

**c. FAA Studies of Objects and Activities in the Vicinity of Airports.** The FAA policy is to protect the public investment in the national airport system. To implement this policy, the FAA studies existing and proposed objects and activities, both off and on public-use airports, with respect to their effect upon the safe and efficient use of the airports and safety of persons and property on the ground. These objects need not be obstructions to air navigation, as defined in 14 CFR Part 77. As the result of a study, the FAA may issue an advisory recommendation in opposition to the presence of any off-airport object or activity in the vicinity of a public-use airport that conflicts with an airport planning or design standard or recommendation.

**213. to 299. RESERVED.**

**Table 2-1. Runway separation standards for aircraft approach categories A & B**

ITEM	DIM <u>1/</u>	AIRPLANE DESIGN GROUP				
		I <u>2/</u>	I	II	III	IV
<i>Visual runways and runways with not lower than 3/4-statute mile (1 200 m) approach visibility minimums</i>						
Runway Centerline to:						
Parallel Runway Centerline	H	- Refer to paragraphs 207 and 208 -				
Holdline		- Refer to Advisory Circular 150/5340-1 -				
Taxiway/Taxilane Centerline <u>3/</u>	D	150 ft 45 m	225 ft 67.5 m	240 ft 72 m	300 ft 90 m	400 ft 120 m
Aircraft Parking Area	G	125 ft 37.5 m	200 ft 60 m	250 ft 75 m	400 ft 120 m	500 ft 150 m
Helicopter Touchdown Pad		- Refer to Advisory Circular 150/5390-2 -				
<i>Runways with lower than 3/4-statute mile (1 200 m) approach visibility minimums</i>						
Runway Centerline to:						
Parallel Runway Centerline	H	- Refer to paragraphs 207 and 208 -				
Holdline		- Refer to Advisory Circular 150/5340-1 -				
Taxiway/Taxilane Centerline <u>3/</u>	D	200 ft 60 m	250 ft 75 m	300 ft 90 m	350 ft 105 m	400 ft 120 m
Aircraft Parking Area	G	400 ft 120 m	400 ft 120 m	400 ft 120 m	400 ft 120 m	500 ft 150 m
Helicopter Touchdown Pad		- Refer to Advisory Circular 150/5390-2 -				

1/ Letters correspond to the dimensions on figure 2-1.

2/ These dimensional standards pertain to facilities for small airplanes exclusively.

3/ The taxiway/taxilane centerline separation distances are for sea level. At higher elevations, an increase to these separation distances may be required to keep taxiing and holding airplanes clear of the RSA and OFZ (refer to paragraph 206).

