CHAPTER THREE
AIRPORT FACILITY REQUIREMENTS

Introduction

This chapter uses the results of the inventory and aviation activity forecasts conducted in Chapter Two, as well as established planning criteria, to determine the airside and landside facility requirements through the current twenty-year planning period. Airside facilities include runways, taxiways, navigational aids and lighting systems. Landside facilities include hangars, fixed base operator (FBO) facilities, aircraft parking apron, aircraft fueling, automobile parking, utilities and surface access.

Detailed descriptions are provided for applicable FAA airport design and airspace planning standards to be applied to Methow Valley State Airport. These standards are consistent with the existing and forecast activity (including the design aircraft) for runways used by large aircraft. Standards for both visual and non precision instrument approach capabilities are presented. The feasibility of developing an instrument approach to the airport is currently being evaluated by FAA and that information will be considered when planned facility upgrades are finalized.

The facility requirements evaluation is used to identify the adequacy or inadequacy of existing airport facilities and to identify what new facilities may be needed during the planning period based on forecast demand. Options for providing these facilities will be evaluated in Chapter Four to determine the most cost effective and efficient means for implementation.

Historic Airport Planning Overview

The most recent FAA-approved ALP for the airport was prepared in 1995. The primary of the 1995 ALP was a planned runway reconfiguration and reconstruction. The ALP depicts limited facility improvements on the west side of the runway including a new apron and hangar sites. The plan recommended removal of several hangars located south of the USFS complex on the east side of the runway. No future parallel taxiways or major access taxiways are depicted on the drawing.

The recommendations from the 1986 ALP to construct an east parallel taxiway and an aircraft apron, fixed base operation (FBO) facilities and hangars near the northeast corner of the airport were not maintained.

The 1995 ALP indicates a future airport reference code (ARC) of A-II, with some references made to standard based on "small" aircraft. Some facilities, such as the runway and taxiway widths are largely consistent with ADG II dimensional standards. However, other standards such as aircraft parking and building setbacks and runway protection zones are not consistent with ADG II standards. The mixed use of small and large design standards reflected on the 1995 ALP does not appear to reflect a facility configuration that is entirely adequate for ADG II design aircraft.

LAND UTILIZATION

The current FAA Airport Master Record (Form 5010-1) lists airport acreage at 65 acres. However, a review of the current airport property ownership mapping indicates that overall acreage is approximately 87 acres. WSDOT will document existing parcel ownership status and verify the total acreage currently in airport ownership to reflect in the updated ALP and Exhibit "A" Airport Property Plan. **Table 3-1** summarizes the existing areas and land uses, based on the estimated 87 acres and a review of aerial photography.

The airport land area includes the runway and its protected areas and landside areas on the east and west side of the runway. As noted in the inventory, the existing airport land base is relatively limited in size beyond the runway area. The west landside area includes the public aircraft parking apron and previously a small hangar which was recently removed after its roof collapsed. USFS-related helicopter parking and ground operations are also accommodated in the grass area along the runway during fire season. The east landside area includes four hangars located south of the USFS complex, and a small undeveloped area along the northern one-third of the runway.

TABLE 3-1: METHOW VALLEY STATE AIRPORT LAND USE CONFIGURATION

Existing Land Use	Acreage *(rounded)*	Percentage of Total Airport Property *(rounded)*
Airside Area Runway, Runway Protection Zones, Object Free Area, Runway Safety Area, Obstacle Free Zone, Primary Surface	60.4	69%
West Landside Area Aircraft Parking Apron; helicopter parking	22.9	26%
East Landside Area Hangars and Undeveloped Land (does not include off-airport development)	3.7	4%
Total	**87**	**100%**

The airport's available undeveloped west landside area may have adequate capacity to accommodate the modest 20-year forecast demand for facilities (i.e., hangars, apron parking, etc.). However, the shape and the limited depth of this land area significantly limit the configuration of facilities. In addition, the existing airport property configuration does not fully accommodate several protected areas for the runway. Without property acquisition or changes to Evans Road, some shortening of Runway 13/31 may be required to meet FAA design standards. The east side of the runway does not have sufficient area to accommodate new hangars or aircraft parking, while observing FAA runway or future parallel taxiway clearance standards.

AIRSPACE

The airspace structure in the vicinity of Methow Valley State Airport is uncomplicated and is not expected to constrain future airport development or operation. Mountainous terrain in the vicinity of the airport creates several unique operational considerations for pilots.

The FAR Part 77 airspace surfaces previously associated with Runway 13/31 were based on visual approach capabilities and use by small aircraft (weighing less than 12,500 pounds). [1,2] However, as noted earlier, based on the runway's physical characteristics and use, airspace planning criteria for runways designed to accommodate large aircraft (more than 12,500 pounds) is appropriate. The updated analysis of airspace for Runway 13/31 should be based on "larger-than-utility" standards for either visual or nonprecision instrument runways, depending on the findings of an FAA feasibility assessment for instrument approach development being performed for the runway.

[1] In FAR Part 77, utility runways are designed to accommodate aircraft weighing less than 12,500 pounds.
[2] As depicted on current FAA-approved Airport Airspace Drawing (W&H Pacific 1995)

It is noted that visual PART 77 airspace surfaces are also compatible with circling instrument approach procedures. A circling instrument approach provides guidance to the airport environment, rather than a particular runway end, and the pilot must maintain visual contact with the airport environment once passed the missed approach point.

The 1995 Airspace Plan depicts large areas of terrain penetration in the horizontal and conical surfaces, west and east of the runway. Terrain penetrations to the airspace surfaces will be reviewed during development of an updated FAR Part 77 airspace plan drawing.

The displaced thresholds located on both runway ends mitigate close-in obstructions for landing aircraft. However, displaced thresholds do not alter the configuration or obstruction clearance for FAR Part 77 airspace surfaces. Options for relocating roadways away from runway ends should be considered in the alternatives analysis to improve approach clearances and reduce or eliminate the need for displaced thresholds.

AIRPORT DESIGN STANDARDS

The selection of the appropriate design standards for the development of airfield facilities is based primarily upon the characteristics of the aircraft that are expected to use the airport. The most critical characteristics are the approach speed and wingspan of the design aircraft anticipated for the airport. The **design aircraft** is defined as the most demanding aircraft type operating at the airport with a minimum of 500 annual itinerant operations (takeoffs and landings). This level of annual activity is considered to be "substantial use" by FAA.

Federal Aviation Administration (FAA) **Advisory Circular (AC) 150/5300-13, Airport Design**, serves as the primary reference in planning airfield facilities. Federal Air Regulation (**FAR) Part 77, Objects Affecting Navigable Airspace**, defines airport imaginary surfaces, which are established to protect the airspace immediately surrounding a runway. The airspace and ground areas surrounding a runway should be free of obstructions (i.e., structures, parked aircraft, terrain, trees, etc.) to the greatest extent possible.

FAA **Advisory Circular 150/5300-13** groups aircraft into five categories based upon their approach speed. Categories A and B include small propeller aircraft, some smaller business jet aircraft, and some larger aircraft with approach speeds of less than 121 knots. Categories C, D, and E consist of the remaining business jets as well as larger jet and propeller aircraft generally associated with commercial and military use; these aircraft have approach speeds of 121 knots or more. The advisory circular also establishes six airplane design groups (ADG), based on the physical size (wingspan) of the aircraft. The categories range from ADG I, for aircraft with wingspans of less than 49 feet, to ADG VI for the largest commercial and military aircraft. ADG

I is further divided into two subcategories: runways serving "small airplanes exclusively" and runways serving aircraft weighing more than 12,500 pounds. Aircraft with a maximum gross takeoff weight of less than 12,500 pounds are classified as "small aircraft" by the FAA. A summary of typical aircraft and their respective design categories is presented in **Table 3-2. Figure 3-4** illustrates common aircraft types by airport reference code.

