AURORA STATE AIRPORT
CONSTRAINED OPERATIONS RUNWAY JUSTIFICATION STUDY

EXECUTIVE SUMMARY

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The purpose of this study is to review the current runway length requirements and activity at the Aurora State Airport compared to the assumptions made in the approved 2012 Airport Master Plan to consider if the eligibility threshold for a runway extension has been met. An analysis of aviation activity at the Airport has identified 349 based aircraft. 10.8% of the aircraft based at the Airport are jet aircraft. The Air Traffic Control Tower (ATCT) began collecting data in October 2015 and has identified 48,459 Airport operations in 2016 and 58,597 Airport operations in 2017. The confirmed TAF numbers are 44,292 and 54,999 respectively. FAA Traffic Flow Management Systems Counts (TFMSC) operations data presented by Aircraft Design Group identified at least 860 annual operations by C and D aircraft on average from 2009 to 2018. Additional analysis of the TFMSC data indicates there have been 599 average annual operations by aircraft requiring 5,901 feet or more of runway length. However, the majority of these operations (70%) are conducted by aircraft that require 6,000 feet or more of runway during given conditions. On average there are 415 annual operations per year by aircraft that require 6,000 feet or more of runway. A constrained operations Airport user survey was distributed as part of this study. The survey identified 645 constrained annual operations from a variety of aircraft and aircraft operators.

Based on the FAA threshold of 500 annual operations, the data suggests a minimum runway length of 5,901 is justified based on available existing Airport activity data. Given that aircraft operations requiring 6,000 feet of runway are forecasted to exceed 500 annual operations by 2029, it is our recommendation to move forward with the full extension to 6,000 feet as identified in the 2012 Airport Master Plan.

INVENTORY/EXISTING CONDITIONS

INTRODUCTION

The intent of the Aurora State Airport (UAO or Airport) Constrained Operations Runway Justification Study is to provide the requisite justification for a runway extension. The study will also document airfield facilities, conditions, and other relevant external factors that may have changed since the completion of the 2012 Airport Master Plan (AMP) update as defined in the scope of work for the project. The framework for this study was based largely on the 2012 Airport Master Plan update, the current Airport Layout Plan (2016), subsequent work product from the previous airport engineering consultant, and other recent state, federal, and local documents used to support the data collection effort.

The data collection effort was focused on presenting a cursory overview of the airfield configuration, facilities, and Airport operations data that may have changed since the 2012 AMP was completed. To aid in the collection of new airport operational data, interviews with airport tenants and users were conducted in coordination with a constrained operations survey to help document recent trends. Additionally, new information related to airport operations necessary to update aeronautical activity forecasts, demand capacity analyses, and any changes that could impact the anticipated runway extension project was also collected and presented within the study.

SUMMARY OF 2012 AMP AIRPORT ISSUES

A number of issues were discussed during the 2012 AMP. The proposed runway extension still being discussed today was discussed in great detail throughout the planning project. Ultimately, it was determined the Airport would be better served by a runway that is 1,000 feet longer than the existing runway. The Air Traffic Control Tower (ATCT), which has since been constructed, was also a focus point of the 2012 AMP. The public involvement process and local concerns about Airport expansion and the effects on the capacity of surrounding infrastructure and environmental impacts were also discussed. In summary, the following items were identified as issues discussed during the 2012 AMP:

1. Runway Extension
2. Air Traffic Control Tower (ATCT)
3. Impact of Airport Expansion on Surrounding Areas
4. Calm Wind Runway Change
5. Precision Instrument Approach
6. Helicopter Operations
7. Other Airport Improvements

EXISTING CONDITIONS INVENTORY

Airport facilities were reviewed for consistency with the 2012 Airport Master Plan (AMP) as well as to identify any changes that have occurred on the Airport since the plan's completion. Utilizing inventory data contained in the previous airport master plan update as well as other data sources including the FAA Airport Record Form 5010, pavement management plan, construction drawings and other relevant documents provided by airport management, a cursory overview was developed to review all airport facilities. This inventory is intended to supplement the 2012 AMP document.

Relevant Documents Review

Oregon Aviation Plan (OAP)

The last full update to the OAP was completed in 2007. Since the 2012 AMP, an update to the economic impact elements of the 2007 OAP was completed in 2014. No changes to the statewide facilities component of the OAP were done at that time. Currently the OAP is being revised with an anticipated completion date of early 2019

Marion County Comprehensive Plan

The Marion County Comprehensive Plan is updated periodically as required by Oregon state law. The Marion County Comprehensive Plan was developed for the purpose of providing a guide to development and conservation of Marion County's land resources. It is a generalized long-range policy guide and land use map that provides the basis for decisions on the physical, social, and economic development of Marion County. The current 2012 Airport Master Plan should be consulted for specific plans related to airport development and protection.

The following policies identified in the Marion County Comprehensive Plan address airports in the County:

1. Airports and airstrips shall be located in areas that are safe for air operations and should be compatible with surrounding uses.

2. The County should review and take appropriate actions to adopt State master plans for public airports in Marion County.

3. The County will adopt appropriate provisions (including plans, ordinances and intergovernmental agreements) to protect the public airports from incompatible structures and uses. These provisions will be consistent with Federal Aviation Administration guidelines.

4. The County will discourage noise-sensitive uses from locating in close proximity to public airports.

Regional Socio-economic Data

Regional socio-economic data for the five county area and the Portland Metropolitan Statistical Area (MSA) has remained relatively steady since the 2012 AMP. Since the Great Recession of December 2007 to June 2009 many of the indicators of economic growth or decline have stabilized to show slow steady growth. The drop in the Per Capita Personal Income Average Annual Growth Rate (AAGR) in the available data from 2008 to 2016 within all five counties and the Portland MSA can be attributed to the Great Recession.

Population data for the five county area and the Portland MSA has remained relatively stable with more than 1% population growth on average. The only exception is Yamhill County, which has was the only county to have less than a 1% AAGR between 2008 and 2016. For the combined five county area average annual growth rates declined from 1.38% to 1.28% indicating slightly slower growth from 2008 to 2016 than in the previous eight years.

Per Capita Personal Income

	2000	2008	2000-2008 AAGR	2016	2008-2016 AAGR
Oregon	28,596	37,149	3.74%	45,399	2.78%
Clackamas County	36,838	43,952	2.41%	51,379	2.11%
Marion County	24,936	31,663	3.37%	38,168	2.57%
Multnomah County	32,785	42,928	3.87%	51,508	2.50%
Washington County	33,727	43,438	3.60%	54,203	3.10%
Yamhill County	24,754	33,212	4.27%	39,974	2.55%
Portland MSA	32,638	41,888	3.54%	50,489	2.57%

Population

	2000	2008	2000-2008 AAGR	2016	2008-2016 AAGR
Oregon	3,429,708	3,768,748	1.24%	4,093,465	1.08%
Clackamas County	339,223	371,103	1.17%	408,062	1.24%
Marion County	285,411	309,729	1.07%	336,316	1.07%
Multnomah County	661,654	712,989	0.97%	799,766	1.52%
Washington County	447,980	515,815	1.89%	582,779	1.62%
Yamhill County	85,198	97,537	1.81%	105,035	0.96%
Portland MSA	1,934,792	2,172,853	1.54%	2,424,955	1.45%

Source: U.S. Department of Commerce Bureau of Economic Analysis, Interactive Data Tool

1/ Census Bureau midyear population estimates. Estimates for 2010-2016 reflect county population estimates available as of March 2017.

2/ Per capita personal income was computed using Census Bureau midyear population estimates. Estimates for 2010-2016 reflect county population estimates available as of March 2017.

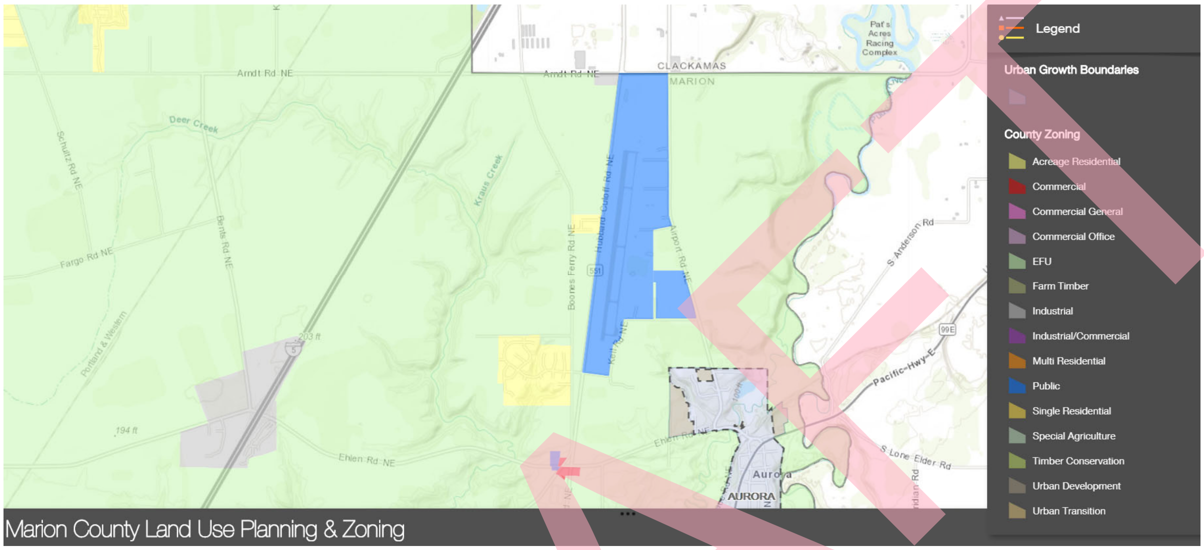
Note-- All dollar estimates are in current dollars (not adjusted for inflation).