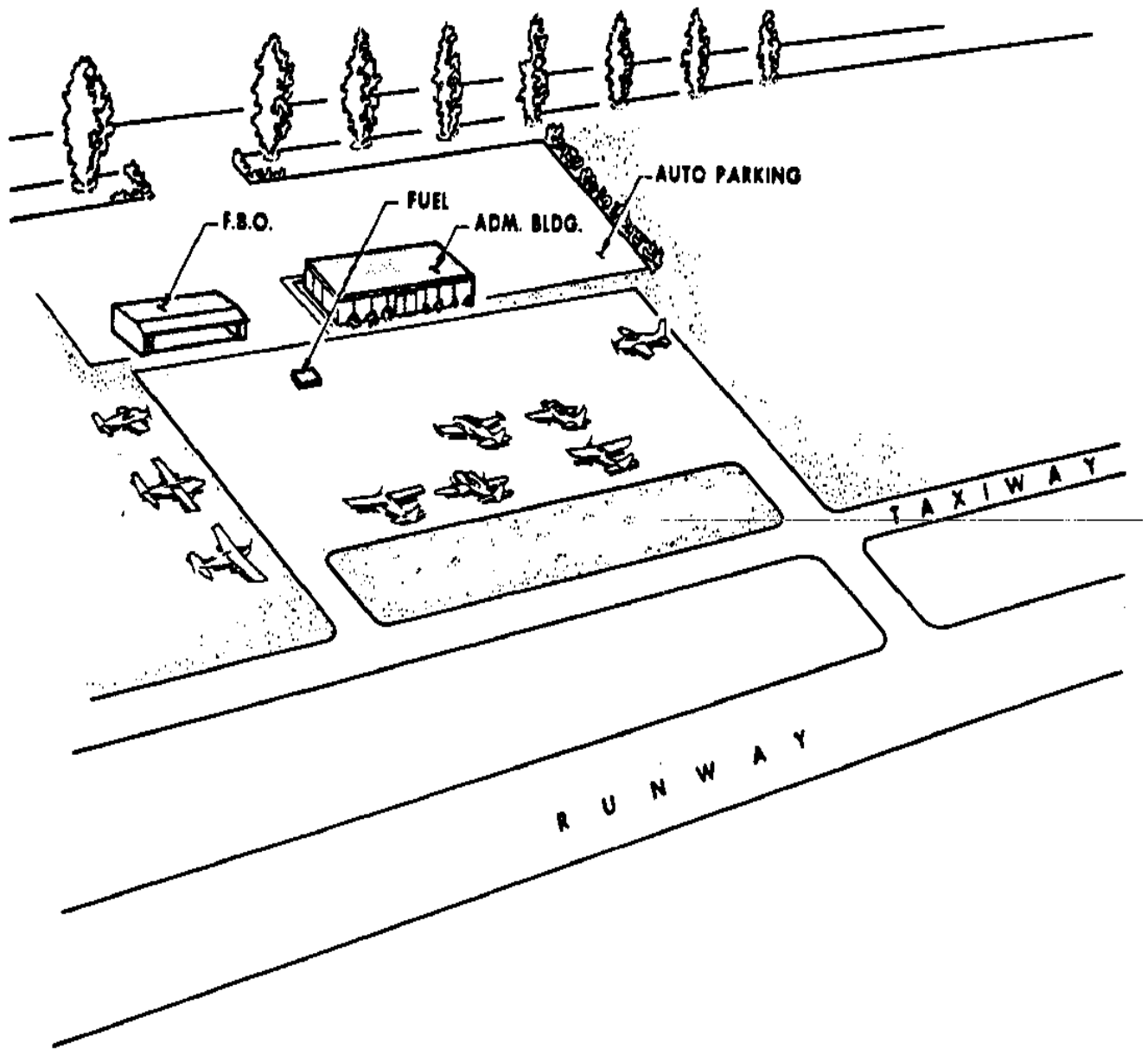
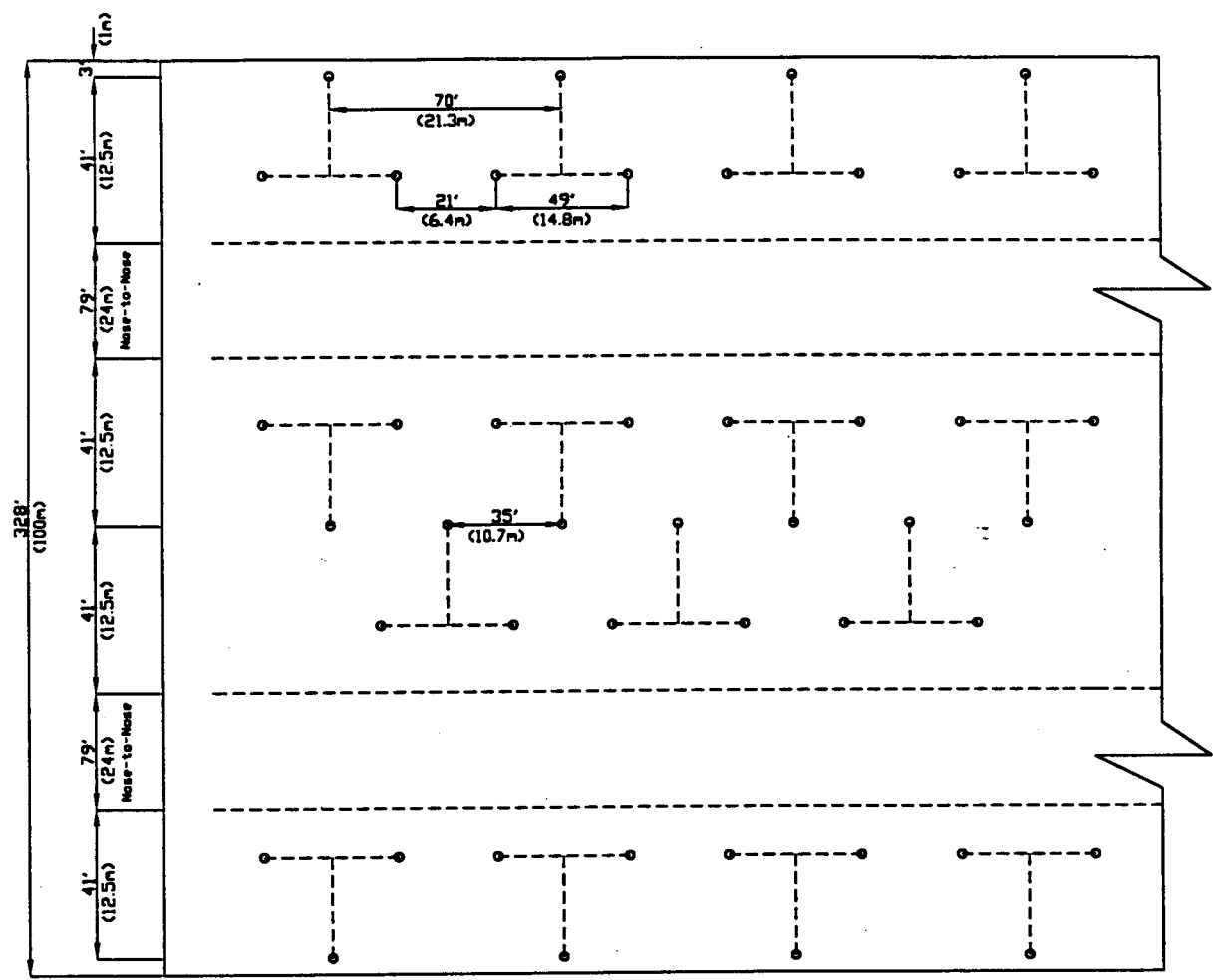
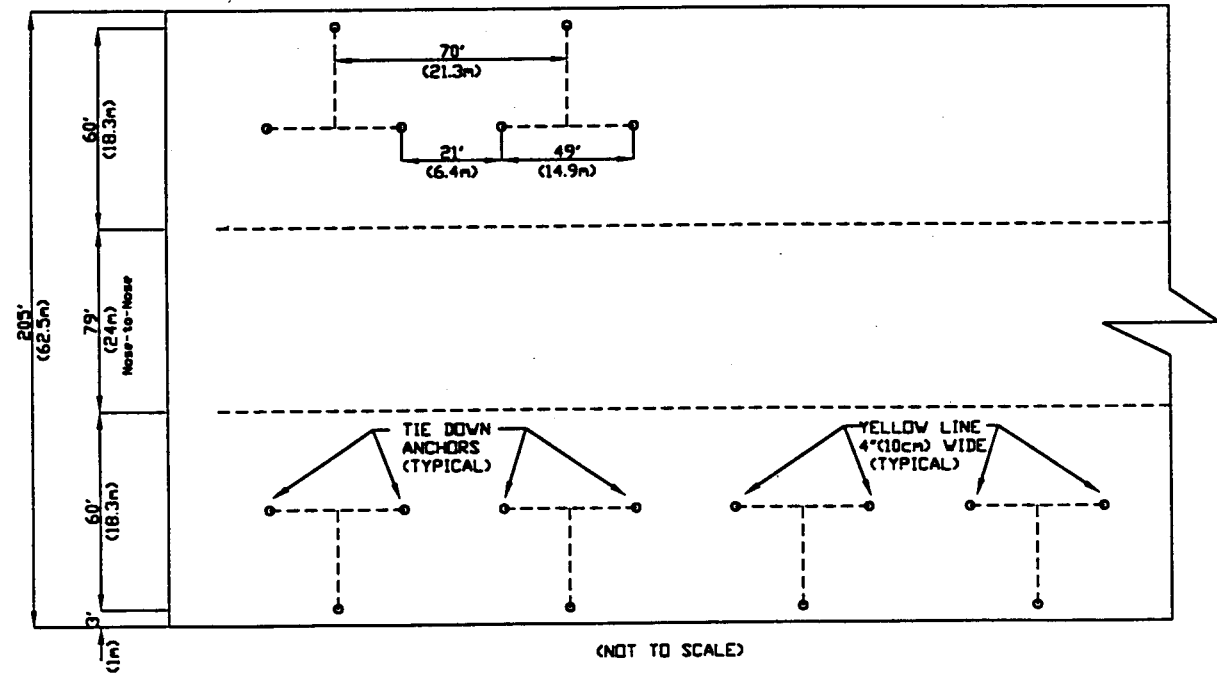


Figure A5-1. Parking apron area



(NOT TO SCALE)



(NOT TO SCALE)