TABLE 3-2:
TYPICAL AIRCRAFT & DESIGN CATEGORIES

Aircraft	Airplane Design Group	Aircraft Approach Category	Maximum Gross Takeoff Weight (Lbs)
Piper PA-28/32 Cherokee	A	I	2,550
Cessna 182	A	I	2,950
Cirrus SR20	A	I	3.000
Lancair Columbia 300	A	I	3,400
Cessna 206	A	I	3,600
Beechcraft Bonanza A36	A	I	3,650
Cessna 210	A	I	3,850
Socata/Aerospatiale TBM 700C2	A	I	7,394
Beechcraft Baron 58	B	I	6,200
Eclipse 500	B	I	5,640
Cessna P337 Skymaster	B	I	4,630
Cessna 402	B	I	6,300
Cessna 421	B	I	7,450
Cessna Citation Mustang (CE525)	B	I	8,730
Cessna Citation CJ1 (CE525)	B	I	10,600
Beechcraft Super King Air 200	B	II	12,500
Piper Malibu	A	II	4,300
Cessna Caravan 1	A	II	8,000
Pilatus PC-12	A	II	10,450
deHavilland DHC-6 Twin Otter	A	II	12,500
Casa C 212-200 Aviocar	A	II	16,976
Cessna Citation CJ2+ (CE525A)	B	II	12,500
Cessna Citation Bravo (CE550)	B	II	14,800
Beech King Air 350	B	II	15,000
Cessna Citation Encore (CE560)	B	II	16,630
Cessna Citation Excel (CE560XL)	B	II	20,000
Shorts Sherpa (C-23A/330)	B	II	25,600
Shorts Sherpa (360)	B	II	26,453
Dassault Falcon 20	B	II	28,660
Bombardier Learjet 45	C	I	20,500
Bombardier Learjet 60	C	I	23,100
Hawker HS125-700	C	I	24,200
Gulfstream 100	C	II	24,650
Cessna Citation Sovereign	C	II	30,250
Cessna Citation X	C	II	36,100
Bombardier Challenger 300	C	II	37,500
Gulfstream III (G300)	C	II	68,700
Gulfstream IV (G450)	D	II	71,780

Source: FAA Advisory Circular (AC) 150/5300-13 (change 9); Jane's Aircraft Guide; aircraft manufacturer data.

FIGURE 3-4: AIRPORT REFERENCE CODE

Design Aircraft

Historically, the design aircraft for Methow State Airport has been the largest aircraft used on regular basis to support smoke jumper operations. The 1995 Airport Layout Plan identifies the deHavilland Twin Otter (DHC-6) as the "existing" design aircraft. The Twin Otter is a short field takeoff and landing (STOL) aircraft that is capable of operating on unimproved runways with takeoff distances 1,200 feet or less. The maximum takeoff weight for the Twin Otter is 12,500 pounds, which is the upper limit for the FAA definition of "small aircraft." The Twin Otter is included in Aircraft Approach Category A and Airplane Design Group II, which results in Airport Reference Code A-II. The USFS smoke jumper operations also use the CASA 212, twin-engine turboprop aircraft. Like the Twin Otter, the CASA 212 is an A-II aircraft capable of operating on short, unimproved runways. The CASA 212 has a maximum gross takeoff weight of 16,976 pounds, which places it in the "large" aircraft category. The smoke jumper base also attracts a wide variety of large and small aircraft at levels typically below the primary fixed wing aircraft (Twin Otter and CASA 212).

Methow Valley State Airport accommodates a variety business class aircraft on a limited basis. Based in large part on the available runway dimensions and pavement strength, a wide variety of business jets and turboprop aircraft are known to use the airport. It is estimated that this segment of activity totals approximately 200 to 300 annual operations. Based on local accounts of the aircraft types observed at the airport, they range from turboprops and smaller business jets (ARC B-II, C-I) to large business jets (ARC C-II, D-II). One example is a Gulfstream III business jet (ARC C-II) that transports the owners of a local ranch from Seattle, on average about two or three trips per month, for about half the year (estimated to be less than 50 annual operations). Other corporate aircraft are flown in owner, company, or fractional flight operations and charter flights.

The design standards for ADG II (visual and nonprecision instrument approaches) are summarized in **Table 3-3.** A summary of Methow Valley State Airport's current conformance with ADG II design standards and FAR Part 77 airspace surfaces is presented in **Table 3-4**. The airport's ability to meet established design standards and development setbacks will require an evaluation of facility reconfiguration/relocation, property acquisition and roadway closures/realignments. These issues will be addressed in the alternatives analysis in Chapter Four.

It should be noted that most A-II/B-II design standards that would be applied to Runway 13/31 will not significantly increase if a basic nonprecision instrument approach is added. The protected areas and development setbacks for runways serving large aircraft for both visual and nonprecision instrument approaches are similar. However, an upgrade from visual to nonprecision instrument approach capabilities will increase the dimensions of the FAR Part 77

approach and horizontal surfaces. In addition, the 20:1 slope required for a visual approach surface increases to 34:1 for a non-precision instrument.

TABLE 3-3: AIRPORT DESIGN STANDARDS SUMMARY (DIMENSIONS IN FEET)

Standard	Runway 13/31 *Existing Conditions*	ADG II[1] A&B Aircraft Visual Approaches	ADG II[2] A&B Aircraft Nonprecision Instrument
Runway Length	5,049	3,450/4,080 [4]	4,080/4,500 [5]
Runway Width	75	75	75
Runway Shoulder Width	10	10	10
Runway Safety Area Width	<150 [6] *(majority of runway meets ADG II width std; width and length at south end by road and property ownership; north end limited by fence, irrigation ditch, and property ownership*	150	150
Runway Safety Area Length (Beyond Rwy End)	50 (south); 60 (north) [6]	300	300
Obstacle-Free Zone Width	250 [7] *(majority of runway does not meets OFZ width std; width at south and north ends limited by roads)*	400	400
Object Free Area Width	250 [7] *(majority of runway does not meet OFA width std; width at south and north ends limited by roads)*	500	500
Object Free Area Length (Beyond Rwy End)	50 (south); 60 (north) [7]	300	300
Primary Surface Width	<250 [7] *(majority of runway does not meet primary sfc width std; width at south end limited by road; north end limited by fence)*	500	500
Primary Surface Length (Beyond Rwy End)	<100 (south); < 100 (north) [7]	200	200
Runway Protection Zone Length	1,000 [8]	1,000	1,000
Runway Protection Zone Inner Width	250 [8]	500	500
Runway Protection Zone Outer Width	450 [8]	700	700

TABLE 3-3 (CONTINUED): AIRPORT DESIGN STANDARDS SUMMARY (DIMENSIONS IN FEET)

Standard	Runway 13/31 *Existing Conditions*	ADG II[1] A&B Aircraft Visual Approaches	ADG II[2] A&B Aircraft Nonprecision Instrument
Runway Centerline to:			
Parallel Taxiway/Taxilane CL	N/A	240	240
Aircraft Parking Area	250 (west) / 125 feet (east) [9]	306 [15]	320 [17]
Building Restriction Line	N/A (west) 135 (east) [10]	376 [16]	376 [18]
Taxiway Width	30 (west) / 30-40 (east)	35	35
Taxiway Shoulder Width	10	10	10
Taxiway Safety Area Width	49	49	49
Taxiway Object Free Area Width	<89[11]	131	131
Taxiway Centerline to Fixed or Movable Object	<44.5 [11]	65.5	65.5
Taxilane Object Free Area Width	<79 [12]	115	115
Taxilane Centerline to Fixed or Movable Object	<39.5 [12]	57.5	57.5

Table 3-5 Notes:

1. Utility (visual) runways (Per FAR Part 77); all other dimensions reflect visual runways and runways with not lower than 3/4-statute mile approach visibility minimums (per AC 150/5300-13, Change 9). RPZ dimensions base on visual and not lower than 1-mile approach visibility minimums. Dimensions for ADG I (A&B Aircraft) reflect "larger than utility" aircraft (per FAR Part 77).
2. Larger-Than-Utility (nonprecision instrument) runways (Per FAR Part 77); all other dimensions reflect visual runways and runways with not lower than 3/4-statute mile approach visibility minimums (per AC 150/5300-13, Change 9). RPZ dimensions base on visual and not lower than 1-mile approach visibility minimums.
3. Runway lengths required to accommodate 75 and 95 percent of General Aviation Fleet 12,500 pounds or less. 87 degrees F, 9-foot change in runway centerline elevation.
4. Runway lengths required to accommodate 95 and 100 percent of General Aviation Fleet 12,500 pounds or less. 87 degrees F, 9-foot change in runway centerline elevation.
5. Runway length required to accommodate 100 percent of General Aviation Fleet 12,500 pounds or less and the design aircraft (typical small/medium business jet). 87 degrees F, 9-foot change in runway centerline elevation.
6. Width and length of standard B-I RSA is limited by adjacent roadways and other items; portions of RSA beyond both runway ends appear to extend beyond airport property (airport control); minor elevated terrain (< 1 foot) may by located within RSA along the sides and end of runway (conduct grading as required).
7. Width and length of OFZ, OFA and primary surface are limited by adjacent roadways and other items; portions of these areas beyond both runway ends appear to extend off airport property (airport control).
8. RPZs extend beyond airport property at both ends of the runway.
9. The nearest aircraft parking position on the tiedown apron is approximately 225 feet from runway centerline.
10. The nearest west side hangars are approximately 135 feet from runway centerline; the nearest east side hangars are approximately 250 feet from runway centerline.
11. Non-airport access road and vehicles appear to be located within west parallel taxiway OFA.
12. Hangars and parked aircraft appear to be located within apron and hangar taxilane OFAs.
13. Distance required with/without ADG I (small) parallel taxiway to meet OFA clearance and clear 8-foot aircraft tail height (typ. small single-engine) in transitional surface for visual approach.
14. Distance required to protect an ADG I (small) parallel taxiway OFA and to accommodate an 18-foot structure (at the BRL) without penetrating the 7:1 Transitional Surface.
15. Distance required to protect an ADG I (A&B Aircraft) parallel taxiway OFA and clear 8-foot aircraft tail height (typ. small single-engine) in transitional surface for nonprecision instrument approach.
16. Distance required to protect an ADG I (A&B Aircraft) parallel taxiway OFA and to accommodate an 18-foot structure (at the BRL) without penetrating the 7:1 Transitional Surface for nonprecision instrument approach.
17. Distance required to protect an ADG II (A&B Aircraft) parallel taxiway OFA and clear 10-foot aircraft tail height (typ. small multi-engine aircraft) in transitional surface for nonprecision instrument approach.
18. Distance required to protect an ADG II (A&B Aircraft) parallel taxiway OFA and to accommodate an 18-foot structure (at the BRL) without penetrating the 7:1 Transitional Surface (assumes 500-foot wide primary surface required for "large airplanes" and nonprecision instrument approaches).