Last updated: November 16, 2017-- new estimates for 2016; revised estimates for 2010-2015

Land Use and Land Use Planning

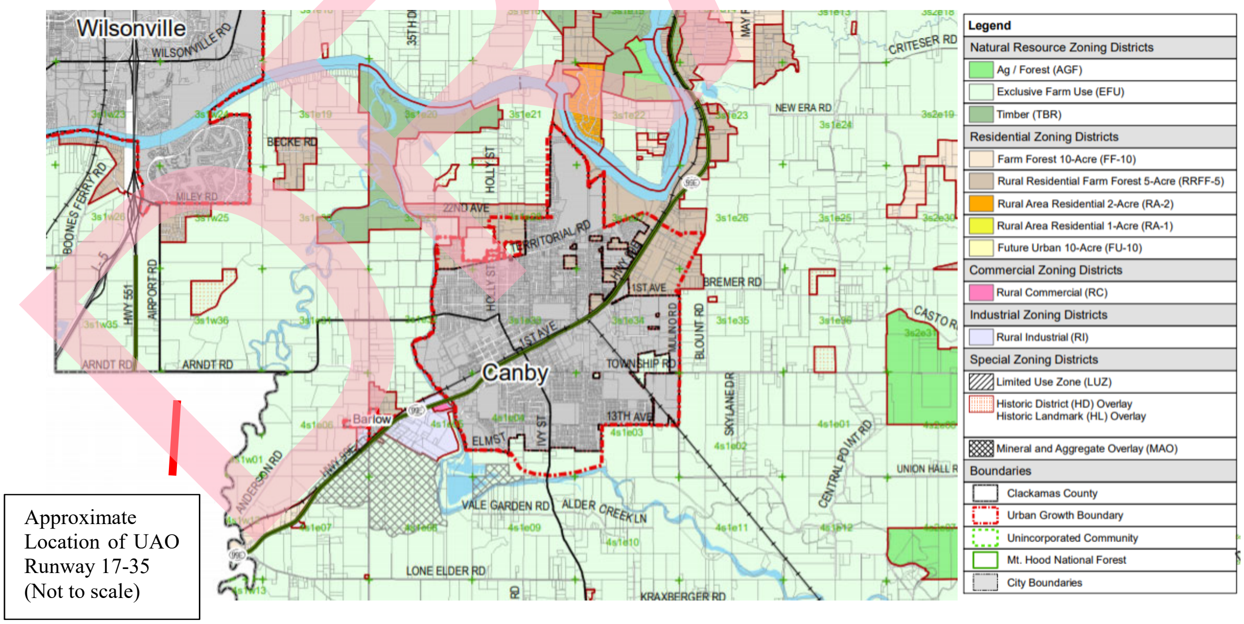
No Changes in local land use since 2012 AMP. Updated Zoning Maps Provided

Marion County Zoning Map



Retrieved from https://www.co.marion.or.us/PW/Planning/Pages/maps.aspx

Clackamas County Zoning Map

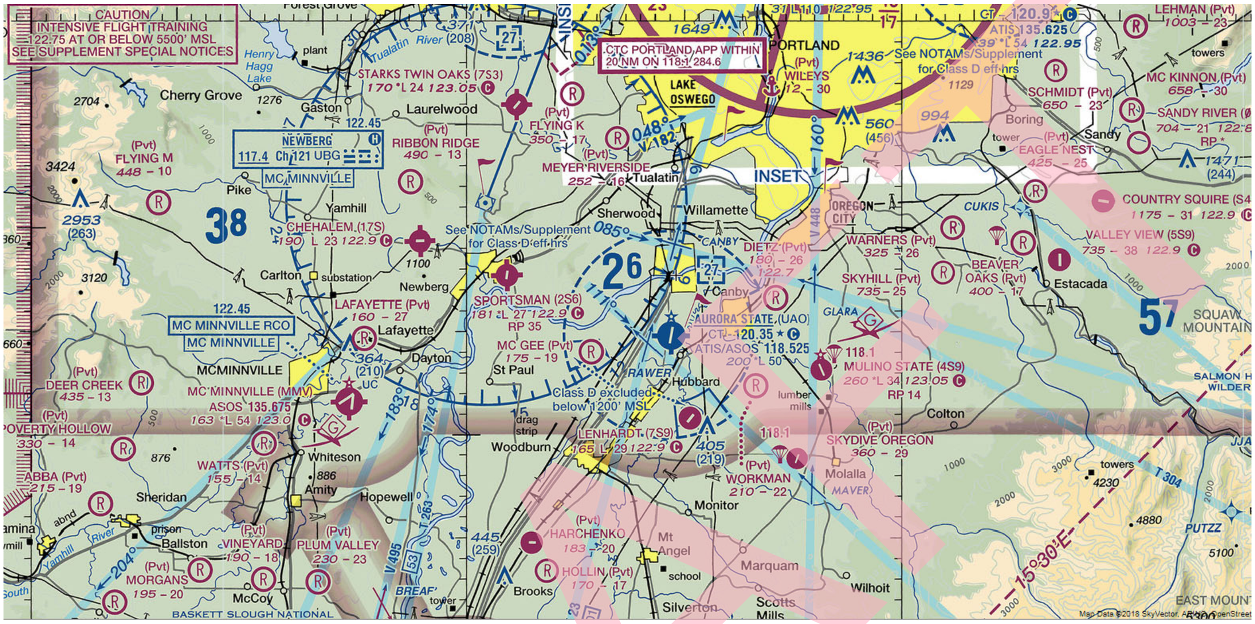


Retrieved from Non-Urban Zoning Map at https://www.clackamas.us/planning

CENTURY WEST ENGINEERING CORPORATION

Airspace and ATCT

Since the 2012 AMP, the airspace around the Airport was changed from Class G to Class D as a result of the opening of the Air Traffic Control Tower (ATCT) in 2015. Presently, when the tower is closed, the Class D airspace becomes Class E airspace to the surface.



Source: http://southendcorporateairpark.com/airpark-facts-future

CENTURY WEST ENGINEERING CORPORATION

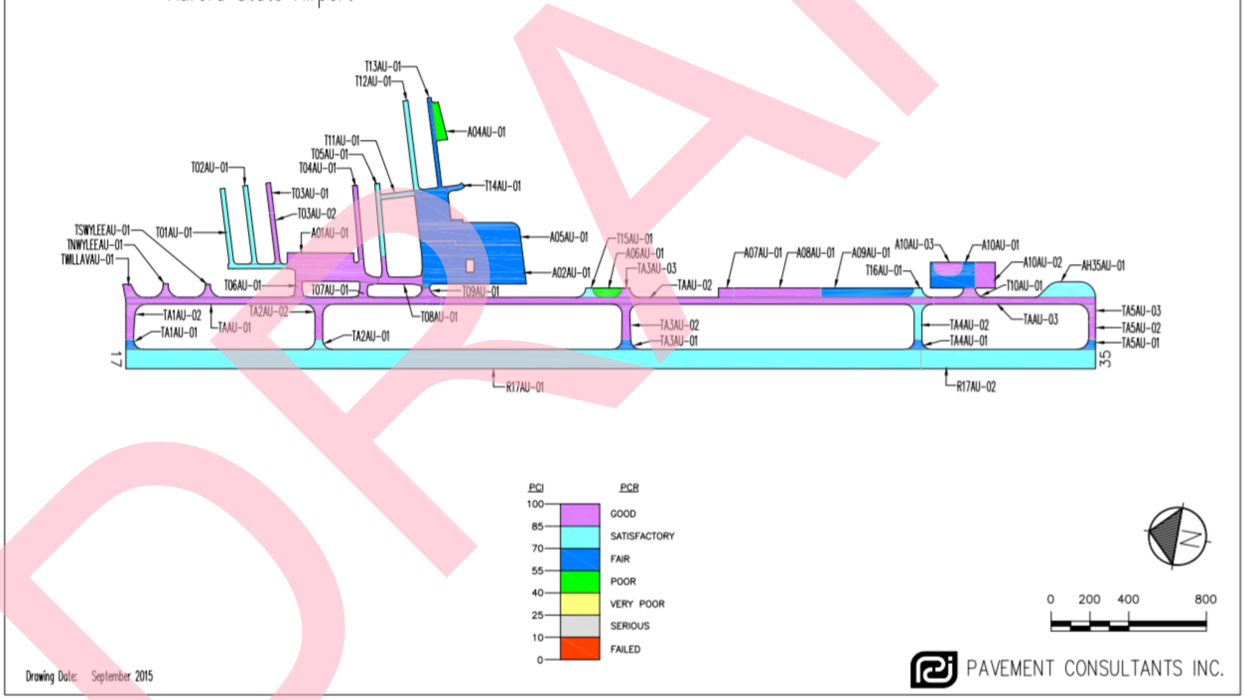
Airfield Facilities

Airfield facilities evaluated for changes since the 2012 AMP include general airfield pavements, Runway 17-35, the taxiway/taxilane/apron and aircraft parking system owned by ODA, airfield lighting, navigational equipment, and instrument approach aids.

Airfield Pavements

Since the completion of the 2012 AMP airfield pavements at the Airport have been maintained through participation in the statewide Oregon Department of Aviation's Pavement Maintenance Program (PMP). The last time the Airport participated in the PMP program was 2016 consistent with the program's scheduled three year intervals by PMP region. In addition to the specific apron, taxiway, and taxilane rehabilitation projects described in subsequent sections, airfield pavement markings within the movement area of the Airport have been repainted over a series of projects that occurred in 2016/2017.

Figure AU-3. Pavement Condition in September 2015.
Aurora State Airport



(Substitute with the 2018 PEP map when received)

Runway 17-35

Runway 17-35 was crack sealed, fog sealed and restriped in 2016 as part of the PMP as described previously. Beyond pavement maintenance, there have been no changes to the runway since the 2012 AMP.

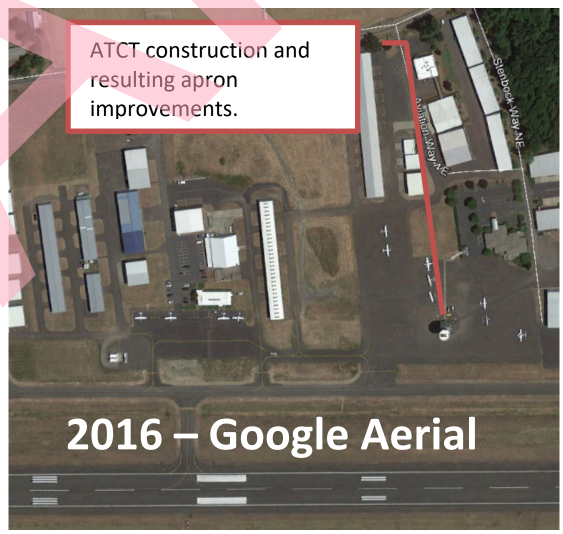
Taxiways and Taxilanes

In 2015 the FAA funded two projects to rehabilitate pavement, correct geometry deficiencies, and mitigate non-standard signs and obstructions on the taxiway/taxilane pavements adjacent to the Aurora Flight Training apron. These projects were completed by the end of 2016

All publicly owned taxiway and taxilane pavements received periodic airfield pavement maintenance as part of the PMP. Beyond periodic restriping and the projects described above, there have been no other changes to the taxiway/taxilane system since the 2012 AMP.

Aprons and Aircraft Parking

In coordination with the taxiway/taxilane rehabilitation projects described above, several changes to the ODA owned apron and aircraft parking apron in front of Aurora Aviation were completed in 2015. Also, in coordination with the construction of the Air Traffic Control Tower in 2014-2015, several modifications to the aircraft parking layout East and South of the Tower were implemented. The combined impact of these two projects resulted in the removal of approximately 12 aircraft tie-down spots.



In addition to the apron improvements described above, there have also been changes to aprons associated with Through-The-Fence (TTF) operators on the airfield consistent with accompanying changes to adjacent aircraft hangars.

Airfield Lighting

No changes to airfield lighting since the 2012 AMP.

Airport Navigation Aids

No changes to the navigation aids since the 2012 AMP.

Visual Approach Aids

No changes to visual approach aids since the 2012 AMP.