Figure A5-2. Tiedown layouts

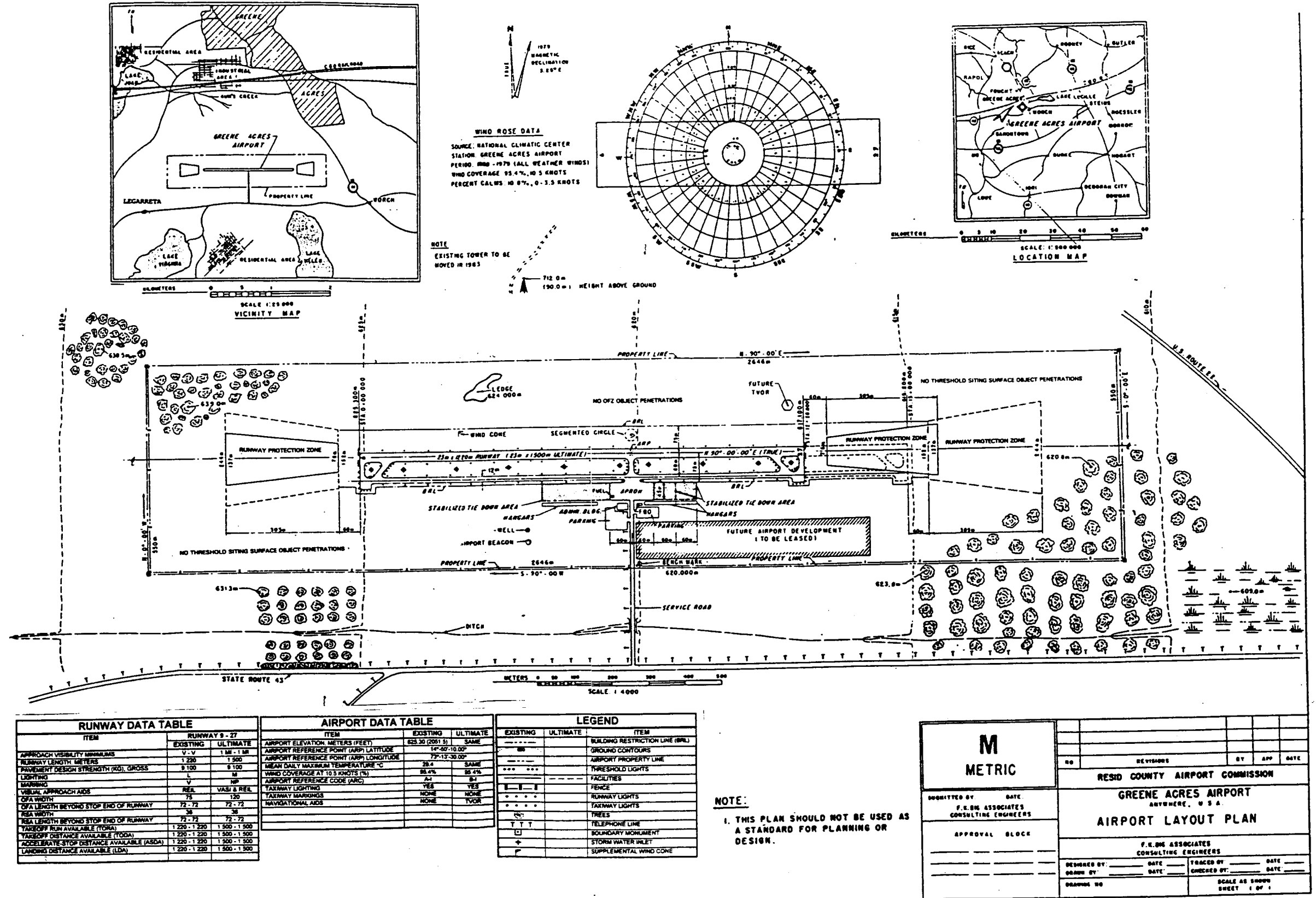


Figure A6-1. Typical airport layout plan



## Appendix 7. AIRPORT LAYOUT PLAN COMPONENTS AND PREPARATION

### AIRPORT LAYOUT PLAN COMPONENTS

1. Narrative Report
2. Airport Layout Drawing
3. Airport Airspace Drawing
4. Inner Portion of the Approach Surface Drawing
5. Terminal Area Drawing
6. Land Use Drawing
7. Airport Property Map

### AIRPORT LAYOUT PLAN (ALP) PREPARATION

1. **NARRATIVE REPORT.**
  - a. Definition - A condensed report explaining the reasoning behind, and important features of the ALP. The narrative report, in preliminary format, should accompany the first submission of a preliminary ALP for agency and sponsor review. (When Airport Layout Plan preparation is being accomplished in conjunction with a Master Plan Study, the Master Plan Report will contain this information so that a separate ALP Narrative Report is normally not needed.)
  - b. Includes:
    - (1) Basic aeronautical forecasts.
    - (2) Basis for proposed items of development.
    - (3) Rationale for unusual design features and/or modification to FAA Airport Design Standards.
    - (4) Development summary for stages of construction and layout sketches depicting the main items of development in that stage.

### c. Preparation Guidelines:

- (1) **Forecasts** - Extent depends on airport size and use. As a minimum, include 0-5, 6-10, 11-20 year forecasts for:
  - (a) Total annual operations.
  - (b) Annual itinerant operations (all aircraft).
  - (c) Based aircraft.
  - (d) Annual instrument approaches.
  - (e) Annual itinerant operations by current **design aircraft**.
  - (f) Annual itinerant operations by future more demanding airplane.
- (2) **Stage Development** - Summarize major developments for three stages (0-5, 6-10, and 11-20 year), and depict these stages on sketches.
- (3) **Coordination** - Obtain and append to the Report evidence that the ALP was coordinated with appropriate local and state governmental units (e.g., City or Metropolitan Planning Agency, County Board of Supervisors, State Highway Department, Utility Companies, etc.), and found to be consistent with their plans.
- (4) **Other** - Remember the primary purpose of the narrative report is to provide useful and understandable information and guidance to the airport sponsor. It also provides the FAA with important information needed to review and ultimately approve the ALP.

## 2. AIRPORT LAYOUT DRAWING.

### a. Features:

- (1) Layout of existing and proposed facilities and features.
- (2) Wind rose and coverage analysis.
- (3) Basic airport and runway data tables.
- (4) Legend and building tables.
- (5) Title and revision blocks.
- (6) Sponsor approval block.
- (7) List of approved modifications to FAA Airport Design Standards, including proposed and planned modifications to standards, such as the use of declared distances for airport design, expected to be approved as part of the ALP review and approval process.

### b. Preparation Guidelines:

- (1) Sheet size - 22" x 34".
- (2) Scale - Determined by airport size. Stay within range of 1" = 200' to 1" = 600' (1:2 000 to 1:8 000).
- (3) North Point - Indicate both True and Magnetic North and the year of the magnetic declination used. Orient drawing so that north is to the top of sheet. If this is not practicable, orient north so that it is to the left.
- (4) Wind Rose
  - (a) Cite data source (i.e., weather station) and time period covered.
  - (b) Include individual and combined coverage for:
    - 1) Runways with 10.5 knots crosswind.
    - 2) Runways with 13 knots crosswind.
    - 3) Runways with 16 knots crosswind.

4) Runways with 20 knots crosswind.

(5) Airport Reference Point (ARP) - Show location based on ultimate airport configuration with latitude and longitude to the nearest second based on NAD 83.

(6) Topographic Information - Show ground contours at intervals of 2 feet to 10 feet (1 m to 5 m) depending on terrain. Draw in with very light lines.

(7) Elevations: Include the following:

(a) Runway - at existing and ultimate ends, displaced thresholds, touchdown zones, intersections, high and low points - accuracy to the nearest 1/10 of a foot (1 cm) where the elevation is not subject to change with time.

(b) Structures on Airport - If Terminal Area Plan Drawing is not to be included, show top elevations on this sheet. Use table and numbering system.

(8) Building Restriction Lines - Show on both sides of runways and extend to airport property line or RPZ. Also, use to restrict buildings from "runway visibility zones."

(9) Runway Details - Include the following:

(a) Approach Visibility Minimums - Include designated or planned approach visibility minimums (V, 1 MILE, 3/4 MILE, 1/2 MILE, CAT II, or CAT III) in the Runway Data Table.

(b) Dimensions - Note length and width (for existing and ultimate) within outline of runway. Include the runway length in the Runway Data Table.