TABLE 3-4: RUNWAY 13/31 CURRENT CONFORMANCE WITH FAA AIRPORT DESIGN & FAR PART 77 AIRSPACE PLANNING STANDARDS

Item	**ADG II** *Visual and NTL ¾ Mile Visibility* *FAR Part 77: Visual*	**ADG II** *Visual and NTL ¾ Mile Visibility* *FAR Part 77: Non-Precision Instrument*
Runway Safety Area	No	No
Runway Object Free Area	No	No
Runway Obstacle Free Zone	No	No
Taxiway Safety Area	Yes	Yes
Taxiway Object Free Area	Yes	Yes
Taxilane Object Free Area	Yes	Yes
Building Restriction Line – West	Yes	Yes
Aircraft Parking Line – West	No	No
Building Restriction Line – East	No	No
Aircraft Parking Line – East	No	No
Runway Protection Zones	No	No
Runway-Parallel Taxiway Separation	No	No
Runway Width	Yes	Yes
Runway Length	No	No
Taxiway Width	No	No
Approach Surfaces (Req. Slope/Clear: Yes/No?)	20:1/No	34:1/No
Primary Surface (Clear)	No	No
Transitional Surface (Clear)	No	No
Horizontal Surface (Clear)	No	No
Conical Surface (Clear)	No	No

Runway Safety Area (RSA)

The FAA defines runway safety area (RSA) as *"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."* Runway safety areas are most commonly used by aircraft that inadvertently leave (or miss) the runway environment during landing or takeoff.

By FAA design standard, the RSA *"shall be:*

(1) cleared and graded and have no potentially hazardous ruts, humps, depressions, or other surface variations;

(2) drained by grading or storm sewers to prevent water accumulation;

(3) capable, under dry conditions, of supporting snow removal equipment, aircraft rescue and firefighting equipment, and the occasional passage of aircraft without causing structural damage to the aircraft; and

(4) free of objects, except for objects that need to be located in the runway safety area because of their function. Objects higher than 3 inches 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. Other objects such as manholes, should be constructed at grade. In no case should their height exceed 3 inches."

The recommended transverse grade for the lateral RSA ranges between 1½ and 5 percent from runway shoulder edges. The recommended longitudinal grade for the first 200 feet of extended RSA beyond the runway end is 0 to 3 percent. The remainder of the RSA must remain below the runway approach surface slope. The maximum negative grade is 5 percent. Limits on longitudinal grade changes are plus or minus 2 percent per 100 feet within the RSA.

The airport sponsor should regularly clear the RSA of brush or other debris and periodically grade and compact the RSA to maintain FAA standards. Items located within the RSA, such as runway edge lights or threshold lights are mounted on frangible supports (breakable coupling and disconnect plug). Any future lighting (such as PAPI, REILS, etc.) located within the RSA will also need to meet the FAA frangibility standard.

The FAA, emphasizing the significance placed on meeting runway safety area standards provides the following guidance *"RSA standards cannot be modified or waived like other design standards. The dimensional standards remain in effect regardless of the presence of natural or man-made objects or surface conditions that might create a hazard to aircraft that leave the runway surface…A continuous evaluation of all practicable alternatives for improving each sub-standard RSA is required until it meets all standards…"*

Portions of the RSA for Runway 13/31 extend beyond airport property at both ends of the runway, which limits the airport's ability to control and protect the area. The south end of the RSA is physically limited by the following items:

- Evans Road, which is located approximately 75 feet from the runway at its nearest point.
- A series of concrete highway barriers placed end to end (on airport property) to prevent vehicles from driving from Evans Road on to the runway. The barriers extend approximately 1,400 feet, separating the road and runway, with approximately 290 feet located in the RSA.

- The southern end of the RSA also extends beyond Evans Road, over a drainage associated with the Methow River.

Other RSA non-conforming items:

- The north end of the RSA is limited by a range fence and an irrigation ditch.
- A portion of the southern-most access taxiway that parallels the runway on its east side is located within the RSA.

The physical items and terrain limitations are continuous hazards to aircraft operating on the runway; vehicles traveling on the roadway are periodic hazards. The RSA that is contained within airport property appears to be relatively level and requires only periodic grading and compaction to meet FAA surface condition standards.

ARC: A-II/B-II

Meeting the A-II/B-II standard for Runway 13/31 will require either eliminating or modifying the conflicting items (road, fence, ditch, concrete barriers) or a reconfiguration of the runway. If any of the conflicting items cannot be mitigated the runway length may need to be reduced to meet FAA standards. As noted in **Table 3-3**, the ADG II RSA is 150 feet wide and extends 300 feet beyond the ends of the runway. Options for providing standard RSA should be evaluated in the alternatives analysis.

Runway Object Free Area (OFA)

Runway object free areas (OFA) are two dimensional surfaces intended to be clear of ground objects that protrude above the runway safety area edge elevation. Obstructions within the OFA may interfere with aircraft flight in the immediate vicinity of the runway. The airport sponsor should regularly clear the OFA of brush or other debris to maintain FAA standards.

The FAA defines the OFA clearing standard:

"The OFA clearing standard requires clearing the OFA of above ground objects protruding above the runway safety area edge elevation. Except where precluded by other clearing standards, it is acceptable to place objects that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes and to taxi and hold aircraft in the OFA. Objects non-essential for air navigation or aircraft ground maneuvering purposes are not to be placed in the OFA. This includes parked airplanes and agricultural operations."

Portions of the OFA for Runway 13/31 extend beyond airport property along the side of the runway (east side - approximately 3,600 feet of the runway; northeast, northwest and southwest corners) and at both ends of the runway. The nonconforming items noted above for the RSA also conflict with the OFA. Additional nonconforming items include four hangars (on airport) located on the east side of the runway, the front section of the USFS apron, the three western-most buildings in the USFS complex, a fence, and equipment storage. Another section of fencing located along the southeast portion of the airport is also located in the OFA.

The west side of OFA and the south end are limited by Evans Road and the concrete barriers between the road and the runway. Approximately 1,900 feet of Evans Road and 1,200 feet of the concrete highway barriers are located in the OFA at the south end of the runway. The OFA that is contained within airport property appears to be relatively level and requires only periodic grading and clearing to meet FAA standards.

ARC: A-II/B-II

Meeting the A-II/B-II standard for Runway 13/31 will require either eliminating or modifying the conflicting items (road, fence, ditch, concrete barriers) or a reconfiguration of the runway. If any of the conflicting items cannot be mitigated the runway length may need to be reduced to meet FAA standards. In addition, several existing hangars and other buildings, and a portion of the USFS apron would need to be relocated outside the OFA to meet FAA standards. As noted in **Table 3-3**, the ADG II OFA is 500 feet wide and extends 300 feet beyond the ends of the runway. Options for clearing the OFA should be evaluated in the alternatives analysis.