Instrument Approach Aids

Since the 2012 AMP there have been changes to instrument approach procedures for the Airport. The RNAV (GPS)-B and VOR/DME-A approaches have been discontinued and the remaining approach procedure minimums have been improved to provide lower visibility minimums. The existing approach visibility minimums and cloud ceiling requirements for existing instrument approach procedures are presented below:

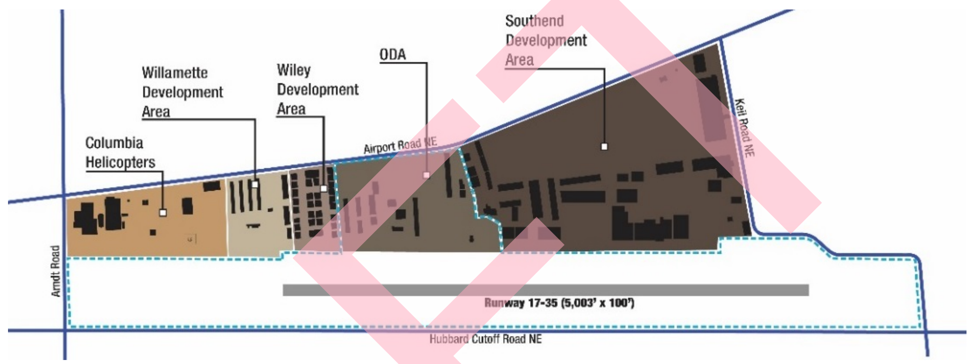
Instrument Approaches and Approach Minima		
	Ceiling (MSL - Feet)	**Visibility (statute miles)**
RNAV (GPS) RWY 17	511	7/8
RNAV (GPS) RWY 35	452	7/8
LOC RWY 17	580	3/4

Landside Facilities

Landside facilities evaluated for changes since the 2012 AMP include landside development areas, hangars, aviation services, and Airport access and vehicle parking.

Landside Development Areas

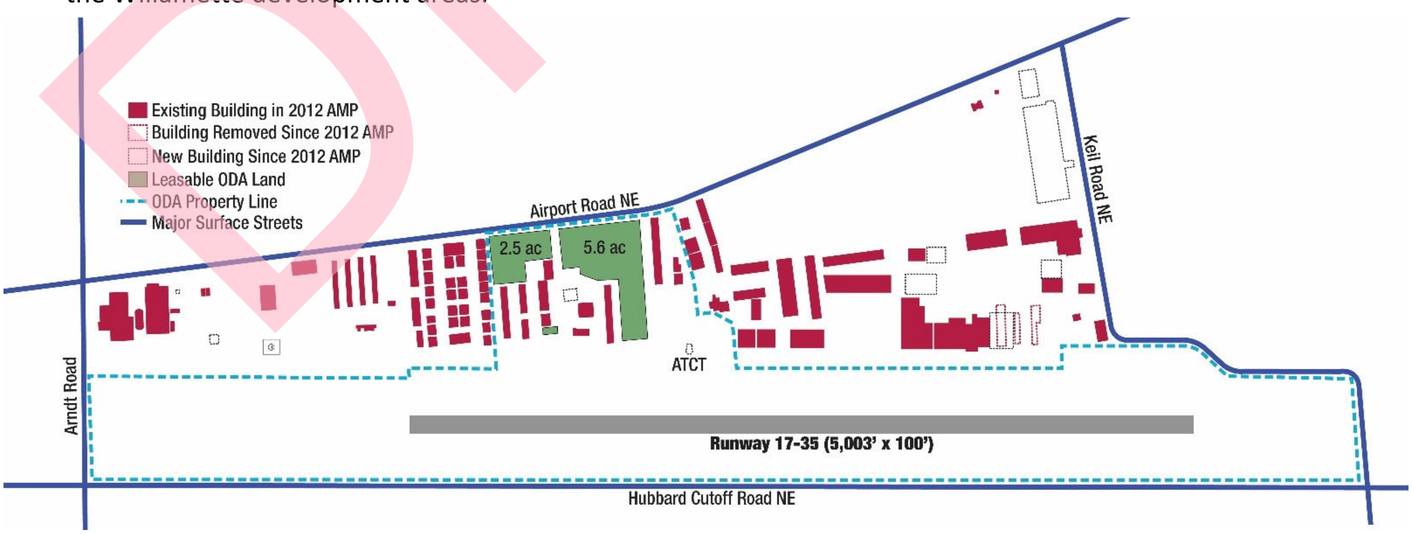
There are five identifiable development areas for landside aviation facilities at the Airport including Columbia Helicopters development area, Willamette Development Area, Wiley Development Area, ODA development area, and the Southend Development Area.



Hangar/Building Inventory

Since the 2012 AMP, the majority of new hangar construction at the Airport has occurred in the Southend Development Area. Approximately 30,650 SF of T-hangars were removed to accommodate construction of new larger conventional and corporate aircraft storage hangars. Overall, in the Southend Development Area, including the HTS building, new construction amounted to approximately 223,000 SF of new aviation commercial and corporate aircraft storage space.

Within ODA property no hangars were removed since the 2012 AMP and new construction included one hangar at approximately 6,200 SF. There is approximately 8.1 acres of developable land within the ODA development area. In the north end Columbia Helicopters development area, new construction included approximately 3,500 SF of new storage buildings that appear to have been constructed to replace steel shipping/storage containers. No changes were identified in the Wiley development area or the Willamette development areas.



Aviation Services

Since the 2012 AMP there have been changes to aviation services such as FBO, flight training, and aviation fuelling. Historically, the FBO operators on the Airport included Aurora Aviation, Aurora Jet Center, and Willamette Aviation Service. Recently, Aurora Aviation has become Aurora Flight Training and no longer provides FBO services and the Aurora Jet Center was sold to Lynx Aviation. Willamette Aviation Service has remained unchanged.

Fuel services are provided by Lynx Aviation and Willamette Aviation. Lynx Aviation provides both Aviation Gasoline (AVGAS/100LL) and JetA and Willamette Aviation provides only AVGAS. Privately-owned above ground fuel tanks currently located on ODA property just west of Aurora Flight Training will be relocated to the south end of the Airport near Lynx Aviation and remain on ODA property under a new ground lease.

Airport Access and Vehicle Parking

No changes to Airport access and vehicle parking since the 2012 AMP.

Airport Support Facilities

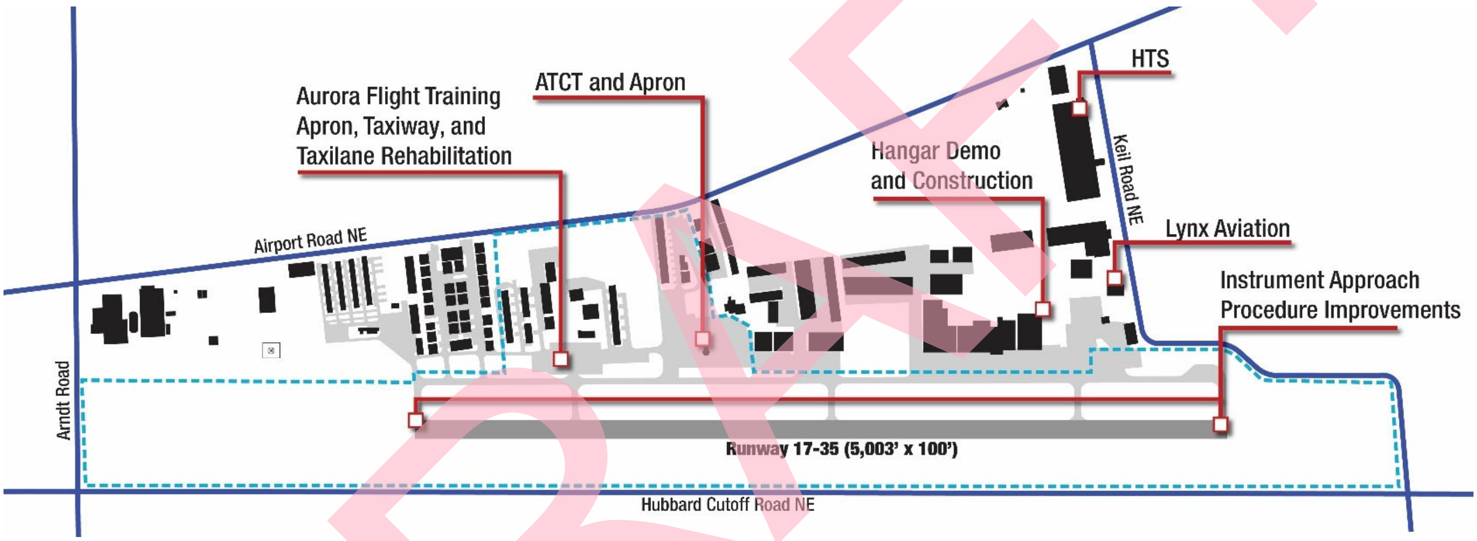
Airport support facilities evaluated for changes since the 2012 AMP include emergency services, airport maintenance, airport fencing, utilities, airport signage, and other support facilities.

There have been no changes to airport support facilities since the 2012 AMP.

Summary of Significant Facility Improvements Since 2012 Airport Master Plan

Since the 2012 AMP there have been several identifiable changes on the Airport, both on and off of ODA property.

1. ATCT and Airspace Designation
2. ATCT Apron Area
3. Aurora Flight Training Apron, Taxiway, and Taxilane Rehabilitation
4. Instrument Approach Aids
5. Hangar Development
6. Aviation Services – FBO and Fueling



Airport Activity Summary

A review of publicly available Airport activity data was completed in addition to the development of a survey to quantify constrained operations that currently exist at the Airport. The data presented here includes:

1. Based Aircraft
2. FAA Terminal Area Forecast (TAF) and ATCT Tower Data
3. Annual Instrument Flight Activity by Aircraft Design Group and Select Jet Aircraft
4. Constrained Operations

Based Aircraft

Based Aircraft data was recently updated in March 2018 and identified 349 validated aircraft that are based at the Airport. 10.8% of the aircraft based at the Airport are jet aircraft.

Validated Based Aircraft - 3-28-2018	
Single Engine Piston	238
Multi Engine Piston	27
Jet	38
Helicopter	46
Total	349
Source: www.basedaircraft.com	

A sample of the jet aircraft based at the Airport includes:

Light Jets

- Cessna 525
- Cessna 550
- Cessna 560
- Phenom 300
- Cessna CJ2
- Cessna 680
- Lear 45

Mid-Size Jets

- Cessna 650
- Falcon 20
- Falcon 50
- Bombardier BD-100 (Challenger 300)

Large Jets

- Hawker 800XP
- Falcon 7X
- Falcon 900
- Canadair CL-600 (Challenger 600)
- Astra 1125
- Falcon 2000
- Bombardier Global Express

FAA TAF

Prior to October 2015 when the ATCT was constructed, reliable annual operational data available was not available for the Airport. Estimating annual operations data at non-towered airports can be extremely difficult. The January 2018 FAA TAF for Aurora State Airport provides historic operational estimates for local and itinerant operations in addition to based aircraft. The FAA TAF data is presented below.