- (c) Pavement Design Strength - Include pavement design strength in the Runway Data Table.
- (d) Orientation - Depict runway end numbers and show true bearing -accuracy to nearest 0.01 degree.
- (e) Lighting - Depict existing and ultimate threshold lights with symbols. Show type of lighting (MIRL, etc.) in Runway Data Table. Don't depict runway edge lights on drawing.
- (f) Marking - Include the type of runway markings (V, NP, or P) in the Runway Data Table.
- (g) Stage Lengths - Show only existing and ultimate. (Depict interim stage lengths on stage development sketches in ALP Narrative Report.)
- (h) End Coordinates - Note end (existing and ultimate) of each runway - accuracy to nearest 0.01 second.
- (i) Monuments - Depict the location of all survey monuments and reference markers. As a minimum, monuments should be established to locate the runway centerline at the runway ends and at displaced thresholds. Include a note describing the manner in which these monuments are protected.
- (j) Declared Distances - Identify any clearway/stopway portions in the declared distances and any runway portions not included in the declared distances. Include all declared distances for all runway directions in the Runway Data Table. Declared distances associated with each runway direction may also be shown on the drawing (refer to appendix 14).
- (10) Object Free Areas (OFA) - Include the existing and ultimate OFA dimensions in the Runway Data Table as OFA width and length of OFA beyond the stop end of runway and/or depict the OFA on drawing with dimensions.
- (11) Safety Areas (RSA) - Include the existing and ultimate RSA dimensions in the Runway Data Table as RSA width and RSA length beyond the stop end of runway and/or depict the RSA on drawing with dimensions.
- (12) OFZ Details - Specify "NO OFZ OBJECT PENETRATIONS" when no object other than frangible NAVAIDS penetrates the OFZ. Otherwise show the object penetrations and indicate how they will be eliminated. The OFZ may be depicted on the drawing with dimensions to facilitate identifying object penetrations. Refer to paragraph 306 for the location, configuration, and dimensions of the OFZ.
- (13) Threshold Details - Depict the thresholds with coordinates - accuracy to nearest 0.01 second, elevation, displacement from runway end, and print "NO THRESHOLD SITING SURFACE OBJECT PENETRATIONS" when no object penetrates the threshold siting surface. Otherwise show the object penetrations and indicate how they will be eliminated. The threshold siting surface may be depicted on the drawing with dimensions to facilitate identifying object penetrations. Refer to appendix 2, paragraph 5 for the location, configuration, and dimensions of the threshold siting surface.
- (14) RPZ Details
- (a) Size - Dependent on operational use (refer to chapter 2). Indicate existing and ultimate sizes on drawing either with note or dimensions.

- (b) Property acquisition - Indicate type (fee or easement) with appropriate legend symbol. NOTE: Boundary of existing property interest may, or may not, coincide with current RPZ boundary.
- (c) Residences and Places of Public Assembly - Show residences and places of public assembly and how they will be removed on the drawing.
- (15) Holding Position Signs and Markings - Depict the holding position signs and markings distance from runway centerline. Use dimension lines.
- (16) Taxiway Details - Include the following:
  - (a) Dimensions - Show widths and separations from runway centerline, parallel taxiway, aircraft parking, and objects. Use dimension lines.
  - (b) Lighting and marking - Indicate by notes in Airport Data Table (refer to figure A6-1).
- (17) Airport Data Table - As per example in figure A6-1.
- (18) Runway Data Table - As per example in figure A6-1.
- (19) Legend Table - As per example in figure A6-1.
- (20) Building Table - Identify existing and proposed structures by number and include a description of the structure. When appropriate, expand to include a column for the top building elevations if a Terminal Area Drawing is not included.
- (21) Location and Vicinity Maps - These are optional.
- (22) Title and Revision Blocks - Refer to example in figure A6-1.

- (23) Approval Block - Include one for only the airport sponsor. (Submission of final ALPs for FAA approval must reflect sponsor approval of the Plan).

### 3. AIRPORT AIRSPACE DRAWING.

#### a. Includes:

- (1) Plan view of all 14 CFR Part 77 Subpart C surfaces based on ultimate runway lengths.
- (2) Small scale profile views of ultimate Part 77 Subpart C approaches.
- (3) Obstruction Data Tables, as appropriate (refer to inner portion of the approach surface discussion).

#### b. Preparation Guidelines:

- (1) Sheet size - same as Airport Layout drawing.
- (2) Scale - 1" = 2000' (1:20 000) recommended for the plan view. 1" = 1000' (1:10 000) (horizontal) and 1" = 100' (1:1 000) (vertical) for approach profiles.
- (3) Title and Revision Blocks - As per example in Chapter 9 of AC 150/5070-6.
- (4) Plan View Details
  - (a) Use current USGS 7 1/2 minute Quad. for base map when available.
  - (b) Show runway end numbers.
  - (c) Include 50-foot (20 m) elevation contours on all sloping surfaces.
  - (d) When horizontal and/or conical surfaces overlap the approach surface, draw in the more demanding surfaces with solid lines and the others with dashed lines.

- (e) Identify objects, and note top elevations thereof, which penetrate any of the surfaces, except those which are within the inner portion of the approach surfaces. For the latter, add note, "Refer to the inner portion of the approach surface plan view details for close-in obstructions."
  - (f) For precision instrument runways (i.e., approaches 50,000 feet (15 000 m) in length), use a cut line and show the balance of 40,000 feet (12 000 m) approach on a separate sheet.
  - (g) Include a note specifying any height restriction zoning ordinances/statutes in the airport environs.
  - (h) Other - Refer to example drawing in Chapter 9 of AC 150/5070-6.
- (5) Approach Profile Details
- (a) Depict the ground profile along the extended runway centerline representing the composite profile based on the highest terrain across the width and along the length of the approach surface.
  - (b) Depict all significant objects within the approach surfaces regardless of whether they are obstructions (e.g., roadways, rivers, bluffs, towers, etc.). Note top elevation of all significant objects.
  - (c) Show existing and ultimate runway ends and Part 77 Subpart C approach slopes.
- 4. INNER PORTION OF THE APPROACH SURFACE DRAWING.**
- a. Includes:
    - (1) For each runway end, a large scale plan view of the inner portion of the approach, usually limited to the area out to where the Part 77 Subpart C approach surface reaches a 100-foot (30 m) height above the runway end.
    - (2) Projected profile views of Item 1 above.
    - (3) Obstruction Tables.
  - b. Preparation Guidelines:
    - (1) Sheet size - same as other.
    - (2) Scale - Horizontal 1" = 200' (1:2 000)  
Vertical 1" = 20' (1:200).
    - (3) Title and Revision Blocks - Same as for Airport Layout Drawing.
    - (4) Plan View Details
      - (a) Use aerial photos for base maps when available.
      - (b) Use numbering system to identify obstructions.
      - (c) Depict property line when it is located within the area.
      - (d) When traverse ways (roads, railroads, waterways, etc.) cross the area beneath the approach surface, show the traverse way elevation and vertical clearance between the traverse way and the approach surface at the approach surface edges and extended runway centerline. Also, number these points for subsequent use on the profile drawings.

- (e) Depict existing and ultimate end of runway. Note runway end number.
  - (f) Show ground contours (with light line) within the area.
- (5) Profile View Details
- (a) Depict terrain along runway safety area and significant items such as fences, stream beds, roadways, etc., regardless of whether the items are obstructions.
  - (b) Identify obstructions with numbers used on plan view.
  - (c) Depict cross-section of roads and railroads with dashed lines where they intersect outer edges of approach surface.
- (6) Obstruction Table Details
- (a) Prepare separate table for each approach surface and specify type and slope of the Part 77 approach surface.
  - (b) Provide columns for obstruction identification number and description, the amount of approach surface penetration, and the proposed disposition of the obstructions, including no action.