Obstacle Free Zone (OFZ)

The OFZ is a plane of clear airspace extending upward to a height of 150 feet above runway elevation, which coincides with the FAR Part 77 horizontal surface elevation. The FAA defines the following clearing standard for the OFZ:

"The OFZ clearing standard precludes taxiing and parked airplanes and object penetrations, except for frangible visual NAVAIDs that need to located in the OFZ because of their function."

The OFZ may include the Runway OFZ, the Inner-approach OFZ (for runways with approach lighting systems), and the Inner-transitional OFZ (for runways with lower than ¾-statute mile approach visibility minimums. At Methow Valley State Airport, only the Runway OFZ is required based on runway configuration and planned approach capabilities. The future development of aircraft holding areas or new taxiway connections should be designed to allow holding aircraft to remain clear of the OFZ. By standard, all items located within the OFZ should be frangible.

The FAA defines the Runway OFZ as:

"The runway OFZ is a defined volume of airspace centered above the runway centerline. The runway OFZ is the airspace above a surface 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 beyond each end of the runway."

Many of the items that conflict with the RSA and OFA described earlier also conflict with the OFZ. In addition to limitations described for the OFA, the OFZ clearing standard does not permit taxiing or holding aircraft. The existing aircraft hold lines on taxiway connections to Runway 13/31 are located 125 feet from runway centerline, which is consistent with a Runway OFZ for *small* aircraft. Aircraft hold lines should be located 200 feet from runway centerline to meet OFZ large aircraft clearance standards. A portion of the USFS aircraft apron and one privately-owned hangar located on the east side of the runway (immediately south of the USFS complex) are located within the OFZ. The parallel section of access taxiway to the southern-most hangar on the east side of the runway is also located in the OFZ; no aircraft hold lines were observed on the taxiway.

The aircraft turnarounds located at the ends of Runway 13/31 are contained entirely within the OFZ. The turnarounds may be used to facilitate aircraft taxiing/turnaround before and after takeoff or landing, but cannot be used as aircraft holding areas while other aircraft takeoff or land on the runway.

ARC: A-II/B-II

Meeting the A-II/B-II standard for Runway 13/31 will require either eliminating or modifying the conflicting items (road, fence, ditch, concrete barriers) or a reconfiguration of the runway. If any of the conflicting items cannot be mitigated the runway length may need to be reduced to meet FAA standards. In addition, one privately owned hangar and the USFS apron would need to be relocated outside the OFZ to meet FAA standards. As noted in **Table 3-3**, the OFZ for runways accommodating large aircraft (above 12,500 pounds) is 400 feet wide (centered on the runway) and extends 200 feet beyond runway end. Options for clearing the OFZ should be evaluated in the alternatives analysis.

Taxiway Safety Area

Methow Valley State Airport has several taxiways that provide access to aircraft parking areas and hangars. With the exception of the taxiway that connects the west apron to the runway, most of the taxiways extend off airport property.

ARC: A-II/B-II

The existing west access taxiway appears to meet ADG II standards for obstruction clearance within the safety area, although the surface may require periodic grading to meet FAA standards. The various taxiways that extend from the east side of the runway also appear to meet safety area clearance standards.

Taxiway/Taxilane Object Free Area

A taxiway or taxilane object free area (OFA) is intended to protect taxiing aircraft from obstructions that could interfere with safe movement, particularly at night or during reduced visibility conditions. Based on FAA clearance requirements, no parked aircraft or structures should be located within a taxiway or taxilane OFA.

The access taxiways that serve facilities on the east and west sides of the runway appear to meet object free area clearing standards. As noted earlier, the addition of an east parallel taxiway cannot be accomplished without removing several existing hangars, in part to meet the taxiway OFA standards.

The west apron is configured with a center taxilane located between two rows of aircraft tiedowns. The taxilane centerline is located approximately 41 feet from the top of each painted tiedown "T," and the clearance between the two rows is approximately 82 feet. The spacing between taxilane centerline and the adjacent aircraft tiedowns is consistent with typical apron designs for ADG I aircraft. The south section of the apron is configured to accommodate large aircraft (ADG II), although the spacing between the tiedowns and the taxilane centerline is the same as the north section of apron.

It is observed that the nose of an aircraft parked in the small tiedown positions typically extends 3 to 5 feet ahead of the tiedown markings, which effectively reduces the clearance between taxilane centerline and a parked aircraft to less than the FAA standard (39.5 feet) for ADG I. Reconfiguration of tiedowns on the main apron to meet the clearing standard should be considered and all future apron designs should provide adequate clearance between parked aircraft and taxilane centerlines.

ARC: A-II/B-II

The existing access taxiways appear to meet ADG II standards for OFA clearance. The west apron taxilanes do not fully meet ADG I or ADG II clearing standards.

Building Restriction Line (BRL)

A building restriction line (BRL) identifies areas on an airport where structures can be located to be compatible with airfield operations. Buildings should not conflict with the recommended airport design standards defined for a particular runway-taxiway system or the protected airspace associated with the runway. The location of the BRL is measured from the runway centerline outward in a perpendicular direction. BRL locations are established based on the ability to accommodate common airport building types (e.g., T-hangars, small conventional hangars, large conventional hangars, etc.) while protecting the FAR Part 77 primary and transitional surfaces that extend outward along the sides of a runway.

All structures at Methow Valley State Airport are currently located on the east side of the runway. A small hangar was previously located near the northwest corner of the west apron, but was recently removed after its roof collapsed. Four hangars are located on airport property, with all remaining buildings located off airport property.

The nearest building (on airport hangar) is located approximately 135 feet from the centerline of the runway. Six other buildings are fully or partially located within 250 feet of the runway centerline (inside the Runway OFA and primary surface). Several additional buildings are located between 250 and 500 feet from runway centerline. The back edge of the west aircraft apron is approximately 440 feet from runway centerline. At this distance, the area could accommodate structures with a top roof elevation up to 27 feet above the runway.

Assuming level ground, an 18-foot tall structure would need to be located a minimum of 376 feet from the runway centerline to clear all runway protected areas and to avoid penetrating the runway transitional airspace surface that extends outward at a 7:1 slope from the sides of the primary surface, beginning 250 feet from runway centerline. Larger buildings would require increased separation distances, depending on their roof heights (based on their relative height above the runway). All existing structures that penetrate FAR Part 77 airspace surfaces should be marked with roof-mounted red obstruction lights and relocated if feasible. All new structure should be located and designed to avoid FAR Part 77 surface penetrations.

A 376-foot BRL is also compatible with an ADG II parallel taxiway, which would be located 240 feet from runway centerline. The ADG II taxiway OFA extends 65.5 feet from taxiway centerline, which is 305.5 feet from runway centerline. The area between a parallel taxiway OFA and the BRL could accommodate aircraft parking areas.

ARC: A-II/B-II

Based on ADG II standards and larger-than-utility visual or nonprecision instrument runway configuration, a BRL of 376 feet on both sides of Runway 13/31 is recommended to accommodate 18-foot tall structures; taller structures should be located to avoid transitional surface penetrations. An increase in the BRL separation may be appropriate for the west side of the runway depending on the configuration of the aircraft apron and potential hangar sites.

Runway Protection Zones (RPZ)

Runway protection zones (RPZ) are located at each end of a runway. The FAA provides the following definition for runway protection zones (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 property interest in the RPZ. The RPZ is trapezoidal in shape and centered about the extended runway centerline. The RPZ begins 200 feet beyond the end of the area useable for takeoff or landing."

As noted above, RPZs with buildings, roadways, or other items do not fully comply with FAA standards. It is recognized that realigning major surface roads routes located within the RPZs may not be highly feasible. Where possible, Okanogan County should discourage development within the RPZs (particularly structures) that is inconsistent with FAA standards.

The 1995 ALP depicts RPZ dimensions (250 x 450 x 1,000 feet) are consistent with design standards based on the following criteria: *"Facilities expected to serve small aircraft exclusively with visual and not lower than 1-mile approach visibility minimums."*

As noted earlier, the design characteristics of Runway 13/31 are consistent with use by large aircraft. As such, the appropriate RPZ dimensions (500 x 700 x 1,000 feet) are based on the following FAA criteria: *"Aircraft Approach Category A & B with visual and not lower than 1-mile approach visibility minimums."*

WSDOT has acquired avigation easements for the portions of the smaller RPZs that are not in airport ownership. Options for relocating roads away from runway ends should be considered in the alternatives analysis; modifications to existing avigation easements or property acquisition within the RPZs should be pursued upon approval of the updated ALP.

ARC: A-II/B-II

The RPZ dimensions 500 x 700 x 1,000 feet for Approach Category A and B aircraft; not lower than 1-mile approach visibility minimums should be applied to Runway 13 and 31.