APO TERMINAL AREA FORECAST DETAIL REPORT - FORECAST ISSUED JANUARY 2018

		Itinerant Operations				Local Operations				
	Year	Air Taxi & Commuter	General Aviation	Military	Total	General Aviation	Military	Total	Total Operations	5010 - Based Aircraft
	1998	8,791	34,650	180	43,621	23,200	0	23,200	66,821	233
	1999	8,791	34,650	180	43,621	23,200	0	23,200	66,821	233
	2000	9,000	36,000	180	45,180	45,000	0	45,000	90,180	265
	2001	6,190	39,475	250	45,915	27,980	0	27,980	73,895	387
	2002	9,227	39,713	250	49,190	29,402	0	29,402	78,592	387
	2003	9,325	39,951	250	49,526	30,824	0	30,824	80,350	391
	2004	9,422	40,188	250	49,860	32,208	0	32,208	82,068	387
	2005	9,520	40,426	250	50,196	33,628	0	33,628	83,824	387
	2006	9,431	39,965	250	49,646	34,064	0	34,064	83,710	421
	2007	9,564	41,176	250	50,990	34,892	0	34,892	85,882	420
	2008	9,656	41,409	250	51,315	36,030	0	36,030	87,345	344
	2009	9,788	42,592	250	52,630	36,865	0	36,865	89,495	324
	2010	6,190	39,475	250	45,915	27,980	0	27,980	73,895	324
	2011	11,175	54,098	250	65,523	36,065	0	36,065	101,588	324
	2012	11,327	54,835	250	66,412	36,557	0	36,557	102,969	309
	2013	11,481	55,583	250	67,314	37,055	0	37,055	104,369	310
	2014	7,909	54,569	280	62,758	32,177	0	32,177	94,935	446
	2015	7,909	54,569	280	62,758	32,177	0	32,177	94,935	441
	2016	1,817	28,864	230	30,926	13,216	150	13,366	44,292	429
TAF Forecasts	2017	2,087	30,548	185	32,821	22,065	113	22,178	54,999	434
	2018	2,115	32,883	185	35,184	35,834	113	35,947	71,131	441
	2019	2,143	33,048	185	35,377	35,834	113	35,947	71,324	448
	2020	2,171	33,214	185	35,571	35,834	113	35,947	71,518	453
	2021	2,200	33,380	185	35,766	35,834	113	35,947	71,713	460
	2022	2,229	33,547	185	35,962	35,834	113	35,947	71,909	467
	2023	2,259	33,715	185	36,160	35,834	113	35,947	72,107	474
	2024	2,289	33,884	185	36,359	35,834	113	35,947	72,306	479
	2025	2,319	34,053	185	36,558	35,834	113	35,947	72,505	484
	2026	2,350	34,223	185	36,759	35,834	113	35,947	72,706	489
	2027	2,381	34,394	185	36,961	35,834	113	35,947	72,908	494
	2028	2,413	34,566	185	37,165	35,834	113	35,947	73,112	499
	2029	2,445	34,738	185	37,369	35,834	113	35,947	73,316	504
	2030	2,477	34,912	185	37,575	35,834	113	35,947	73,522	509
	2031	2,510	35,087	185	37,783	35,834	113	35,947	73,730	514
	2032	2,543	35,263	185	37,992	35,834	113	35,947	73,939	519
	2033	2,577	35,440	185	38,203	35,834	113	35,947	74,150	524
	2034	2,611	35,617	185	38,414	35,834	113	35,947	74,361	529
	2035	2,646	35,795	185	38,627	35,834	113	35,947	74,574	534
	2036	2,681	35,974	185	38,841	35,834	113	35,947	74,788	539
	2037	2,716	36,154	185	39,056	35,834	113	35,947	75,003	544
	2038	2,752	36,335	185	39,273	35,834	113	35,947	75,220	549
	2039	2,788	36,516	185	39,490	35,834	113	35,947	75,437	554
	2040	2,825	36,698	185	39,709	35,834	113	35,947	75,656	559
	2041	2,862	36,881	185	39,929	35,834	113	35,947	75,876	564
	2042	2,900	37,065	185	40,151	35,834	113	35,947	76,098	569
	2043	2,938	37,250	185	40,374	35,834	113	35,947	76,321	574
	2044	2,977	37,436	185	40,599	35,834	113	35,947	76,546	579
	2045	3,016	37,622	185	40,824	35,834	113	35,947	76,771	584

ATCT Tower Data

The Air Traffic Control Tower (ATCT) began collecting data in October 2015. For the two years of available data (2016 and 2017) the ATCT has identified 48,459 Airport operations in 2016 and 58,597 Airport operations in 2017. Partial data collected through March 2018 indicates the Airport is on pace to receive over 51,000 operations in 2018. It should be noted that the ATCT operates from 07:00 to 20:00 daily, so some night operations are not captured in this count.

Annual Instrument Flight Activity

FAA Traffic Flow Management Systems Counts (TFMSC) tracks flight activity operating under instrument flight rules (IFR) for the entire national airspace system. The data includes all civil aircraft filing IFR flight plans with the originating and destination airport and can be categorized by aircraft design group or aircraft type. Aircraft will sometimes file to or from another known airport in the vicinity or cancel the IFR flight plan enroute. Subsequently, not every flight plan results in an operation. In our analysis, the data has been normalized and adjusted to account for this variation.

Aurora State Airport TFMSC operations data presented by Aircraft Design Group identified 860 annual operations by C and D aircraft on average from CY 2009 to CY 2018. The C and D category of aircraft are typically jet aircraft and generally require more runway length.

FAA TFMSC IFR Operations Data by Aircraft Design Group

Aircraft Design Group	2009 Operations	2010 Operations	2011 Operations	2012 Operations	2013 Operations	2014 Operations	2015 Operations	2016 Operations	2017 Operations	2018 Operations	Average Annual Operations
A-I	3332	3046	2310	2372	2638	2414	2482	2750	2752	3428	2752
A-II	418	396	440	410	494	1108	1554	1814	1966	1840	1044
A-III	18	14	6	14	6	2	4	4	10	6	8
A-IV	0	0	0	0	0	0	0	0	0	0	0
B-I	1682	2174	1634	1496	1368	1422	1194	1198	1126	1134	1443
B-II	1354	1678	1838	2070	2066	2004	2382	3062	2902	2942	2230
B-III	12	0	0	0	0	0	2	0	2	4	2
B-IV	0	0	0	0	0	0	0	0	0	0	0
C-I	66	180	156	136	164	204	320	298	278	240	204
C-II	516	514	604	728	754	818	564	568	610	596	627
C-III	0	2	4	18	10	6	8	0	14	50	11
C-IV	2	0	0	0	0	0	0	0	0	2	0
C-V	0	0	0	0	0	0	0	0	0	0	0
D-I	10	24	20	2	8	16	0	4	10	8	10
D-II	0	0	0	0	0	0	0	0	0	0	0
D-III	4	2	18	6	10	4	2	6	8	4	6
D-IV	0	0	0	0	0	0	0	0	0	0	0
D-V	0	0	0	0	0	0	0	0	0	0	0
Unknown	816	832	388	442	390	376	386	504	370	368	487
Total	**8230**	**8862**	**7418**	**7694**	**7908**	**8374**	**8898**	**10208**	**10048**	**10622**	**8826**
Operations by C and D Aircraft	**598**	**722**	**802**	**890**	**946**	**1048**	**894**	**876**	**920**	**900**	**860**

It should be noted that the TFMSC data identifies a significant drop in C-II aircraft operations from 2014 to 2015. This drop in larger jet aircraft may be attributed to the opening of the ATCT, which may have caused several operators to change their operational procedures in a way that their activity data is no longer being captured within the TFMSC data or to switch to a smaller aircraft better suited for the existing runway length and Airport operational environment.

Further analysis of the Aurora State Airport TFMSC data by select jet aircraft with a maximum certificated takeoff weight of more than 12,500 pounds and other select aircraft over 60,000 pounds is presented on the table below and provides additional understanding of the frequency of larger more demanding jet aircraft operating at the Airport.

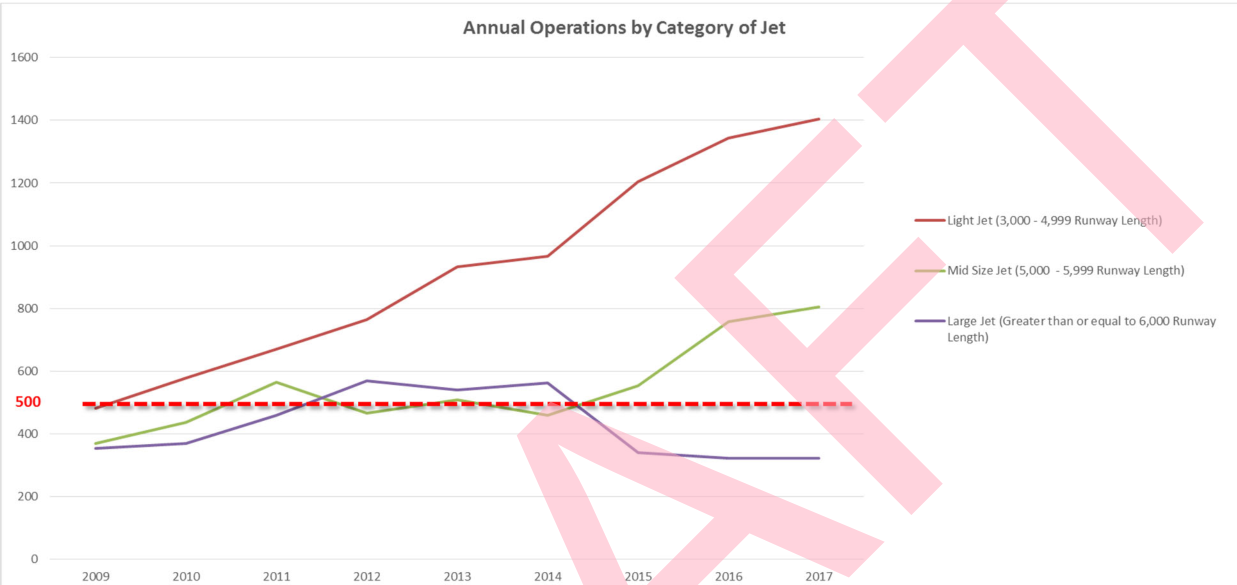
In summary, on average over the past 9 years, there have been 803 annual operations by aircraft requiring 5,723 feet or more runway length. Furthermore, there have been 599 average annual operations by aircraft requiring 5,901 feet or more of runway length. The majority of these operations (69%) are conducted by aircraft that require 6,000 feet or more of runway during given conditions. On average there are 415 annual operations per year by aircraft that require 6,000 feet or more of runway. Based on the FAA threshold of 500 annual operations, this data suggests a minimum runway length of 5,901 is justified based on available existing Airport activity data.