## 5. TERMINAL AREA DRAWING.

(The need for this drawing will be decided on a case-by-case basis. For small airports, where the Airport Layout Drawing is prepared to a fairly large scale, a separate drawing for the terminal area may not be needed.)

- a. Includes: Large scale plan view of the area (or areas) where aprons, buildings, hangars, parking lots, etc., are located.

## b. Preparation Guidelines:

- (1) Sheet Size - Same as Airport Layout Drawing.
- (2) Scale - Range of 1" = 50' to 1" = 100' (1:500 to 1:1 000 m).
- (3) Title and Revision Block - Same as Airport Layout
- (4) Building Data Table - For listing structures and showing pertinent information relative to them. Include space and columns for:
  - (a) Structure identification number (identify structures on plan view with numbers instead of words).
  - (b) Top elevation of structures.
  - (c) Obstruction marking (existing and planned).
- (5) Legend - Include symbol for indicating planned removal, abandonment, etc.

## 6. LAND USE DRAWING.

- a. Definition - A drawing depicting existing and recommended use of all land within the ultimate airport property line (on airport) and in the vicinity of the airport (off airport to at least 65 LDN). The land uses should be depicted by general use categories (e.g., agriculture, recreational, industrial, aviation, commercial, etc.).
- b. Purpose - This drawing provides the airport management a plan for leasing revenue producing areas on the airport. It also provides guidance for determining allowable proximity of farming operations to runways and taxiways. Factors which need to be considered in the preparation of this plan include line of sight between runway ends and within the "runway visibility zones." Furthermore, the drawing provides guidance to local authorities for establishing appropriate zoning in the vicinity of the airport.

- c. Preparation Guidelines:
- (1) Sheet Size - Same as Airport Layout Drawing.
  - (2) Scale - Same as Airport Layout Drawing.
  - (3) Title and Revision Block - Same as Airport Layout Drawing.
  - (4) Base Map - Use aerial photos when available.
  - (5) Legend - Within the various parcels and/or areas on and off the airport, use standard drafting symbols (i.e., shading, cross hatching or other tonal effects) to identify recommended land uses by general category (e.g., agricultural, recreational, industrial, commercial, residential, aeronautical, etc.). Use notes to identify existing land uses by general category.
  - (6) Public Facilities - Depict the location of all public facilities (e.g., schools, hospitals, prisons, parks, etc.) in the vicinity of the airport.
  - (7) Drawing Details - Normally limited to existing and future airport features (i.e., runways, taxiways, aprons, runway protection zones, terminal buildings and NAVAIDs). The drawing should be sufficiently detailed to allow the airport management to determine limit lines for areas which must be kept in grass or restricted to low growing crops.
7. **AIRPORT PROPERTY MAP.**
- a. Definition - A drawing indicating how various tracts of land within the airport boundaries were acquired (e.g., Federal funds, surplus property, local funds only, etc.). Easement interests in areas outside the fee property line should also be included.
- b. Purpose - The primary purpose of this drawing is to provide information for analyzing the current and future aeronautical use of land acquired with Federal funds.
- c. Preparation Guidelines:
- (1) Sheet Size - Same as Airport Layout Drawing.
  - (2) Scale - Same as Airport Layout Drawing.
  - (3) Title and Revision Block - Same as Airport Layout Drawing.
  - (4) Legend - Use standard drafting symbols (i.e., shading, cross hatching, or other tonal effects) and legend table to indicate the type of acquisition involved with each tract or area.
  - (5) Data Table - A data table with a numbering or lettering system should be used to show pertinent data applicable to property acquisitions. As a minimum, the following data should be included:
    - (a) The date the property was acquired.
    - (b) The Federal aid project number under which the property was acquired. Like property interests acquired with Federal funds under the same project may be grouped together and shown as one tract or area.
  - (6) Drawing Details - Normally limited to existing and future airport features (i.e., runways, taxiways, aprons, runway protection zones, terminal buildings and NAVAIDs) which would indicate aeronautical need for airport property.
    - (a) Details should be subordinated to property lines and tract outlines by half toning, screening, or other similar techniques.

- (b) A screened reproducible of the Airport Layout Drawing may be used as the base for the Airport Property Map.
- (c) Airport boundary lines and lines depicting property interest areas should be bold so as to stand out from background details.

## Appendix 16. NEW INSTRUMENT APPROACH PROCEDURES

1. **BACKGROUND.** This appendix applies to the establishment of new authorized instrument approach procedures. A Global Positioning System (GPS) instrument procedure duplicating an existing authorized instrument procedure is not a new procedure.

a. FAA Order 8260.3, United States Standards for Terminal Instrument Procedures (TERPS), paragraph 122, includes minimum standards for the approval of an instrument approach procedure. These minimum standards include in part:

(1) The airport landing surface must be adequate to accommodate the aircraft which can be reasonably expected to use the procedure.

(2) The airport must have been found acceptable for IFR operations as a result of an Airport Airspace Analysis (AAA) conducted pursuant to FAA Order 7400.2, Procedures for Handling Airspace Matters.

b. This appendix identifies these airport landing surface requirements to assist airport sponsors in their evaluation and preparation of the airport landing surface to support new instrument approach procedures. It also lists the airport data provided by the procedure sponsor which the FAA needs to conduct the airport airspace analysis specified in FAA Order 7400.2.

c. FAA Order 7400.2 is in the process of being revised to include the content of this appendix in a revised streamlined AAA process.

d. FAA Order 8260.19, Flight Procedures and Airspace, is also in the process of being revised to include the content of this appendix as the minimum airport landing surface requirements which must be met prior to the establishment of instrument approach procedures at a public use airport.

2. **INTRODUCTION.** For a runway to have a new authorized instrument approach procedure, the runway must have an instrument runway designation. Instrument runways are runway end specific. Their runway end designation is based on the findings of an AAA study (Refer to Order 7400.2.)

a. For airports with an FAA-approved ALP, the instrument runway designation for the desired minimums must be depicted on the FAA-approved ALP. If not depicted, a change to the ALP is required. As part of the ALP approval process, the FAA will conduct an AAA study to determine the runway's acceptability for the desired minimums.

b. For other airports, the FAA, with the airport data submitted by airport sponsors and/or others, will conduct an AAA study to determine the runway's acceptability for the desired minimums. This assistance by the sponsor in providing the required airport data is a prerequisite in obtaining a favorable determination. In many cases, this is the only data available to the FAA for conducting the AAA study.

3. **ACTION.** The airport landing surface must meet the standards specified in table A16-1 for each specified runway direction and have adequate airspace to support the instrument approach procedure. When requesting an instrument procedure, the sponsor of the instrument approach procedure must specify the runway direction for the procedure, the desired approach minimums for each runway direction, and whether circling approach procedures are desired, as well as provide the following airport data for each specific runway direction:

a. For airports with an FAA-approved ALP, provide a copy of the FAA-approved ALP and, if required, submit a change to the ALP.

b. For other airports, provide the airport data identified in table A16-2 for visibility minimums of  $\geq 1$  statute mile and a decision height (or minimum descent altitude)  $\geq 400$  feet. Use table A16-3 for lower minimums. Minimums of  $\geq 1$  statute mile and  $\geq 400$  feet are approach visibility minimums of greater than or equal to 1 statute mile and Decision Height or Minimum Descent Altitude above the Runway Touchdown Zone of greater than or equal to 400 feet.