Aircraft Parking Line (APL)

Aircraft parking lines (APL) are used to identify areas on an airport where aircraft can be parked clear of all airfield protected areas and airspace.

The 1995 Airport Layout Plan does not depict aircraft parking lines on either side of Runway 13/31. The Airspace Plan drawing depicts a 250-foot wide primary surface for Runway 13/31 based on standards for small aircraft. No future parallel taxiways are depicted on the 1995 ALP.

West Landside Area

The nearest aircraft parking positions (8 tiedowns) on the west side of the runway are located approximately 250 feet from runway centerline in the outer row of tiedowns on the west apron. The outer edge of the apron coincides with edge of the primary surface and beginning of the transitional surface slope. As a result, aircraft parked in any of the tiedown positions located along the outside of apron penetrate the runway transitional surface. The apron also has a back row of light aircraft tiedowns and large aircraft parking positions that are located approximately 350 feet from runway centerline. Most aircraft parked in these positions will not penetrate the transitional surface, although some larger business jets or other large aircraft with tail heights greater than 20 feet may penetrate the surface. In the aerial photography flown for this project, a Gulfstream III business jet is located in one of the large aircraft parking positions. The nose of the aircraft is located in line with the top of the painted tiedown markings, 350 feet from runway centerline. In this location, the tail of the aircraft (24.4 feet tall) would penetrate the transitional surface by approximately 3 feet.

Some reconfiguration of the large aircraft parking positions may be possible to address the transitional surface penetrations. Future apron expansion projects should also relocate the front row of tiedowns to eliminate the transitional surface penetration.

East Landside Area

The nearest aircraft parking positions on the east side of the runway are located just beyond the aircraft hold lines on the USFS apron (125 to 200 feet from runway centerline). The back section of the USFS apron is connected to the front section at its south end, and extends to approximately 400 feet from runway centerline. There are no other designated aircraft parking aprons on the

east side of the runway, although several small aprons are located in front of individual hangars and some aircraft park in unimproved areas adjacent to hangars on the east side of the runway.

ARC: A-II/B-II

An APL of 306 feet from runway centerline would be required to accommodate an 8-foot tail height without penetrating the transitional surface for either a visual or nonprecision instrument runway. This setback is also compatible with the clearances required for a parallel taxiway object free area (65.6 feet from taxiway centerline) and a 240-foot runway to parallel taxiway separation (305.5 feet). Options for reconfiguring aircraft parking areas to conform to FAA design standards should be evaluated in the alternatives analysis.

Runway-Parallel Taxiway Separation

ARC: A-II/B-II

The ADG II standard separation (centerline to centerline) between the runway and a parallel taxiway is 240 feet. Runway 13/31 is not currently equipped with a full- or partial-length parallel taxiway and a lengthy back-taxi on the runway is required for aircraft to reach the turnarounds at each runway end.

The addition of a parallel taxiway to a runway is most commonly designed to increase runway capacity by reducing runway occupancy times for aircraft. At airports without significant capacity constraints, parallel taxiways are often added to increase safety by reducing or eliminating the need to back-taxi on runways. The latter example would apply to Runway 13/31.

The southern-most hangar access taxiway on the east side of the runway has a section that parallels the runway, with a centerline-to-centerline separation of approximately 85 feet. Although the taxiway is not used as a parallel taxiway, its parallel section is located entirely within the Runway OFZ, which does not meet FAA standards.

As depicted in **Figure 3-3,** presented earlier, the future development of parallel taxiways on Runway 13/31 presents a challenge based on physical site constraints and the location of existing facilities. Options for providing parallel taxiway access on the runway should be evaluated in the alternatives analysis. There may be significant benefits in adding a partial-length parallel taxiway to the runway end used most often for takeoff, thereby reducing runway back-taxiing for those operations. For landing operations, the shortest distance from either end of the runway to the nearest taxiway exit is approximately 1,500 to 2,000 feet, which allows most aircraft to stop and exit the runway without having to turnaround and back-taxi.

FAR Part 77 Surfaces

Airspace planning for U.S. airports is defined by Federal Air Regulations (FAR) Part 77 – Objects Affecting Navigable Airspace. FAR Part 77 defines imaginary surfaces (airspace) to be protected around airports. **Figures 3-5 and 3-6** illustrate plan and isometric views of the Part 77 surfaces. As noted earlier in this chapter, "larger-than-utility" standards based on visual approach capabilities (per Part 77) reflect current runway use and capabilities. The basic feasibility of developing an instrument approach to the runway is currently being evaluated by FAA Flight Procedures staff. Both visual and nonprecision instrument standards will be evaluated in this section. Once the FAA completes the feasibility analysis, a decision will be made by WSDOT Aviation about defining long-term airspace planning for Methow Valley State Airport.

The airspace plan drawing in the 1995 ALP drawing set used visual approach standards for utility (small aircraft) runways. 29 obstructions were identified at the ends of the runway and along the east side of the runway. Most built item obstructions (hangars, etc.) have not been eliminated. It appears that some of the obstructions have been mitigated, although an obstruction survey would be required to thoroughly identify the location and heights of all current obstructions based on the selected airspace planning criteria.

Based on the airport design standards described earlier in the chapter, the use of "larger-than-utility" airspace planning standards for Runway 13/31 is appropriate. As noted earlier, the FAA is currently evaluating the technical feasibility to develop a nonprecision instrument approach to either end of Runway 13/31 or the overall airport environment. Depending on the outcome of that analysis, a determination can then be made by WSDOT Aviation and FAA about future airspace planning criteria. For the purposes of this analysis, both visual and nonprecision instrument standards for larger-than-utility runways will be addressed. **Table 3-5** summarizes FAR Part 77 standards for Runway 13/31 for both visual and nonprecision instrument approaches.

A review of terrain penetrations and other physical obstructions to Part 77 surfaces will be conducted during the update of the Airport Airspace Plan drawings. In cases where obstructions are identified beyond airport property, avigation easements should be acquired by the airport sponsor to preserve the integrity of the protected airspace, particularly within the inner approach surfaces (generally corresponding to the runway protection zones). For obstructions that cannot be removed or eliminated outright, red obstruction lights are recommended to increase visual recognition of potential hazards to pilots operating the vicinity of the airport.

TABLE 3-5: FAR PART 77 AIRSPACE SURFACES – METHOW VALLEY STATE AIRPORT

Item	Larger-than-Utility[1] (visual)	Larger-than-Utility[1] (nonprecision instrument)[2]
Width of Primary Surface	500 feet	500 feet
Radius of Horizontal Surface	5,000 feet	10,000 feet
Approach Surface Width at End	1,500 feet	3,500 feet
Approach Surface Length	5,000 feet	10,000 feet
Approach Slope	20:1	34:1

Notes:
1. Larger-Than-Utility runways are designed for aircraft weighing more than 12,500 pounds.
2. Instrument approach visibility minimums not lower than 1-mile.

FIGURE 3-5: FAR PART 77 DIAGRAM

FIGURE 3-6: FAR PART 77 DIAGRAM

Approach Surfaces

Runway approach surfaces extend outward and upward from each end of the primary surface, along the extended runway centerline. As noted earlier, the dimensions and slope of approach surfaces are determined by the type of aircraft intended to use the runway and most demanding approach planned for the runway.

Providing unobstructed approaches to runway ends is a high priority item associated with airport safety. When obstructions exist, options include removing, lowering or relocating the obstructions; or modifying runway approaches and/or runway configurations. Use of obstacle clearance surfaces (OCS) is often recommended in conjunction with obstruction removal to mitigate close-in obstructions that cannot otherwise be eliminated.

The 1995 ALP Airspace Plan drawing depicts 20:1 visual approaches for utility runways. The approach surfaces extend 5,000 feet from each runway end. No terrain penetrations are depicted for the approach surfaces. Close-in obstructions (roads, fences, etc.) are depicted at both runway ends. Evans Road passes through the inner end of the approach surface where it connects to the primary surface, which results in a 0:1 clear approach. A recommendation to displace the runway landing thresholds was completed in a subsequent runway reconstruction project based on a 250-foot inner width of the approach surface. The 1995 ALP Airspace drawings also recommended obstacle clearance surfaces (OCS) for both runway ends based on standards for small aircraft and visual approaches.

If existing visual approach capabilities are maintained, the runway approach surfaces retain the same length (5,000 feet) and slope (20:1) as the previously depicted surfaces. However, the inner width (500 feet) and outer width (1,500 feet) of the approach surfaces are larger than the visual surfaces previously depicted. The use of an OCS appropriate for large aircraft and visual approaches may require an increase in the displaced threshold distances, which would reduce available runway length for landing.