TFMSC IFR Data - Select Jet Aircraft Operations Table

	Aircraft Design Group	Aircraft Based at UAO	Aircraft Designator	Maximum Takeoff Weight (MTOW)	Takeoff Distance (at MTOW)	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Average Annual Operations
Embraer ERJ 135	**C-II**		E135	41,887	6,177	92	56	12	0	4	6	0	2	2	0	17
Phenom 300	**B-II**	**x**	E55P	17,968	3,625	0	0	0	14	102	96	92	86	122	56	57
Challenger 300	**C-II**	**x**	CL30	38,850	5,538	8	6	4	32	90	64	72	78	104	88	55
Challenger 600	**C-II**	**x**	CL60	45,100	6,544	4	10	42	126	122	36	12	64	80	58	55
Cessna 550 Citation	**B-II**	**x**	C550	13,300	4,133	192	194	154	210	134	162	224	260	158	212	190
Cessna 560 Citation	**B-II**	**x**	C560	20,000	4,121	248	238	344	362	496	460	580	688	772	704	489
Cessna 650 Citation	**C-II**		C650	22,000	5,912	152	132	158	90	90	118	144	118	114	98	121
Cessna 680 Citation	**B-II**	**x**	C680	30,775	4,200	6	12	32	64	52	68	72	64	90	138	60
Cessna 750 Citation	**B-II**	**x**	C750	36,600	5,901	4	6	8	60	74	90	94	90	94	104	62
Falcon 20	**B-II**	**x**	FA20	28,650	5,853	12	48	104	90	84	28	14	98	74	76	63
Falcon 50	**B-II**	**x**	FA50	37,480	5,413	18	6	8	10	18	96	220	310	316	276	128
Falcon 900	**B-II**	**x**	F900	45,503	5,723	168	214	254	180	144	48	8	54	80	68	122
Falcon 2000	**B-II**	**x**	F2TH	41,000	6,016	0	4	2	2	14	6	4	6	4	34	8
Astra 1125 - 2012 AMP Design Aircraft	**C-II**	**x**	ASTR	24,650	6,084	182	210	230	178	152	164	114	160	162	96	165
Galaxy 1126	**C-II**		GALX	35,450	6,314	2	2	14	8	10	16	0	2	4	0	6
Lear 31	**C-I**		LJ31	15,500	3,915	0	8	2	4	2	0	0	6	54	92	17
Lear 35	**D-I**		LJ35	18,000	5,740	8	20	20	2	8	16	0	4	6	8	9
Lear 45	**C-I**	**x**	LJ45	20,500	4,845	36	126	138	110	148	180	236	240	208	110	153
Lear 55	**C-I**		LJ55	21,500	6,096	0	0	2	0	2	0	0	2	0	4	1
Lear 60	**C-I**		LJ60	23,500	6,153	4	0	8	2	4	10	82	36	14	30	19
Lear 75	**C-II**		LJ75	21,500	5,114	0	0	0	0	0	0	0	4	10	12	3
Hawker Horizon	**C-II**		HA4T	39,500	6,027	0	0	0	2	2	2	0	0	0	0	1
Hawker 800	**C-II**	**x**	H25B	28,000	6,176	56	84	124	224	210	310	118	42	28	34	123
Gulfstream 150	**C-II**	**x**	G150	26,100	5,770	0	4	8	2	0	0	2	2	6	80	10
Gulfstream IV/G400*	**C-II**		GLF4	73,200	6,257	10	0	4	4	0	4	0	2	6	2	3
Gulfstream V/G500*	**D-III**		GLF5	76,850	6,877	4	2	18	6	10	4	2	0	4	2	5
Gulfstream VI/G600*	**D-III**		GLF6	91,600	6,785	0	0	0	0	0	0	0	6	4	2	1
Bombardier Global Express*	**B-III**	**x**	GLEX	92,500	7,232	0	2	4	18	10	4	8	0	14	50	11
Total						**1206**	**1384**	**1694**	**1800**	**1982**	**1988**	**2098**	**2424**	**2530**	**2434**	**1954**
Annual operations by aircraft requiring 5,000' or more runway length						724	806	1024	1036	1048	1022	894	1080	1126	1122	988
Aircraft Identified in Table 3-2 of AC 150/5325-4B - Figure 3-2 Recommended Runway Length 5,500'						410	460	620	756	732	820	640	584	590	596	621
Annual operations by aircraft requiring 5,500' or more runway length						706	800	1016	1026	1030	926	674	766	800	834	858
Annual operations by aircraft requiring 5,723' or more runway length						698	794	1012	994	940	862	602	688	696	746	803
Annual operations by aircraft requiring 5,901' or more runway length						510	508	626	720	704	770	578	530	530	514	599
Annual operations by aircraft requiring 6,000' or more runway length						354	370	460	570	540	562	340	322	322	312	415

Notes:
1. * MTOW exceeds 60,000
2. Aircraft Identified in Table 3-2 in AC 150/5325-4B Justifying Runway Length Analysis with Figure 3-2: 100 Percent of Fleet at 60 or 90 Percent Useful Load Identified by blue highlight
3. Aircraft requiring 6,000' or more of runway length identified by green highlight
4. Takeoff Distance Calculations utilized previous data and methodology provided in 2012 Airport Master Plan

In the chart below the typical categories of jet aircraft operating at the Airport are depicted to identify any noticeable trends that may be occurring at the Airport. There has been a steady increase in light jet aircraft operations and a recent increase in the number of mid-size jet aircraft operations. As previously mentioned, the large jet aircraft operations have experienced a slight decline since the ATCT began operating in 2015.



Constrained Operations Identified in Airport User Survey

A constrained operations Airport user survey was distributed as part of this study. The survey identified 645 constrained annual operations from a variety of aircraft and aircraft operators. A summary of respondent's constrained operations and data provided in the survey are summarized and presented below:

Cessna Citation 750

Typical stage length - 950 NM

30 constrained operations annually (will be 50 with the purchase of a new aircraft)

Weight/fuel restricted due to runway length. Exceed takeoff performance numbers due to runway length. We have to stop for fuel enroute due to the takeoff performance issue.

Phenom 300

Typical stage length - 950 NM

47 constrained operations per year

Required to meet balanced field length requirements which are limited at KUAO above 85 degrees Fahrenheit, when wet, or when contaminated with snow or slush.

Challenger 300

Typical stage length - 1399nm

5 constrained operations per year.

Have to reposition to other airports to take enough fuel to fly to our destination. Altered departure times (temps) and passenger loads (weight) to depart within takeoff limits. Have also departed with accelerate stop distances exactly the same as the runway length, which is not nearly as safe as having a margin of runway to spare.

Falcon 900

Typical stage length - 500-1,500nm

75 constrained operations per year

Cannot depart with full fuel when runway is wet or if temperature is greater than 80F because of short runway length.

Challenger 600

Typical stage length - 4 flight hours

2 constrained operations per year

Unable to depart with enough fuel to accomplish mission due to inadequate runway length.

Falcon 50

Typical stage length – 1,000-1,500 nm

160 constrained operations per year

Unable to depart with enough fuel to accomplish mission due to inadequate runway length.

Falcon 20

Typical stage length – 1,000 nm

50 constrained operations per year

Unable to depart with enough fuel to accomplish mission due to inadequate runway length.

Bombardier Global Express

Typical stage length – 2,000 nm

40 constrained operations per year

Unable to depart with enough fuel to accomplish mission due to inadequate runway length.

Lear 45

Typical stage length – Varies

47 constrained operations per year

Unable to depart with enough fuel to accomplish mission due to inadequate runway length.

Challenger 601

Typical stage length – Varies

36 constrained operations per year

Unable to depart with enough fuel to accomplish mission due to inadequate runway length.

Gulfstream G100

Typical stage length – Varies

2 constrained operations per year

Inadequate runway length limits departure capability

Citation 525

Typical stage length – Varies

24 constrained operations per year

Wet runway operations are hampered by inadequate runway length.

Citation 650

Typical stage length – Varies

51 constrained operations per year

Unable to depart with enough fuel to accomplish mission due to inadequate runway length.

Gulfstream G150

Typical stage length – Varies

26 constrained operations per year

Unable to depart with enough fuel to accomplish mission due to inadequate runway length.

Citation 680

Typical stage length – Varies

10 constrained operations per year

For temperatures above 80 degrees F. The balanced field length is limited to 1000 pounds below gross weight.

Astra 1125

Typical stage length – Varies

40 constrained operations per year

We are often weight limited due to runway length and have to use PDX as an alternate departure airport. Our company headquarters are in Wilsonville so having to use PDX is a strain on operations. This is especially prevalent during the summer when temperatures are higher.

Emergency Operations

Several of the operators of the Light Jet category aircraft (Cessna 525, Cessna 550, Cessna 560, Phenom 300) based at UAO have indicted the existing runway length is inadequate for a return-to-base during an emergency. If these operators experience an engine-out emergency at gross weight after takeoff they cannot return to UAO due to insufficient runway length. If these operators did experience an emergency situation, the inadequate runway length at UAO would require the pilot to fly over densely populated areas of the Portland Metropolitan Area and divert to land at either PDX or HIO as opposed to turning around and flying over the more rural areas surrounding UAO.

One specific example is the Cessna 525 (CJ2), which is one of the smaller jet aircraft based at UAO. The operator of the CJ2 indicated the following:

> *"Our average required landing runway length on a standard 60deg day is approximately 3,300ft. If we were at maximum takeoff weight (1,000lbs heavier than max landing weight) and the runway was contaminated with water, slush, snow or ice the landing distance would be in excess of 5,000ft—depending on exact conditions may even push up against 6,000ft with safety margins in place. Our contaminated runway landing distance numbers are anywhere from 50% to 65% longer than a dry runway.*
>
> *The scenario and data I have listed above is what leads our flight department to constrained operations at the Aurora Airport. When the runway is wet, we have to carefully consider the risks associated with diverting to another airfield IF an emergency occurred shortly after takeoff. With a 6,000ft runway at Aurora these constraints would be lifted and we could operate in a much safer way during the wet weather, contaminated runway season in Oregon."*

Part 135 Operator Constrained Operations

FAA Part 135 requires operators to be stopped within 60% of the available runway and also requires an additional 15% safety margin on wet runways. This FAA safety requirement applied to Air Taxi operators, and recommended for Part 91 Corporate Operations, increases the runway length required for many aircraft operations. For example, the Phenom 300 at gross weight, which is a light-jet aircraft frequently utilized for Part 135 Air Taxi operations the Airport, requires 4,821 feet of runway on a dry day (when Part 135 standards are applied) but 5,543 feet of runway length on a wet day (Portland experiences 154 rainy days per year according to the National Weather Service).

The additional constraint on aircraft operations this FAA Part 135 safety requirement imposes is difficult to quantify. However, the FAA TAF data indicates over 2,000 itinerant annual Air Taxi operations and the Phenom 300 is on the smaller end of the spectrum for runway length requirements. Therefore, it can be assumed that many of the Air Taxi jet aircraft have experienced constrained operations at some point.

Potential Future Constrained Operations

Throughout the process of developing this study and collecting constrained operations activity data through a user survey, several aircraft operators indicated they would be acquiring new aircraft that would require additional runway length and/or knew of other potential operators that would prefer to base an aircraft at UAO, but would not due to inadequate runway length.

For example, UAO based Air Taxi operator Aurora Aviation recently notified the FAA of their intent to add a Lear 60 to their fleet. Additionally, Southend Airpark developers have provided several anecdotal examples of large jet aircraft operators (that would require 6,000 feet or more of runway) who would prefer to base aircraft at UAO but have chosen to base out of Hillsboro or PDX instead due to longer runways. While these examples cannot be quantified in the existing activity data, the potential for future growth and new aircraft will be incorporated in to the updated aeronautical activity forecasts as part of this study.

Overweight Landing Requests/Pavement Strength

Since 2014 there have been approximately 104 overweight landing requests submitted to ODA for evaluation and approval by operators of aircraft that exceed the Airport's published pavement strength rating of 30,000 lbs SWG or 45,000 lbs DWG. The requests received to date have been submitted by operators of Gulfstream Aircraft such as the GIV, GV, GVI, and Global Express type aircraft, which are also identified in the TFMSC IFR operations data table presented on Page 16 of this study.

Based on a cursory fleet mix/pavement section design analysis of the most recent TFMSC data available, it is unlikely that the pavement section design for the existing runway length would require any additional strengthening to accommodate the existing fleet mix of aircraft operating at the Airport. However, once the future required runway length has been determined and justified, an updated analysis of the TFMSC data will be utilized to formulate an updated fleet mix, which will then be used to determine an acceptable pavement section design that meets FAA design guidelines for the existing runway pavement section as well as the proposed runway extension.