**Table A16-1. Instrument approach requirements**

Minimums and Airport Features <sup>1</sup>	1/2-statute mile and 200 feet	3/4-mile statute and < 300 feet	3/4-statute mile and ≥ 300 feet	≥1-statute mile and ≥400 feet
Airport Layout Plan <sup>2</sup>	<i>Required</i>	<i>Required</i>	<i>Required</i>	<i>Required</i>
TERPS Para 332 surfaces	34:1 clear	20:1 clear	20:1 clear	NA
Minimum Runway Length	4,200 ft ( <i>Paved</i> ) 1 280 m ( <i>Paved</i> )	3,500 ft ( <i>Paved</i> ) 1 067 m ( <i>Paved</i> )	3,500 ft ( <i>Paved</i> ) 1 067 m ( <i>Paved</i> )	2,400 ft 732 m
Runway Markings	<i>Precision</i>	<i>Precision</i>	<i>Nonprecision</i>	<i>Visual</i> <sup>3</sup>
Holding Position Signs & Markings (See AC 150/5340-1 and AC 150/5340-18)	<i>Required</i>	<i>Required</i>	<i>Required</i>	<i>Required</i> <sup>3</sup>
Runway Edge Lights <sup>4</sup>	<i>Medium Intensity Runway Lights</i>	<i>Medium Intensity Runway Lights</i>	<i>Medium Intensity Runway Lights</i>	<i>Low Intensity Runway Lights</i>
Parallel Taxiway <sup>5</sup>	<i>Required</i>	<i>Required</i>	Recommended	Recommended
Approach Lights	<i>MALSR</i>	Recommended <sup>6</sup>	Recommended <sup>6</sup>	Not Required
Obstacle Free Zone (OFZ) <sup>7</sup>	<3/4-statute mile approach visibility minimums	≥3/4-statute mile approach visibility minimums	≥3/4-statute mile approach visibility minimums	≥3/4-statute mile approach visibility minimums
Threshold Siting Criteria To Be Met <sup>7</sup>	<i>Appendix 2, Paragraph 5e Criteria</i>	<i>Appendix 2, Paragraph 5d Criteria</i>	<i>Appendix 2, Paragraph 5d Criteria</i>	<i>Appendix 2, Paragraph 5b &amp; c Criteria</i>

1. Minimums are subject to the application of FAA Order 8260.3 (TERPS). For CAT II and CAT III, also refer to AC 120-28, Criteria for Approval of Category III Landing Weather Minima, and AC 120-29, Criteria for Approving Category I and Category II Landing Minima for FAR 121 Operators.
2. For airports not obligated by Federal agreement to maintaining a current Airport Layout Plan, an engineering drawing providing the information in table A16-2 for minimums of ≥1 statute mile and ≥ 400 feet and table A16-3 for lower minimums, reflecting compliance with the above criteria, is acceptable in lieu of an Airport Layout Plan.
3. Unpaved runways require case-by-case evaluation.
4. Runway edge lighting is required for night minimums. High intensity lights are required for RVR-based minimums.
5. A parallel taxiway must lead to the threshold and, with airplanes on centerline, keep the airplanes outside the OFZ.
6. To achieve lower visibility minimums based on credit for lighting, a SSALS, MALSR, or ALSF (or ALS for 1/2 mile visibility reduction), as specified by TERPS, is required.
7. Circling procedures to a secondary runway from the primary approach will not be authorized when the secondary runway does not meet threshold siting (reference Appendix 2) and OFZ (reference paragraph 306) criteria.



**Table A16-2. Airport information for desired minimums of  $\geq 1$ -statute mile and  $\geq 400$  feet**

1. **Layout of Existing Facilities and Features**. Refer to figures 2-1 and A6-1.
  - a. **North Point** - Indicate both True and Magnetic North and the year of the declination. Orient drawing so that north is at the top of sheet. If this is not practicable, orient north so that it is to the left.
  - b. **Runway Details** - Include the following:
    - (1) Depict the length, width, and physical ends of runway and runway safety area.
    - (2) Note the runway end coordinates and elevation to accuracies described in Appendix 7.
    - (3) Note the length and width of the runway and the runway safety area.
    - (4) Depict the runway end numbers and show true bearing for each direction.
  - c. **Holding Position Signs and Markings** - Depict the holding position signs and markings distance from runway centerline. Use dimension lines.
  - d. **OFZ Details** - Depict the OFZ with dimensions and note "NO OFZ OBJECT PENETRATIONS" when no object, other than frangible NAVAIDS, penetrates the OFZ. Otherwise show the penetration(s) and indicate how it (they) will be eliminated. Paragraph 306 and Table A16-4 describe the OFZ.
  - e. **Threshold Details** - Depict thresholds with coordinates, elevation, displacement from runway end. Note "NO THRESHOLD SITING SURFACE OBJECT PENETRATIONS" when no object penetrates the OFZ. Otherwise, show any object that penetrates this surface and note how it will be eliminated. Table A16-4 describes the threshold siting surface.
2. **Airport Data Table** - Refer to example in figure A6-1.
  - a. **Airport Elevation** - Include the airport elevation to an accuracy as described in Appendix 7.
  - b. **Airport Reference Point (ARP)** - Note the ultimate planned ARP location.
3. **Runway Data Table** - Refer to example in figure A6-1.
  - a. **Runway Marking** - Specify type of runway marking (Visual, Nonprecision, Precision, etc.).
  - b. **Runway Lighting** - Specify type of runway edge lighting (None, LIRL, MIRL, HIRL).
4. **Legend Table** - Refer to example in figure A6-1.

**Table A16-3. Airport information for lower minimums**

1. **Layout of Existing Facilities and Features.** Refer to figures 2-1 and A6-1.
  - a. **North Point** - Indicate both True and Magnetic North and the year of the declination used. Orient drawing so that north is at the top of sheet. If this is not practicable, orient north so that it is to the left.
  - b. **Runway Details** - Include the following:
    - (1) Depict the length, width, and physical ends of runway and runway safety area.
    - (2) Note the runway end coordinates and elevation to accuracies described in Appendix 7, as well as the elevation of the highest point in the first 3,000 feet (915 m) from the threshold.
    - (3) Note the length and width of the runway and the runway safety area.
    - (4) Depict the runway end numbers and show true bearing for each direction.
  - c. **Holding Position Signs and Markings** - Depict the holding position signs and markings distance from runway centerline. Use dimension lines.
  - d. **Taxiway Details** - Depict the taxiway centerline separation distance from runway centerline. Use dimension lines.
  - e. **OFZ Details** - Depict the OFZ with dimensions. Note "NO OFZ OBJECT PENETRATIONS" when no objects other than frangible NAVAIDS penetrate the OFZ. Otherwise, show the penetrations and indicate how they will be eliminated. Paragraph 306 describes the OFZ.
  - f. **Threshold Details** - Depict thresholds, with coordinates, elevation, displacement from runway end. Note "NO THRESHOLD SITING SURFACE OBJECT PENETRATIONS" when no object penetrates the OFZ. Otherwise, show any object penetrating the threshold siting surface and note how it will be eliminated. Appendix 2, paragraph 5, describes the threshold siting surface.
2. **Airport Data Table** - Refer to example in figure A6-1.
  - a. **Airport Elevation** - Include the airport elevation to an accuracy as described in Appendix 7.
  - b. **Airport Reference Point (ARP)** - Note the ARP location based on ultimate planned airport configuration with latitude and longitude to the nearest second based on NAD 83.
3. **Runway Data Table** - Refer to example in figure A6-1.
  - a. **Runway Marking** - Specify type of runway marking (Visual, Nonprecision, Precision, etc.).
  - b. **Runway Lighting** - Specify type of runway edge lighting (None, LIRL, MIRL, HIRL).
  - c. **Approach Lighting** - Specify type (None, ODALS, MALS, MALSR, etc.).
4. **Legend Table** - Refer to example in figure A6-1.