The potential addition of a straight-in nonprecision instrument approach would enlarge the approach surface to 10,000 feet long and the increase (flatten) the approach slope to 34:1. OCS dimensional standards for runway ends with instrument approaches also increase over the surfaces for visual approaches. Options for providing clear approaches to the runway ends will be addressed in the alternatives analysis.

Primary Surface

The primary surface is a rectangular plane of airspace, which rests on a runway (at centerline elevation) and extends 200 feet beyond the runway end. The primary surface end connects to the inner portion of the runway approach surface. The width of the primary surface is determined by the runway category and approach type. The primary surface should be free of any penetrations, except items with locations fixed by function (i.e., PAPI, runway or taxiway edge lights, etc.).

The 1995 ALP Airspace Plan drawing depicts a 250 foot wide primary surface for Runway 13/31. Six primary surface obstructions were identified with recommended dispositions ranging from removal to no action. It is noted that by applying the 500-foot primary surface to Runway 13/31, the number of primary surface penetrations will increase significantly, particularly on the east side of the runway. Most of the items previously noted that do not conform with the Runway OFA clearing standards also apply to the primary surface.

As noted earlier, the 500-foot wide primary surface required for Runway 13/31 applies to both visual and straight-in nonprecision instrument approaches. The standard primary surface for the existing 5,049-foot runway extends beyond the airport property lines along most of the east side of the runway and at both ends of the runway (northwest and southwest corners). Approximately 1,200 feet of Evans Road is located in the primary surface near the end of Runway 31. Vehicles traveling on the road penetrate the primary surface and addition to the runway approach and transitional surfaces.

Transitional Surface

The transitional surface is located at the outer edges of the primary surface for the runway, represented by two planes of airspace that rises perpendicularly at a slope of 7 to 1, until reaching the horizontal surface at an elevation 150 feet above runway elevation. This surface should be free of obstructions (i.e., parked aircraft, hangars, trees, etc.). Any structures penetrating transitional surfaces should have roof-mounted obstruction lights if they cannot be relocated. Relocation of existing buildings may also be considered where feasible and no new structures should be permitted that would penetrate the transitional surface.

No areas of terrain penetration are depicted within the transitional surface for Runway 13/31 in the 1995 ALP Airspace Plan. It appears that the transitional surface extending from the runway's 500-foot wide primary surface will also not be penetrated by terrain. Vehicles traveling on Evans Road penetrate the west side transitional surface where it connects to the primary surface.

The transitional surfaces for Runway 13/31 associated with either a straight-in nonprecision instrument approach or a visual approach begins 250 feet from the runway centerline. The east

side transitional surface will be penetrated by several off-airport structures located in close proximity to the runway. As noted earlier, all penetrating items that cannot be removed or relocated should be marked with red obstruction lights.

Horizontal Surface

The horizontal surface is a flat plane of airspace located 150 feet above runway elevation. Depending on the runway designation, the outer boundary of the horizontal surface is defined by 5,000- or 10,000-foot radii, extending from the runway ends (the intersection point of the extended runway centerline, the outer edge of primary surface, and the inner edge of the approach surface). The outer points of the radii for each runway end are connected to form a semi-oval shape, which is defined as the horizontal surface. The elevation of the existing horizontal surface is based on the published elevation of the airport (1,694 feet MSL), plus 150 feet (1,844 feet).

The 1995 ALP Airspace Plan drawing depicts large areas of terrain penetration within the horizontal surface east and west of the airport, along the sides of the valley. The areas of horizontal surface terrain penetration would increase significantly if the surface is increase from 5,000 (visual) to 10,000 feet (nonprecision instrument). The degree to which increased terrain penetration is significant will be reflected in the FAA's technical evaluation of instrument approach feasibility and potential approach minimums. In general, the presence of close-in terrain increases instrument approach minimums considerably. This information will be helpful in determining whether an upgrade from visual to instrument approach capabilities is both feasible and practical.

Conical Surface

The conical surface is an outer band of airspace, which abuts the horizontal surface. The conical surface begins at the elevation of the horizontal surface and extends outward 4,000 feet at a slope of 20:1. The top elevation of the conical surface is 200 feet above the horizontal surface and 350 feet above airport elevation (1,613 feet MSL). The 1995 ALP Airspace Plan drawing depicts large areas of terrain penetration within the conical surface east and west of the airport, along the sides of the valley. Increasing the radius of the horizontal surface, as described earlier, will likely also increase conical surface terrain penetrations.

AIRSIDE REQUIREMENTS

Airside facilities are those directly related to the arrival and departure and movement of aircraft:

- Runways
- Taxiways
- Airfield Instrumentation and Lighting

Runways

The adequacy of the existing runway system at Methow Valley State Airport was analyzed from a number of perspectives including runway orientation, airfield capacity, runway length, and pavement strength.

Runway Orientation

The orientation of runways for takeoff and landing operations is primarily a function of wind velocity and direction, combined with the ability of aircraft to operate under adverse wind conditions. When landing and taking off, aircraft are able to maneuver on a runway as long as the wind component perpendicular to the aircraft's direction of travel (defined as crosswind) is not excessive. For runway planning and design, a crosswind component is considered excessive at 12 miles per hour for smaller aircraft (gross takeoff weight 12,500 pounds or less) and 15 miles per hour for larger aircraft. FAA planning standards indicate that an airport should be planned with the capability to operate under allowable wind conditions at least 95 percent of the time.

No tabulated wind data is available for Methow Valley State Airport. Although the wind coverage on Runway 13/31 is generally believed to be adequate, occasional crosswind conditions would be expected. The airport is situated within valley created by the Methow River with rising terrain located on either side.

It appears that the current runway alignment was determined when the airport was first developed as early as the 1930s or 1940s. The airport site is relatively narrow and could not accommodate changes in runway alignment without significant property acquisition and relocation of existing tenants. It is noted that Runway 10/28 at Twisp Municipal Airport is aligned within approximately 30 degrees of Runway 13/31. In both cases, prevailing winds from the west-northwest are generally aligned with the runways, although quartering crosswinds are common.

It is believed that none of the airports located nearby with tabulated wind data would be useful for comparison with Methow Valley State Airport to gauge wind coverage due to the effect of surrounding mountainous terrain on local wind patterns.

Runway Length

Runway length requirements are based primarily upon airport elevation, mean maximum daily temperature of the hottest month, runway gradient, and the critical aircraft type expected to use the runway. Runway 13/31 accommodates predominantly small single engine and multi-engine piston aircraft weighing 12,500 pounds or less. The existing dimensions and pavement strength of Runway 13/31 are consistent with FAA design criteria established for large airplanes.

Runway 13/31 regularly accommodates turbine aircraft activity, including business class turboprops and business jets and a variety of aircraft used in fire related operations. Many of these aircraft weigh more than 12,500 pounds. The airport also accommodates a small number of larger business jets that typically weigh more than 60,000 pounds, including a Gulfstream III operated by a local ranch owner.

For planning purposes, general aviation (GA) runways used by larger business class aircraft typically have length requirements greater than the small airplane fleet, consistent with the specific needs of the design aircraft or family of design aircraft. A summary of FAA-recommended runway lengths based on local conditions is presented in **Table 3-6.** For comparison, the runway length requirements of several specific ADG II business jets are also summarized in the table and in **Table 3-7**.

TABLE 3-6: FAA-RECOMMENDED RUNWAY LENGTHS

(From FAA Computer Model)

Runway Length Parameters for Methow Valley State Airport

- *Airport Elevation: 1,694 feet MSL*
- *Mean Max Temperature in Hottest Month: 86.6F*
- *Maximum Difference in Runway Centerline Elevation: 18 feet*
- *Existing Runway Length: Runway 13/31 - 5,049 feet*

Small Airplanes with less than 10 seats:	
75 percent of these airplanes	*3,040 feet*
95 percent of these airplanes	*3,630 feet*
100 percent of these airplanes	*4,250 feet*
Small airplanes with 10 or more seats	*4,530 feet*
Large Airplanes of 60,000 pounds or less:	
75 percent of these airplanes at 60 percent useful load	***5,500 feet***
75 percent of these airplanes at 90 percent useful load	*7,000 feet*
100 percent of these airplanes at 60 percent useful load	*5,980 feet*
100 percent of these airplanes at 90 percent useful load	*8,820 feet*
***Selected Small/Medium Business Jets**:*	
Cessna Citation CJ2 (6-7 passengers / 1 crew 12,375# MGW)	*4,300 feet**
Cessna Citation Encore (7-11 passengers / 2 crew 16,375# MGW)	*4,570 feet**
Cessna Citation Excel (6-8 passengers / 2 crew 20,000# MGW)	*4,640 feet**

** Takeoff distances based on maximum gross weight and conditions listed above under balanced field requirements defined in FAR Part 25; passenger and/or fuel loads may be reduced based on aircraft operating weight limits and runway length available. Runway length requirements based on 15 degrees flaps, 86 degrees F, MGTW, distance to 35 feet above the runway, and a runway elevation of 1,694 feet; data provided by manufacturer (Cessna Citation Flight Planning Guides).*

At 5,049 feet, Runway 13/31 is 451 feet shorter than the length recommended to accommodate 75 percent of the larger airplane fleet at 60 percent useful load under the conditions common during a typical summer day at the airport. Useful load is defined as the amount of passengers, baggage, freight and fuel that can be carried on a particular aircraft.