AVIATION ACTIVITY FORECASTS

AVIATION ACTIVITY FORECASTS

The primary purpose of the forecast update associated with the Aurora State Airport Constrained Operations Runway Justification Study is to evaluate the forecasts of aviation activity (2010-2030) contained in the 2012 Aurora State Airport Master Plan (AMP), which supported the planned runway extension depicted on the 2012 Airport Layout Plan (ALP). This forecast update focuses on the activity generated by the critical aircraft, or group of aircraft, required to support the runway length justification study, but also updates other elements of the 2012 AMP forecast, per FAA requirements for aviation activity forecast approval. This interim forecast update will rely on existing master plan data where appropriate, and supplement with more recent data, where available.

The primary tasks supporting the runway justification study include verifying current year activity (2018 based aircraft and aircraft operations, including critical aircraft) and updating key forecasts for the next twenty years (2018-2038). Events occurring at UAO since the AMP was completed in 2012 will be reviewed to evaluate the accuracy of AMP forecasts and to support the updated forecast.

The updated forecasts will support the runway length justification study by identifying the current and future levels of critical aircraft operations. The critical aircraft operations are used to establish the corresponding Airport Reference Code (ARC) and Runway Design Code (RDC) designations for Runway 17/35 that define the applicable FAA design standards and length requirements.

The 2012 AMP forecasts provided reasonable growth assumptions for both based aircraft and annual aircraft operations that reflected both broad regional economic conditions and airport-specific factors. An updated discussion of the underlying economic conditions and airport events is provided in the existing conditions section of this memo (see 2012 AMP for additional information).[1] The evaluation of critical aircraft activity contained in this forecast update confirms that the current and future C-II ARC and RDC defined for Runway 17/35 in the 2012 AMP remain valid.

However, the availability of new data sources, particularly air traffic control tower (ATCT) operations counts (adjusted to include aircraft activity when the tower is closed) indicates that recent UAO activity is currently about 25 percent below previously forecast levels. The ability to rely on actual traffic counts improves the accuracy of the overall forecasts, although it appears that the original long term growth rate assumptions were reasonable.

Although the recalibration (lowering) of overall air traffic volumes at UAO is significant, data confirms that this adjustment does not affect critical aircraft (business jet) determination at UAO. Table 9, provided later in this chapter, illustrates that the volume of high performance business jet activity at UAO increased by 40 percent between 2012 and 2018.[2] This most recent five-year period of business jet activity represents an average annual growth rate of 7 percent, which is slightly lower than the 9.7 percent annual

[1] Aurora State Airport Master Plan, Chapter Three: Aeronautical Activity Forecast (W&H Pacific)

[2] FAA TFMSC Data (jet aircraft operations)

growth experienced at UAO between 2009 and 2018. This trend provides a strong indication of future growth potential at UAO.

Similarly, a March 2018 validated based aircraft count of 349 provided by airport management through the FAA's National Based Aircraft Inventory Program (www.basedaircraft.com) database, is well below the 2012 AMP forecast for both 2015 (379) and 2020 (405), and is actually slightly below the 2010 base year total (354).

Despite what appears to be nearly flat overall growth, significant shifts in based aircraft fleet mix have occurred over the last eight years. Some of the shifts are directly related to recent and ongoing hangar construction at UAO, which is a strong driver of current activity trends at UAO. Additional detail about these recent events are summarized in the following sections of the memo.

It is important note that the based aircraft counts have continued to fluctuate--both downward and upward since the March 2018 count. However, attempting to characterize shifts in activity occurring over a short term period does not provide a definitive indication of trend and should not be used to "adjust" the forecasts that were prepared using March 2018 data.

Air Traffic Evaluation - Conclusions

Based on the review of current and recent historic UAO activity, it is evident that the 2012 AMP forecasts require updating for use in evaluating the runway length analysis. However, analysis of fleet mix data indicate that the ARC (C-II) defined in the 2012 AMP remains valid. It is also noted that the volume of ARC C-II or greater aircraft operating at UAO requiring additional runway length currently meet the FAA threshold of regular use (minimum of 500 annual operations) required to implement the previously-planned runway extension.

Highlights of the updated (2018-2038) UAO Aviation Activity Forecasts are summarized below.

Updated Based Aircraft Forecast:

- Increase from 349 to 561 between 2018 and 2038
- Net increase of 212 based aircraft
- Average annual growth 2.40%

Updated Aircraft Operations Forecast:

- 2018 Base Year Activity: 66,153 Operations
- Increase from 66,153 to 112,200 between 2018 and 2038
- Average annual growth 2.68%
- Assumes 5% increase of 2018 Operations Per Based Aircraft (OPBA) ratio (190-200) over 20 years

Critical Aircraft:

- Current and Future Critical Aircraft: **IAI Astra** and **Cessna Citation X** (these aircraft are representative of Approach Category C Aircraft and Airplane Design Group II). 2009-2018 instrument flight plan data indicates approximately 15 different ARC C-II or greater aircraft types/models regularly operate at UAO, including transient and locally based aircraft.
- Current and Future ARC and RDC (Runway 17/35): **C-II**

Overview of 2012 AMP Forecast

The 2012 AMP forecasts were prepared during the period immediately following the Great Recession. The timing was fortunate in that the impacts of the recession and the initial phases of recovery were factored into both the baseline activity and future expectations of growth. Although several broad economic indicators have continued to improve since the AMP was completed in 2012, the underlying conditions and industry expectations affecting general aviation have not changed significantly, suggesting that the modest, broadly-defined, forecast assumptions remain reasonable.

This conclusion is also consistent with the FAA's current outlook reflected in its FY2018-2038 Aerospace Forecast, which effectively maintains previous predictions of modest-to-moderate growth in most segments of general aviation activity looking forward twenty years. The favorable local economic conditions described in the updated inventory chapter are consistent with the FAA's long term outlook for the U.S. general aviation. The highlights from the 2012 AMP forecasts (2010-2030) are summarized below:

- **Based Aircraft (Preferred Forecast: 1.36% Annual Growth)**
  The forecast projected an increase from 354 to 464 between 2010 and 2030. This forecast results in a net increase of 112 aircraft over twenty years. The forecast anticipated increases for all aircraft types, including a doubling of jet aircraft from 23 to 47, and a 72 percent increase in helicopters from 25 to 43.

- **Aircraft Operations (Preferred Forecast: 1.58% Annual Growth)**
  The forecast projected an increase from 90,909 to 124,386 annual operations between 2010 and 2030. The operations forecast reflected a gradual increase in the operations per based aircraft (OPBA) ratio from 257 to 268 during the planning period. This forecast anticipated increases for air taxi and general aviation operations and maintained a static projection of 250 annual military operations through the forecast period.

- **Critical Aircraft/Airport Reference Code (ARC)**
  - **Current: C-II – IAI Astra (ARC C-II)**
  - **Future: C-II – Cessna Citation X (ARC C-II)**

The forecast provided estimates of critical aircraft operations at UAO based on a review of IFR aircraft flight plan filings. For 2007 and 2009, the total number of Approach Category C annual operations at UAO exceeded 500, as did the total number of Airplane Design Group II operations. The forecast did not identify future year critical aircraft operations, but stated that the number of C-II or greater operations would remain well above the required 500, during the twenty-year planning period. Jet operations were expected to increase overall, with their operational fleet mix increasing from 12 to 18 percent. The forecast indicated that a change in critical aircraft components (e.g., from Approach Category C to D, or from Airplane Design Group II to III, etc.) was not likely in the twenty year planning period.

Table 1 summarizes the 2012 AMP forecast.

Table 1 – UAO Airport Master Plan Forecast (2012)

	2010	2015	2020	2030	*AAR % (20 years)*
Based Aircraft					
Single Engine	261	276	288	316	*0.96%*
Multi-Engine Piston	24	24	25	27	*0.59%*
ME Turboprop	16	19	20	26	*2.46%*
Jet	23	27	33	47	*3.64%*
Helicopter	25	28	34	43	*2.75%*
Other	5	5	5	5	*0.0%*
Total	**354**	**379**	**405**	**464**	***1.36%***
Aircraft Operations					
Itinerant					
Air Taxi	10,000	10,815	11,697	13,682	*1.58%*
General Aviation	48,395	52,354	56,635	66,272	*1.58%*
Military	250	250	250	250	*0.0%*
Subtotal	58,645	63,419	68,582	80,205	*1.58%*
Local					
General Aviation	32,264	34,902	37,756	44,181	*1.58%*
Total	**90,909**	**98,321**	**106,338**	**124,386**	***1.58%***
Operations Per Based Aircraft (OPBA)	*257*	*259*	*263*	*268*	-
Operations Fleet Mix					
Piston	48%	44%	42%	37%	
Turboprop	10%	11%	11%	12%	
Jet	12%	13%	15%	18%	
Helicopter	30%	32%	32%	33%	
Jet Operations	10,909	12,782	15,951	22,389	*3.66%*
Approach Category C and ADG II Operations (1)	>500	>500	>500	>500	

(1) Actual number of critical aircraft operations not provided

2012 AMP Forecast Assessment (detailed descriptions provided in the following sections)

- The addition of an air traffic control tower (ATCT) in summer 2015 has provided multiple years of actual aircraft operations counts that are significantly lower than forecast operations;
- The overall 2018 based aircraft count is slightly below the 2010 baseline total, although the current number of business jets and helicopters is well above 2020 forecast levels;
- Historical Instrument Flight Plan Data (FAA TFMSC) confirms validity of the airport master plan critical aircraft designation (ARC C-II business jet); and
- The underlying assumptions used in the master plan forecasts remain valid, although specific elements within the forecasts require adjustment.

Recent Relevant Events (2012-2018)

Several events or changes in conditions provide important information about development and activity trends at UAO for the period since the AMP was completed in 2012. These items provide relevant data inputs for the forecast evaluation and updated projections.

Operations Data: Air Traffic Control Tower (ATCT)

The air traffic control tower (ATCT) at UAO began operation in August 2015, about five years after the 2012 AMP forecasts were prepared. **Table 2** summarizes ATCT operations based on the normal 13-hour per day operating schedule. Prior to the ATCT, aircraft operations at UAO were estimated and the most recent acoustical activity count was conducted in 2002-2003. For the initial forecast update, ATCT operations counts were available for two complete years (2016 and 2017) and nine months of 2018. The ATCT data is used to validate previous forecast activity and to verify the current baseline operations level for the updated forecasts. Note: the second version of the aviation activity forecast was prepared in 2019, following FAA review and comment; full year 2018 ATCT counts were subsequently added to **Table 2** and are reflected in the updated forecasts presented later in the memo.

A review of 2012-2018 FAA instrument flight plan data associated with UAO indicates that approximately 16 percent of the recorded flight activity occurred outside the normal 13 hours of daily ATCT operation (8am-9pm). It is reasonable to assume that UAO also accommodates aircraft operating under visual flight rules (VFR) when the ATCT is closed. To account for VFR and IFR activity occurring during non-ATCT operating hours, an adjustment of 5 percent on ATCT operations counts is recommended to estimate total airport operations. This assumption is consistent with the 5 percent adjustment used by ODA to estimate "after-hours" air traffic in the 2018 Aurora State Airport Assessment Report (Oregon Solutions, December 2018). The updated base year (2018) aircraft operations at UAO will be incorporated into the updated aircraft operations forecasts.