**Table 16-4. OFZ and threshold siting surface for minimums of  $\geq 1$ -statute mile and  $\geq 400$  feet**

1. **OFZ<sup>1</sup>** - The OFZ is the airspace above a surface centered on runway centerline whose elevation at any point is the same as the elevation of the nearest point on the runway centerline. The runway OFZ extends 200 feet (60 m) beyond each end of the runway. Its width is:
  - a. 400 feet (120 m) for runways serving airplanes of more than 12,500 pounds (5 700 kg) maximum certificated takeoff weight, and
  - b. 250 feet (75 m) for runways serving airplanes of 12,500 pounds (5 700 kg) or less maximum certificated takeoff weight exclusively.
2. **Threshold Siting Surface** - The threshold siting surface starts at the threshold, at the threshold elevation, and slopes upward from the threshold at a slope 20 (horizontal) to 1 (vertical). In the plan view:
  - a. **for runways serving airplanes of more than 12,500 pounds (5 700 kg) maximum certificated takeoff weight**, the centerline of this surface extends 10,000 feet (3 000 m) along the extended runway centerline. This surface extends laterally 200 feet (60 m) on each side of the centerline at the threshold and increases in width to 500 feet (150 m) at a point 1,500 feet (450 m) from the threshold; thereafter, it extends laterally 500 feet (150 m) on each side of the centerline.
  - b. **for runways serving airplanes of 12,500 pounds (5 700 kg) or less maximum certificated takeoff weight exclusively**, the centerline of this surface extends 5,000 feet (1 530 m) along the extended runway centerline. This surface extends laterally 125 feet (38 m) on each side of the centerline at the threshold and increases in width to 350 feet (110 m) at a point 2,250 feet (690 m) from the threshold; thereafter, it extends laterally 350 feet (110 m) on each side of the centerline.

1. More information on OFZ criteria is found in Paragraph 306.



**Appendix 17. ACRONYMS**

The acronyms presented herein are intended for use with this publication only.

AAA	Airport Airspace Analysis	NDB	Nondirectional Beacon
AC	Advisory Circular	NP	Non-Precision (Markings)
AD	Airport Design	NTIS	National Technical Information Service
ADG	Airplane Design Group	ODALS	Omnidirectional Approach Lighting System
AIP	Airport Improvement Program	OFA	Object Free Area
ALP	Airport Layout Plan	OFZ	Obstacle Free Zone
ALS	Approach Lighting System	OM	Outer Marker
ARC	Airport Reference Code	P	Precision (Markings)
ARP	Airport Reference Point	PAPI	Precision Approach Path Indicator
ASDA	Accelerate-Stop Distance Available	RAIL	Runway Alignment Indicator Lights
ASDE	Airport Surface Detection Equipment	ROFA	Runway Object Free Area
ASR	Airport Surveillance Radar	RPZ	Runway Protection Zone
ATC	Air Traffic Control	RSA	Runway Safety Area
ATCT	Airport Traffic Control Tower	RVR	Runway Visual Range
AWOS	Automated Weather Observing System	RW	Runway
AZ	Azimuth	SWY	Stopway
BRL	Building Restriction Line	TERPS	Terminal Instrument Procedures
CAT	Category	TH	Threshold
CFR	Code of Federal Regulation	TL	Taxilane
CFW	Center Field Wind	TODA	Takeoff Distance Available
CWY	Clearway	TORA	Takeoff Run Available
DME	Distance Measuring Equipment	TSA	Taxiway Safety Area
DXF	AutoCAD Drawing Interchange file format	TVOR	Very High Frequency Omnidirectional Beacon located on an airport
EDS	Environmental Data Service	TW	Taxiway
EL	Elevation	USGS	United States Geological Service
FBO	Fixed Base Operator	V	Visual (Markings)
GS	Glide Slope	V <sub>1</sub>	Takeoff decision speed
GVGI	Generic Visual Slope Indicator	V <sub>2</sub>	Takeoff safety speed
IFR	Instrument Flight Rules	VFR	Visual Flight Rules
IGES	Initial Graphics Exchange Specification file format	V <sub>LOF</sub>	Lift-off speed
ILS	Instrument Landing System	V <sub>SO</sub>	Stalling speed or the minimum steady flight speed in the landing configuration
IM	Inner Marker	VOR	Very High Frequency Omnidirectional Beacon
IMC	Instrument Meteorological Conditions		
LDA	Landing Distance Available		
LDIN	Lead-In Lights		
LIRS	Low Impact Resistant Supports		
LOC	Localizer		
MALS	Medium Intensity Approach Lighting System		
MALSF	Medium Intensity Approach Lighting System with Sequenced Flashers		
MALSR	Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights		
MLS	Microwave Landing System		
MM	Middle Marker		
MSL	Mean Sea Level		
NAVAID	Navigational Aid		
NCDC	National Climatic Data Center		



**Appendix 18. INDEX**

Accelerate-Stop Distance Available (ASDA)	
definition.....	2
length.....	276
Acronyms.....	297
Adaptation of Airport Design Standards.....	5
Administration Building.....	118
Advisory Circular (AC).....	3
Aeronautical Studies.....	6, 13
Aircraft Approach Category	
airplane listing.....	251
definition.....	1
selection.....	4
Aircraft Parking Area.....	10, 14, 15, 117, 139
Airplane Data.....	156, 165, 251
Airplane Design Group (ADG)	
airplane listing.....	251
definition.....	1
selection.....	4
Airport Buildings.....	117
Airport Design Standards Modification.....	5
Airport Elevation	
definition.....	1
Airport Layout Plan (ALP)	
application.....	9
components.....	131
definition.....	1
preparation.....	131
requirements.....	5
typical plan.....	126
Airport property requirements.....	9
Airport Reference Code (ARC)	
definition.....	4
standards.....	4
Airport Reference Point (ARP)	
definition.....	1
standards.....	107
Airport Rotating Beacon.....	65
Airport Surface Detection Equipment (ASDE).....	66
Airport Surveillance Radar (ASR).....	66
Airport Survey.....	122
Airport Traffic Control Tower (ATCT).....	65
Airport Traffic Control Tower Visibility.....	10, 35
Airspace Availability.....	9
Approach Lighting System (ALS)	
ALSF-2.....	64
MALS.....	64
MALSF.....	64
MALSR.....	64
Apron for Based Airplanes.....	117
Aprons	
criteria.....	10
gradient.....	54
Auto Parking.....	13, 123
Aviation easements.....	9
Bird Hazards.....	10
Blast Fence	
criteria.....	77
definition.....	1
Bridges	
approach aprons.....	70
blast protection.....	70
curbs.....	70
height.....	69
length.....	69
load considerations.....	69
longitudinal grades.....	69
marking and lighting.....	69
pavement heating.....	70
security fences.....	70
service roads.....	70
siting precepts.....	69
width.....	69
Building Plan.....	122
Building Restriction Line (BRL)	
criteria.....	12
definition.....	1
Bypass Taxiway.....	34
Category I (CAT I) Runway.....	2
Category II (CAT II) Runway.....	2
Category III (CAT III) Runway.....	2
Center Field Wind (CFW) Installations.....	66
Clear Zone.....	1
Clear Zone (See Runway Protection Zone).....	2, 13, 276
Clearway (CWY)	
definition.....	1
standards.....	22, 139, 276
Compass Calibration Pad	
criteria.....	111
definition.....	1
Computer Program.....	34, 35, 88, 146, 153
Crosswind Runway.....	10, 87
Crosswinds	
definition.....	87
Declared Distances	
criteria.....	275, 276
definition.....	1
Displaced Threshold	
definition.....	3
siting requirements.....	101
Dual Parallel Taxiway.....	35
Eating Facilities.....	123
Electronic Deliverables.....	283
Entrance Taxiway.....	34
Environmental	
assessments.....	6, 9
Exit Taxiway.....	35, 142
FAA Studies of Objects.....	6, 13