The existing runway length is generally considered to be adequate for existing use, although it is recognized that the current configuration does not meet several FAA design standards. Both ends of Runway 13/31 are constrained by roads, other physical items and property ownership. No increase in the length of Runway 13/31 or the ability to meet ADG II standards for RSA, OFA, and OFZ for current runway length is feasible without some property acquisition. The realignment or closure of Evans Road at the south end of the runway or a significant shift of the runway to the north would be required to meet several FAA design standards for the existing runway. Alternatively, the runway length may need to be reduced to meet ADG II standards.

The ability to accommodate a future runway extension or a runway extension reserve will be determined in part by the preferred solution for addressing the constraints at the south end of Runway 13/31. It appears that approximately 1,000 to 1,500 feet of developable land exists between the north end of the runway and the river. This area could accommodate a runway extension shift, but may also be suitable for providing relocated surface access to the west side of the airport if Evans Road is closed near the south end of the runway.

Family Grouping of Aircraft

The majority of business jet aircraft and the CASA 212 used for smoke jumping during fire season at Methow Valley State Airport are categorized as "large aircraft" by FAA based on their maximum gross takeoff weights (MGTW) above 12,500 pounds. It is estimated that these aircraft currently generate between 200 and 300 annual operations.

FAA Advisory Circular (AC) 150/5325-4B prescribes a particular design approach based on the appropriate airplane weight category of the design aircraft. [3] Based on the current and future design aircraft weighing over 12,500 pounds and less than 60,000 pounds, the recommended design approach is based on the needs of the "Family Grouping of Large Airplanes," rather than the requirements associated with a specific aircraft model or type. The majority of these aircraft are listed in FAA AC 150/5325-4B **Table 3-1. Aircraft that Make Up 75 Percent of the Fleet**. The use of performance curves based on the 75 percent of the family of large aircraft provides the recommended runway lengths based on several airport-specific inputs and the percentage of aircraft useful load to be accommodated.

It appears that the existing runway can accommodate a wide range of business jet aircraft (Lear, Gulfstream, Falcon, Hawker, etc.) at less than maximum gross takeoff weights. As noted earlier, the airport accommodates a limited amount of large business jet activity (aircraft weighing more than 60,000 pounds). A local ranch operates a Gulfstream III two or three times per month during part of the year from its home airport in Seattle (Boeing Field). Other corporate and charter aircraft including a variety of Gulfstream models are known to use the airport on a limited basis.

Since the volume of Approach Category C or D aircraft is expected to remain well below the levels needed to meet the criteria for design aircraft, the use of the 75% of the large aircraft fleet (most consistent with ARC: B-II) at 60% useful load is considered reasonable planning standard. It is also noted that the physical capabilities of the existing site would be difficult to overcome in meeting the increased lateral separations between the runway, parallel taxiways and adjacent aircraft parking and hangar areas.

[3] Chapter 3 Runway Lengths for Airplanes Within a Maximum Certificated Takeoff Weight of More than 12,500 Pounds Up To and Including 60,000 Pounds.

The existing width of Runway 13/31 is 75 feet, which meets the ADG II standard of 75 feet.

TABLE 3-7:
TYPICAL BUSINESS AIRCRAFT RUNWAY REQUIREMENTS

Aircraft	Passengers (typical configuration)	Maximum Takeoff Weight	Runway Length Required for Takeoff[1]	Runway Length Required for Landing[2]
Beechcraft King Air 200	6-8	12,500	3,600	2,600
Cessna Citation CJ1	4-5	10,600	4,950	3,000
Cessna Citation CJ2	6-7	12,375	4,300	3,250
Cessna Citation CJ3	6-7	13,870	4,320	3,340
Cessna Citation II	6-9	14,100	5,430	2,880
Cessna Citation Encore	7-11	16,830	4,570	3,080
Cessna Citation Excel	6-8	20,000	4,640	3,480
Cessna Citation VII	7-8	22,450	5,790	3,240
Citation Sovereign	8-9	30,000	4,460	3,426
Cessna Citation X	8-9	36,100	6,330	3,880
Learjet 45	7-9	20,500	4,350(a)	2,660(a)
Challenger 300	8-15	37,500	4,950(a)	2,600(a)
Gulfstream 100 (Astra)	6-8	24,650	5,395(a)	2,920(a)
Gulfstream 200 (G-II)	8-10	35,450	6,080(a)	3,280(a)
Gulfstream 300 (G-III)	11-14	72,000	5,100(a)	3,190(a)

1. FAR Part 25 or 23 Balanced Field Length (Distance to 35 Feet Above the Runway); Sea Level, 77 degrees F; Zero Wind, Dry Level Runway, 15 Degrees Flaps, except otherwise noted.
2. Distance from 50 Feet Above the Runway; Flaps Land, Zero Wind. @ 2,000' msl
   a. For general comparison only. **Distances based on sea level and standard day temperature** (59 degrees F) at maximum takeoff/landing weight; higher airfield temperatures will require additional runway length and/or reduction in operating weights.

Source: Aircraft manufacturers operating data, flight planning guides.

Airfield Pavement

The weight bearing capacity for Runway 13/31 is published at 30,000 pounds for aircraft with single wheel (SW) landing gear, which is generally consistent with use by large aircraft. According to available pavement data, Runway 13/31 has a 3-inch asphalt surface course (1996) over a 6-inch crushed aggregate base and a 5-inch aggregate base. The west tiedown apron was constructed at the same time as the runway, with the same section design.

Based on 2005 inspections,[4] most pavements at Methow Valley State Airport were rated "good" or better with pavement condition indices (PCI) ranging from 12 to 100. The runway, USFS apron, west apron and west taxiway, and other taxiways were rated "very good" or "excellent." The circular taxiway located near the off-airport fueling area was rated "very poor."

Most airfield pavements are projected to be in "good" or "very good" condition in 2015, although some sections are projected to be in "poor" or "very poor" condition. The pavement maintenance plan contains a recommended 7-year program of pavement maintenance for the airport. **Table 3-8** summarizes recommended items (preventative maintenance) for the initial seven-year period and items anticipated during the remainder of the current twenty-year planning period.

TABLE 3-8: SUMMARY OF RECOMMENDED AIRFIELD PAVEMENT MAINTENANCE

Pavement Section	7-Year Recommended Maintenance	Other Recommended Maintenance During 20-Year Planning Period
Runway 13/31	Preventive Maintenance (Vegetation control, crack filling, periodic sealcoats, etc.)	Sealcoats or Slurry Seals on 5 to 6 year intervals; overlay (2016+)
West Apron & Taxiway	Rehabilitation; Preventive Maintenance (Vegetation control, crack filling, periodic sealcoats, etc.)	Sealcoats or Slurry Seals on 5 to 6 year intervals; overlay (2016+)
USFS Apron	Preventive Maintenance (Vegetation control, crack filling, periodic sealcoats, etc.)	Sealcoats or Slurry Seals on 5 to 6 year intervals; overlay (2023+)
Other Taxiways	Preventive Maintenance (Vegetation control, crack filling, periodic sealcoats, etc.)	Sealcoats or Slurry Seals on 5 to 6 year intervals; overlay as needed
New Airfield Pavements	Preventive Maintenance (Vegetation control, crack filling, periodic sealcoats, etc.)	Sealcoats or Slurry Seals on 5 to 6 year intervals

For planning purposes, it is assumed that the useful life of most airfield asphalt pavements is approximately 20 years. The useful life of pavement can be significantly reduced if preventative maintenance is not performed in a timely manner. In addition, the rate of deterioration increases with age. A regular maintenance program of vegetation control, crack filling, and sealcoating is recommended to extend the useful life of all airfield pavements. Based on the age of the Runway 13/31 pavement (12 years) and the projected pavement condition, an overlay should be assumed late in the current 20-year planning period. The west access taxiway and tiedown apron may also require overlays during the current planning period.