Table 2 - UAO Air Traffic Control Tower (ATCT) Aircraft Operations (Unadjusted)

Year	Itinerant				Local			Total
	Air Taxi	GA	Military	Subtotal	GA	Military	Subtotal	
2015*	250	3,135	20	3,405	1,762	38	1,800	**5,205**
2016	2,040	30,909	246	33,195	15,053	129	15,182	**48,377**
2017	2,164	32,291	186	34,641	23,391	120	23,511	**58,152**
2018	1,980	34,390	259	36,629	26,145	229	26,374	**63,003**

** 5 months data (August - December)*

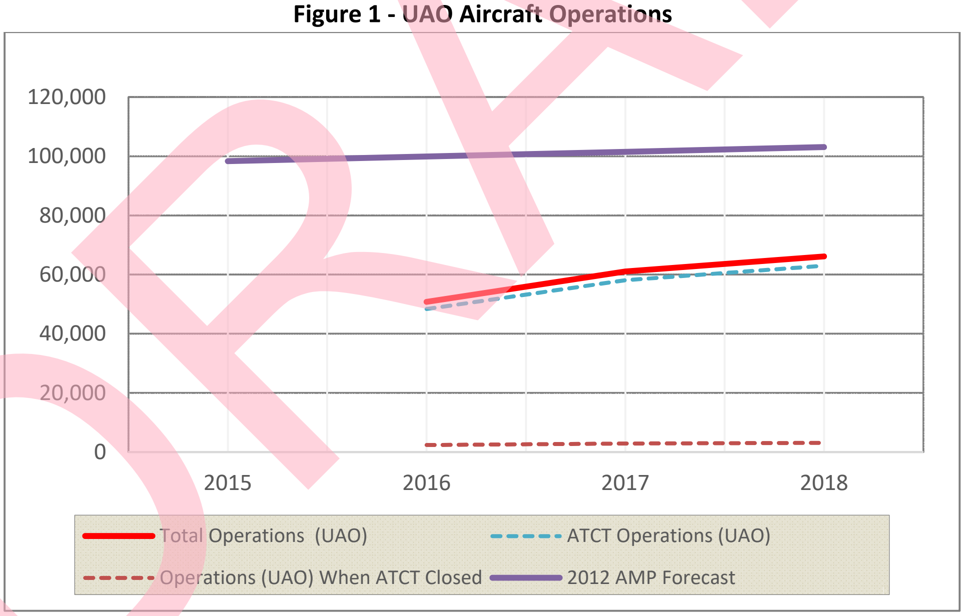
Table 3 includes the recommended 5 percent adjustment to account for aircraft operations when the tower is closed. The nearest 2012 AMP forecast year is 2020, with a total of 106,338 operations, which is approximately 56 percent above the 2018 estimate. **Figure 1** depicts aircraft operations levels at UAO derived from full year (2016-2018) ATCT data.

Table 3 - UAO Aircraft Operations (Adjusted ATCT Counts)

Year	ATCT Operations	5% Off Hours Adjustment	Total Operations
2015*	5,205	260	5,465
2016	48,377	2,419	50,796
2017	58,152	2,908	61,060
2018	63,003	3,150	66,153

** Partial year data*

Figure 1 - UAO Aircraft Operations



Assessment: The most significant factor related to the updated aircraft operations forecast is the availability of actual operations counts from the air traffic control tower (ATCT) that began operation in late 2015. The actual operations counts are significantly lower than previous estimates of activity used to develop the operations forecast. An adjustment of 2018 base year operations and the subsequent forecasts is required to reconcile actual and forecast activity. Annual aircraft operations for 2018 are estimated to total 66,153. This activity combined with the 2018 based aircraft count of 349, results in a ratio of 190 operations per based aircraft (OPBA).

It is important to recognize that the disparity found between the previous master plan forecasts and more recent ATCT-derived data is attributed to the use of different data sources. The availability of actual aircraft operations counts to re-set the forecast baseline significantly improves the accuracy of subsequent operations forecasts.

Operations Data: Instrument Flight Activity (TFMSC)

Instrument flight plan data recorded by FAA through its Traffic Flow Management System Counts (TFMSC) provide an effective method of approximating turbine business aviation activity at most airports since these aircraft predominantly file flight plans under instrument flight rules (IFR). The TFMSC data identifies individual aircraft by registration number and model, which allows the data to be sorted by aircraft type and airport reference code (ARC). For UAO, the TFMSC data provides an extended period of documentation for critical aircraft (high performance business jet) activity. By comparison, ATCT data provides documents activity by segment (local, itinerant, GA, military, air taxi, etc.) but does not identify aircraft type, nor does it distinguish between fixed-wing aircraft and helicopter operations.

The FAA recommends "normalizing" TFMSC data to capture instances where the both segments of a flight (takeoff and landing) are not recorded on both ends of an instrument flight. Pilots occasionally cancel IFR flight plans when enroute depending on air traffic congestion or weather conditions, and complete their intended flight under visual flight rules (VFR). Normalizing the data allows single IFR events attributed to an individual aircraft to be converted into two operations.

Table 4 summarizes normalized 2009-2018 TFMSC operations data at UAO by ARC. The average number of operations for the nine-year period for each ARC grouping confirms the 2012 AMP critical aircraft selection (ARC C-II) remains appropriate for the ongoing evaluation of Runway 17/35.

Table 4 - UAO Instrument Aircraft Activity (TFMSC Data)

FAA TFMSC IFR Operations Data by Aircraft Design Group											
Aircraft Design Group	**2009 Operations**	**2010 Operations**	**2011 Operations**	**2012 Operations**	**2013 Operations**	**2014 Operations**	**2015 Operations**	**2016 Operations**	**2017 Operations**	**2018 Operations**	**Average Annual Operations**
A-I	3332	3046	2310	2372	2638	2414	2482	2750	2752	3428	2752
A-II	418	396	440	410	494	1108	1554	1814	1966	1840	1044
A-III	18	14	6	14	6	2	4	4	10	6	8
A-IV	0	0	0	0	0	0	0	0	0	0	0
B-I	1682	2174	1634	1496	1368	1422	1194	1198	1126	1134	1443
B-II	1354	1678	1838	2070	2066	2004	2382	3062	2902	2942	2230
B-III	12	0	0	0	0	0	2	0	2	4	2
B-IV	0	0	0	0	0	0	0	0	0	0	0
C-I	66	180	156	136	164	204	320	298	278	240	204
C-II	516	514	604	728	754	818	564	568	610	596	627
C-III	0	2	4	18	10	6	8	0	14	50	11
C-IV	2	0	0	0	0	0	0	0	0	2	0
C-V	0	0	0	0	0	0	0	0	0	0	0
D-I	10	24	20	2	8	16	0	4	10	8	10
D-II	0	0	0	0	0	0	0	0	0	0	0
D-III	4	2	18	6	10	4	2	6	8	4	6
D-IV	0	0	0	0	0	0	0	0	0	0	0
D-V	0	0	0	0	0	0	0	0	0	0	0
Unknown	816	832	388	442	390	376	386	504	370	368	487
Total	**8230**	**8862**	**7418**	**7694**	**7908**	**8374**	**8898**	**10208**	**10048**	**10622**	**8826**
Operations by C and D Aircraft	**598**	**722**	**802**	**890**	**946**	**1048**	**894**	**876**	**920**	**900**	**860**

Assessment: The recent historical volume of Aircraft Approach Category C and D operations, combined with all Airplane Design Group II or larger operations at UAO, has consistently exceeded the FAA's "regular use" threshold of 500 annual operations, including itinerant and local, but excluding touch-and-goes, required to define the current critical aircraft and ARC (C-II). The TFMSC data provides a reliable indication of documented business jet activity at UAO, including the identification of jet operations by ARC that supports updated aircraft operations forecasts.

Hangar Development Trends (2012-2018)

Since the 2012 AMP, the majority of new hangar construction at UAO has occurred in the Southend Development Area where approximately 30,650 SF of T-hangars were removed to accommodate construction of new larger conventional and corporate aircraft storage hangars. Overall, new construction of aviation commercial and corporate aircraft storage space in the Southend Development Area totalled approximately 223,000 SF, including the new HTS building (heavy lift helicopter operator relocated operations from Corvallis Airport). Within ODA property no hangars were removed since the 2012 AMP and new construction included one hangar at approximately 6,200 SF.

The Southend Development Area, including the HTS building, has amounted to approximately 223,000 SF of new aviation commercial and corporate aircraft storage space since the 2012 AMP. The new construction of corporate aircraft storage and aviation commercial space, in addition to associated pavements and supplemental infrastructure, is estimated to exceed $50 million of private investment at UAO since the completion of the 2012 AMP.

Figure 2 illustrates recent hangar development activity at UAO; the airport property line is depicted with a light blue dashed line, which illustrates the distribution of on- and off-airport hangar development at UAO.

Figure 2 - UAO Hangar Development Activity

An evaluation of ongoing and planned hangar development at UAO was conducted to gauge the impact of development on airport activity. Currently, 600,000 SF of additional hangar space is planned for construction within the next twenty years, with more than 60 percent (375,000 SF) actively planned within the next five years. ODA is currently negotiating ground leases for the remaining 10 to 12 developable hangar sites and adjacent off-airport developers are currently seeking local permit or other land use approvals. The approximate footprints of the planned hangar developments are depicted in **Figure 2**.

For planning purposes, a weighted percentage of total proposed hangar construction is recommended to account for uncertainty and the potential of project deferrals due to changes in market demand or economic conditions. An updated based aircraft forecast will be prepared to reflect the weighted hangar construction for comparison with the master plan defined growth rate applied to the current based aircraft count. Airport management indicates that existing aircraft parking apron capacity is not constrained, although the majority of based aircraft growth is expected to continue to utilize hangar storage.

Assessment: The recent development of new hangar space at UAO reflects the underlying transition of activity that has occurred since the 2012 AMP. Private investment in hangar space at UAO has moved toward accommodating business aircraft and commercial helicopter tenants, which has reduced the number of smaller hangars, including T-hangars. This activity is believed to have contributed to the reduction (relocation) of small single engine aircraft to other nearby airports, while the number of business jets and helicopters has increased sharply. The planned construction of new hangar space at UAO is expected to directly result in increases in based aircraft and continue the recent shifts in based aircraft fleet mix.

Based Aircraft Fleet Mix

As noted above, the based aircraft fleet mix at UAO has changed significantly since the 2012 AMP. Although the combined fleet of single-engine and multi-engine piston aircraft has contracted slightly (-11%), these aircraft still account for the majority (73%) of the based aircraft at UAO. By comparison, the number of multi-engine turbine fixed-wing aircraft and helicopters have increased significantly—from 64 to 94 aircraft (+47%).

The airport management based aircraft count completed in March 2018 (FAA www.basedaircraft.com database) identified 349 "validated" based aircraft UAO. **Table 5** compares based aircraft by type for the 2012 AMP forecast base year (2010) and the current year. This activity is summarized in more detail in the following section.

Based aircraft counts were not available for the years between the 2010 base year estimate contained in the 2012 AMP and the 2018 airport management count. However, airport management reports that several factors appear to have contributed to the changes in fleet composition and the apparent "no net increase" in based aircraft between 2010 and 2018. The factors include changes in airspace and operating rules related to the new air traffic control tower and hangar development trends. These factors are believed to have contributed to a reduction in the number of small piston engine aircraft at UAO with some pilots relocating their aircraft to nearby lower activity, non-towered airports such as Mulino State.