Federal Assistance .....	6	Object Clearing Criteria	
Frangible NAVAID		recommendations .....	13
definition .....	2	standards .....	12
Hangars .....	118	Object Free Area (OFA)	
Hazard to Air Navigation		definition .....	2
definition .....	2	standards .....	22, 33, 276
determination .....	6	Obstacle Free Zone (OFZ)	
presumption .....	2	definition .....	2
Holding Bay .....	34	standards .....	21, 139
Holdline		Obstruction to Air Navigation	
to runway .....	10, 14, 15, 139	definition .....	2
Inner-approach OFZ		presumption .....	2
definition .....	2	survey requirement .....	9
standards .....	22	Omindirectional Approach Lighting System	
Inner-transitional OFZ		(ODALS) .....	65
definition .....	2	Parallel Taxiway .....	33
standards .....	22	Property requirements .....	9
Instrument Approach Procedures .....	291	Public Restrooms .....	123
Instrument Landing System (ILS)		Recommendations	
glide slope .....	61, 62	requirement .....	1
localizer .....	61, 62	Related Reading Material .....	3
marker beacons .....	61, 63	Relocated Threshold	
Jet Blast		definition .....	3
heat effects .....	77	siting requirements .....	101
pressures .....	77	Rescue and Firefighting Access Roads .....	23
velocity distances .....	77	Roads .....	123
Landing Distance Available (LDA)		Runway (RW)	
definition .....	2	definition .....	2
length .....	276	gradient .....	49
Large Airplane		length .....	21
definition .....	2	line of sight .....	56
Lead-in Lighting System (LDIN) .....	65	location .....	9
Local Role .....	6	orientation .....	9, 87
Low Impact Resistant Supports (LIRS)		requirements for additional runways .....	10, 87
definition .....	2	to aircraft parking area .....	10, 14, 15, 139
Manager's Office .....	123	to helicopter touchdown pad .....	10, 14, 15
Metric Conversion .....	125	to holdline .....	10, 14, 15, 139
Microwave Landing System (MLS) .....	59	to parallel runway .....	11
Modification of Airport Design Standards .....	5	to parallel taxilane .....	10, 12, 14, 15, 139
Navigational Aids (NAVAIDs)		to parallel taxiway .....	10, 12, 14, 15, 139
clearing requirements .....	59	width .....	21
non-Federal .....	59	Runway Blast Pad	
protection .....	59, 67	definition .....	2
siting .....	59	drainage .....	78
Nondirectional Beacon (NDB) .....	63	gradient .....	54
Notice to the FAA		length .....	21, 78
airport development .....	5	marking and lighting .....	78
proposed construction .....	6	surface characteristics .....	21
Object		surface strength .....	78
definition .....	2	width .....	21, 78
		Runway Object Free Area	
		background .....	139
		definition .....	2
		standards .....	22, 276



Runway OFZ			
definition.....	2		
standards.....	21		
Runway Protection Zone (RPZ)			
criteria .....	13, 140, 276		
definition.....	2		
Runway Safety Area (RSA)			
background .....	139		
definition.....	3		
gradient.....	54		
length.....	21, 276		
surface characteristics.....	21		
width.....	21		
Runway Shoulder			
definition (See Shoulder).....	3		
drainage.....	78		
gradient.....	54		
marking and lighting.....	78		
strength.....	78		
surface characteristics.....	21		
width.....	21, 78		
Runway visibility zone .....	56		
Runway Visual Range Facilities .....	66		
Separation Standards.....	10, 14-16		
Shoulder			
definition.....	3		
Small Airplane			
definition.....	3		
Standards			
applicability .....	5		
modification.....	5		
requirement.....	1		
State Role.....	6		
Stopway (SWY)			
definition.....	3		
gradient.....	49		
location .....	23		
standards.....	139		
surface characteristics.....	23		
width.....	23		
Takeoff Distance Available (TODA)			
definition.....	1		
length.....	276		
Takeoff Run Available (TORA)			
definition.....	1		
length.....	276		
Taxilane (TL)			
airport traffic control tower visibility.....	35		
definition.....	3		
dimensional standards .....	33		
on apron edge.....	35		
to object.....	10, 16, 141		
to parallel runway.....	10, 12, 14, 15, 139		
to parallel taxilane.....	10, 16, 141		
to parallel taxiway.....	10, 16, 141		
to parked aircraft .....	10, 16, 141		
to service and maintenance roads.....	10, 16, 141		
Taxilane Object Free Area			
definition .....	2		
standards .....	33		
width .....	33, 141		
wingtip clearance.....	33		
Taxiway (TW)			
airport traffic control tower visibility.....	35		
definition .....	3		
dimensional standards.....	33		
edge safety margin .....	34, 36		
gradient .....	54		
intersections.....	34		
layout.....	10		
line of sight.....	56		
on apron edge .....	35		
pavement fillet.....	34, 36, 38, 149		
taxiway between parallel runways .....	35		
to object .....	10, 16, 141		
to parallel runway .....	10, 12, 14, 15, 139		
to parallel taxilane .....	10, 16, 141		
to parallel taxiway.....	10, 16, 141		
to parked aircraft .....	10, 16, 141		
to service and maintenance roads.....	10, 16, 141		
width .....	33, 36, 141		
Taxiway Object Free Area			
definition .....	2		
standards .....	33		
width .....	33, 141		
wingtip clearance.....	33		
Taxiway Safety Area (TSA)			
definition .....	3		
gradient .....	54		
surface characteristics .....	33		
width .....	33, 142		
Taxiway Shoulder			
definition (See Shoulder) .....	3		
drainage.....	78		
gradient .....	54		
marking and lighting .....	78		
strength .....	78		
surface characteristics .....	33		
width .....	33, 78		
Terminal Very High Frequency Omnidirectional Range (TVOR)....	64		
Threshold (TH)			
definition .....	3		
siting requirements .....	101		
Tiedowns .....	117, 118		
Transient Apron.....	117		
Tunnels			
drainage.....	70		
lighting .....	70		
passenger and baggage.....	70		
ventilation .....	70		

Appendix 18

Turnaround ..... 35  
Vehicle Parking..... 13, 123  
Visual Runway  
    definition..... 3  
Waiting Room ..... 122  
Wind Analysis..... 9, 87  
Wind Coverage..... 87  
Wingtip Clearance..... 33, 146