Airfield Capacity

The capacity of a single runway without a parallel taxiway typically is approximately 30 operations per hour during visual flight rules (VFR) conditions. However, the back-taxiing

[4] Applied Pavement Technology (2005).

required on the 5,049-foot runway- from near the middle to the ends, can significantly reduce capacity during busy periods.

The 20-year forecast of peak hour activity at Methow Valley State Airport is expected to remain well below current capacity.

Taxiways

Runway 13/31 is not served by a parallel taxiway. The runway has a single access taxiway on its west side that connects the west apron and runway. The runway has five taxiway connections on its east side, all of which provide access to off-airport facilities.

The west taxiway is 35 feet wide, which meets the ADG II standard width of 35 feet. Other taxiway widths vary from 30 to 40 feet.

Airfield Instrumentation, Lighting and Marking

The feasibility of developing an instrument approach to Methow Valley State airport is currently being evaluated by FAA. In the event that it is feasible to develop a procedure, it would likely be a Wide Area Augmentation System (WAAS) approach, which is based on the global position system (GPS). A WAAS approach offers a high degree of design flexibility, although the mountainous terrain surrounding the airport will continue to be the primary determinant in approach design and minimums (descent altitude and visibility requirements). No ground equipment or other instrumentation is required for a WAAS approach. However, if an approach is developed, installation of runway end identifier lights (REILS) is recommended to improve pilot identification of the runway ends during low visibility or darkness.

Runway 13/31 has medium intensity runway edge lighting (MIRL) and threshold lights, the standard for general aviation runways. The existing MIRL system appears to be in fair condition, although replacement should be expected during the current twenty-year planning period, as the system reaches the end of its useful life (typically 20 to 30 years). The flush-mounted threshold lights installed in the pavement for Runway 13 require more frequent replacement as they are prone to damage from snow plows or other maintenance vehicles.

Runway 13/31 is not equipped with a Precision Approach Path Indicator (PAPI), the current standard for visual guidance indicators (VGI) at general aviation airports. The 1995 ALP identifies “future” PAPIs for both ends of the runway.

Portions of the existing taxiway system have edge reflectors. Based on the anticipated level of nighttime operations, edge reflectors are adequate. Parallel taxiways and major access taxiways should be marked with edge reflectors.

The location of existing runway distance remaining signs may need to be adjusted if there are changes in runway configuration.

Limited overhead lighting is available in aircraft hangar and apron areas. Additional flood lighting is recommended for all expanded operations areas for improved utilization and security. The installation of new outdoor lighting for hangars and apron areas should be designed to limit light emissions (glare) that can create a hazard for aircraft and adversely affect the natural dark skies setting of the Methow Valley. Unshielded floodlights, wallpacks, streetlights, and barn lights are examples of commonly used light fixtures that produce excessive glare. The use of full or partial cutoff (shielded) fixtures is recommended, which will limit the amount of light that escapes outward and upward into the sky, rather than illuminating the areas on the ground that require coverage.

Markings

Runway 13/31 has basic runway markings (displaced threshold markings, threshold bars, runway numbers, centerline stripe, edge stripe) that are in fair condition. The taxiway markings are in fair/good condition. All markings require periodic repainting.

There are currently seven direct taxiway connections to Runway 13/31 (six on the east side of the runway and one on the west side). All but one taxiway is marked with aircraft hold lines located 125 feet from runway centerline. The southern-most taxilane located south of the USFS complex has no markings. In order to be consistent with the outer edge of the runway OFZ (400 feet wide), aircraft hold lines would need to be relocated 75 feet further from the runway centerline (200 feet from centerline). In the case of the USFS apron, the entire front section of apron is located within the OFZ, which prevents the hold lines from being relocated without also relocating or reconfiguring the apron. This issue should be addressed in the alternatives analysis.

On-Field Weather Data

Methow Valley State Airport has a privately-owned Automated Weather Observation System (AWOS-3) that provides basic weather data to pilots. The AWOS was recently acquired and installed by an airport user. Assuming the privately-owned system continues in operation, the airport will have adequate weather data to support visual and operations or the potential development of an instrument approach.

LANDSIDE FACILITIES

The purpose of this section is to determine the space requirements during the planning period for landside facilities. The following types of facilities are associated with landside aviation operations areas:

- *Hangars*
- *Aircraft Parking and Tiedown Apron*
- *Fixed Base Operator (FBO) Facilities*

Hangars

In late 2007 there were a total of 3 hangars located on the airport and 6 hangars located off the airport. Most of the hangars are used primarily for aircraft storage, although the airport supports several aircraft service businesses. The larger hangars can accommodate multiple aircraft.

Hangar and apron space requirements for the current planning period to be determined based on the forecast demand, once finalized.

FBO Facilities

Methow Valley State Airport has off-airport, privately owned FBO facilities including fuel storage located on the east side of the runway, although the facilities are not reportedly in current use.

FBO facility requirements are driven primarily by market conditions and the particular needs of the FBO and its customers. Because future FBO facility needs are difficult to quantify, the best planning approach is to identify development reserves on airport property that could accommodate FBO facilities.

Surface Access & Security Requirements

The existing surface access to the airport is provided by Evans Road (west side of runway) and Inter-City Airport Road (east side of runway). In both cases, some changes in access may be needed to address conflicts with runway protected areas or to effectively control traffic that inadvertently enters the USFS smoke jumper base. The four hangars located on airport property on the east side of the runway do not have dedicated vehicle access. Although these hangars have been planned for relocation for many years, current use creates access requirements for several tenants.

Adding fencing and vehicle gates should be considered to control unauthorized public access to the airfield.

Some overhead lighting is mounted on aircraft hangars; additional lighting is recommended to illuminate new aprons and adjacent landside facilities.

SUPPORT FACILITIES

Aviation Fuel Storage

As noted in the inventory chapter, Methow Valley State Airport does not have aviation gasoline (AVGAS) or jet fuel available for sale. The two privately owned fuel tanks are located off airport property on the east side of the runway. The fueling area is located near the circular taxiway that is located immediately north of the USFS complex. According to airport users, the tanks have not been in use for several years. It is unknown whether the owner of the tanks intends to provide aviation fuel for sale in the near future.

For planning purposes, a small fuel storage reserve should be identified on airport property, adjacent to facilities used by itinerant aircraft. The airport may also want to discuss aviation fuel storage needs with the USFS and the owner of the existing fuel tanks to identify possible long-term options.

Airport Utilities

The airport has electrical power, with limited telephone and water service (wells) on the east side of the runway. The airport has no sanitary sewer service, although the facilities on east side of the runway utilize individual septic systems.

FACILITY REQUIREMENTS SUMMARY

The projected twenty-year facility needs for Methow Valley State Airport are summarized in **Table 3-9**. However, several other facility requirements needs are related to upgrading or replacing existing facilities that do not meet FAA airport design standards.

TABLE 3-9: FACILITY REQUIREMENTS SUMMARY (ARC: A-II/B-II)

Item	Short Term	Long Term
Runway 13/31	• Pavement Maintenance[1] • Obtain Clear Approaches and standard RSA, OFA, and OFZ	• Pavement Maintenance[1] • Overlay Runway • Runway Extension Reserve
Taxiways/Taxilanes	• Pavement Maintenance[1] • Construct Taxiways/Taxilanes for new hangar areas, as needed	• Pavement Maintenance[1] • Parallel Taxiway/Reserve • Construct Taxiways/Taxilanes for New Hangar Areas, as needed
Aircraft Aprons	• Pavement Maintenance[1]	• Pavement Maintenance[1] • Reconfigure/Expand West Aircraft Apron to meet FAA Standards • Development Reserves (fuel, tiedowns, etc.) • West Apron Expansion Reserve • Overlay West Apron
Hangars	• Develop Hangar Sites (market demand)	• Hangar Development Reserves
Navigational Aids Lighting, and Weather	• Install PAPI	• Replace MIRL • GPS Approach (feasibility TBD)
Fuel Storage & FBO Facilities	• Define Reserve for on-airport storage capacity	• Same
Utilities	• Extend Electrical to new facilities • Water Improvements (fire protection)	• Same
Roadways & Vehicle Parking	• Relocate/Reconfigure Evans Road • Extend internal access roads to new facilities; add vehicle parking	• Extend internal access roads to new facilities; add vehicle parking
Security	• Airport Perimeter Fencing and Vehicle Gates • Flood Lighting	• Same

1. Vegetation control, crackfill, sealcoat