Table 5 - UAO Based Aircraft Fleet Mix (2010 and 2018)

UAO Based Aircraft Fleet Mix	2010	2018	*Net Change*
Single Engine (Piston and Turboprop)	261	238	*-23*
Multi-Engine Piston	24	17	*-7*
Turboprop (Multi-Engine)	16	10	*-6*
Jet	23	38	*+15*
Helicopter	25	46	*+21*
Other	5	0	*-5*
Total	**354**	**349**	***-5***

Updated Forecasts

Updated forecasts for based aircraft and aircraft operations were developed utilizing the updated data collected and information presented in the 2012 AMP.

Based Aircraft

Two updated based aircraft forecasts were prepared for this evaluation and comparison to the current FAA Terminal Area Forecast (TAF). Both projections reflect overall growth in based aircraft, which is anticipated as the recent transition toward more active turbine aircraft continues. This trend is also reflected in the forecast based aircraft fleet mix presented in the following section.

The future growth in single engine aircraft at UAO will in part be driven by an active experimental aircraft and LSA market. On a national level, the future growth in experimental aircraft and LSAs is well documented in FAA forecasts. Many of these aircraft are replacing older traditional single engine aircraft removed from service. Vans Aircraft, based at UAO, is an industry leader in kit aircraft manufacturing, and has expanded its product line to include factory built LSA models certified by FAA. Their presence at UAO contributes to market demand that supports growth in general aviation, expanding on traditional activity segments. In a broader context, this growing segment of the aircraft manufacturing is providing viable (financial) access for existing and new pilots to remain active in general aviation.

Other regional market factors will contribute to future changes in activity at UAO. For example, the Troutdale Airport (TTD), located 24 miles northeast, recently completed a master plan update that recommends downsizing its runway, eliminating all aeronautical facilities on the north side of the runway, and replacing lost hangars and aircraft parking on the south side of the runway. The scenario suggests that the overall aeronautical capacity of TTD will effectively be capped, which would be expected to affect facility demands and aeronautical activity at the other airports in the local service area, including UAO.

Updated Forecast 1. The first projection maintains the 2012 AMP recommended forecast average annual growth rate (1.36% AAR) and applies the rate to the updated 2018 based aircraft count. The growth rate is comparable to current FAA TAF and long term forecasts, and provides a reasonable basis for projecting future activity at UAO. This projection increases based aircraft from 349 to 457 (+108) between 2018 and 2038.

Updated Forecast 2. The second projection is based on an evaluation of planned hangar construction described earlier in the memo. As noted earlier, airport management indicates that there is ample aircraft apron space available to accommodate additional based aircraft, although the expectation is that the majority of new based aircraft at UAO will be hangared. The recent pattern of investment and the anticipated rate of additional hangar construction suggests that UAO enjoys a competitive position in the local business aviation market.

Increased business jet activity at UAO assumes the addition of aircraft new to the local market and the ability to attract existing business jets from other airports in the service area such as Hillsboro, PDX, Troutdale, and Salem. According to FAA based aircraft data, the six general aviation airports[3] located within UAO service area with some jet capabilities currently list a total of 1,128 based aircraft, including 92 jets and 108 helicopters. UAO accounted for 41 percent of business jets and 46 percent of helicopters at these airports. UAO and Portland-Hillsboro Airport combined, accommodated 91 percent of the business jets and 75 percent of helicopters based in the service area.

Five separate hangar development projects were evaluated for their potential impact on UAO based aircraft and operations levels. As noted earlier, the total build out for the hangar projects may exceed 600,000 square feet, the majority of which will be located off airport property. For forecasting purposes, varying levels of construction probability and timelines have been assigned to each to project to gauge growth during the twenty-year planning period. Based on this assessment, hangar development anticipated within the next ten years is estimated at approximately 300,000 square feet; an additional 130,000 square is anticipated by 2038. Development plans for off-airport hangar projects have been submitted to Marion County for review, which suggests strong near term development potential. Other projects are also moving forward based on current and near term market demand. **Table 6** summarizes the hangar projects currently known to be currently in the active planning stages. Additional hangar development documentation is provided in **Appendix --.**

[3] Hillsboro, Troutdale, McMinnville, Salem, Hood River, Aurora

Table 6 – Planned Hangar Development (some projects will be phased)

	Next 2 years	**2-5 years**	**5-10 years**	**10+ years**
ODA Property	--	100,000 SF Hangar	--	--
Off Airport Project A	166,000 SF Hangar		--	--
Off Airport Project B	--	109,000 SF Hangar 75,600 SF Office	65,000 SF Hangar 45,000 SF Office	--
Off Airport Project C	--	--	--	160,000 SF Hangar/Office

Assumptions were then made for the distribution of aircraft types occupying the new hangar space. The number of based aircraft were estimated using a range of 1,500 to 5,000 square feet of hangar space per aircraft (ranging from smaller aircraft to large jets and large helicopters). Based on established hangar development trends at UAO, it is assumed that the new based aircraft located in the new hangar developments will include:

- 25% small piston fixed wing aircraft and helicopters;
- 30% small turboprop and jet aircraft (12,500# and below);
- 35% medium business jets or large turboprops(above 12,500#); and
- 10% large jets (30,000 to 75,000#).

The allocations were then distributed between 2018 and 2038 based on anticipated development phasing. The probability of a full build (600,000 SF) by the end of the twenty-year planning period is tempered by individual project weighting varying from 50 to 90 percent and square footages were adjusted accordingly. Any unrealized development is anticipated to occur beyond the 20-year time frame. Based on development plans currently underway, the growth anticipated in the 5- to 10-year period is initially stronger, then eases as demand is absorbed by additional hangar capacity.

This projection increases based aircraft from 349 to 561 (+212) between 2018 and 2038, which equals an average annual growth rate of 2.4 percent over the planning period.

As noted earlier, a portion of the future growth in single engine aircraft at UAO is expected to be driven by an active experimental aircraft and light sport aircraft (LSA) market. Anticipated growth in business aircraft and helicopters is consistent with recent hangar development trends at UAO.

Recommended Forecast. The updated based aircraft forecasts, the current FAA TAF, and the 2012 AMP recommended forecast for UAO are summarized in **Table 7** and depicted in **Figure 3**. Based on the factors noted above, **the recommended updated based aircraft forecast for UAO is the Hangar Build projection.** This forecast recognizes the correlation between the development of new hangar space and the ability to increase the airport's based aircraft fleet. Although near term growth is projected to approach 6 percent annually as new hangars come on line, the overall 20-year growth rate averages 2.4 percent through 2038.

It is important to acknowledge the history of private investment for hangar construction at UAO. Private hangar development has steadily grown and occupancy vacancy rates are at optimal levels. As indicated earlier, private investment in corporate aircraft storage, aviation commercial space, and the required infrastructure, is estimated to exceed $50 million at UAO since the completion of the 2012 AMP.

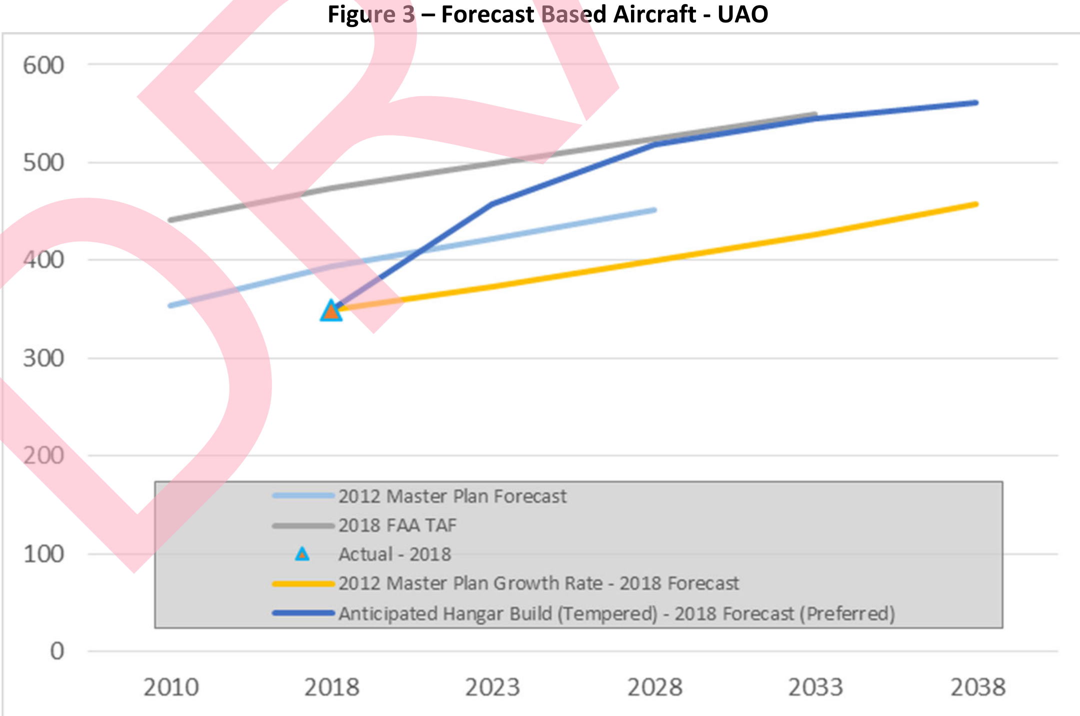
Table 7 – Existing/Updated UAO Based Aircraft Forecasts

	2010	2018	2023	2028	2033	2038	*AAR % (20 years)*
Actual	354	349					--
2012 AMP Recommended*	354	394	422	452			*1.36%*
2018 FAA TAF	324	441	474	499	524	549	*1.10%*
Updated Forecasts							
2012 AMP Growth Rate *(Applied to 2018 Actual Base)*	--	349	373	400	427	457	*1.36%*
2018 Hangar Build (Tempered) **Recommended Forecast**	--	**349**	**458**	**519**	**545**	**561**	***2.40%***

* *2012 AMP recommended forecast interpolated to match current forecast years*

It is noted that the (January 2018) FAA TAF based aircraft forecast for UAO referenced in **Table 7** does not coincide with the FAA's www.basedaircraft.com database, updated by airport management in March 2018. The TAF baseline and future year projections do not reflect recent or planned hangar construction activity at UAO.

Figure 3 – Forecast Based Aircraft - UAO



Based Aircraft Fleet Mix (Recommended Forecast)

The distribution of forecast based aircraft is included in **Table 8**. The current and long term fleet mix is depicted in **Figure 4** and **Figure 5**.

Table 8 – Updated UAO Based Aircraft Fleet Mix

	2018	2023	2028	2033	2038	*AAR % (20 years)*
Based Aircraft						
Single Engine	238	293	323	332	335	*1.72%*
Multi-Engine Piston	17	22	26	26	27	*2.34%*
ME Turboprop	10	15	19	19	20	*2.18%*
Jet	38	65	81	85	87	*4.23%*
Helicopter	46	62	72	83	93	*3.58%*
Total	**349***	**458**	**519**	**545**	**561**	***2.40%***

Figure 4 – 2018 Based Aircraft Fleet Mix - UAO

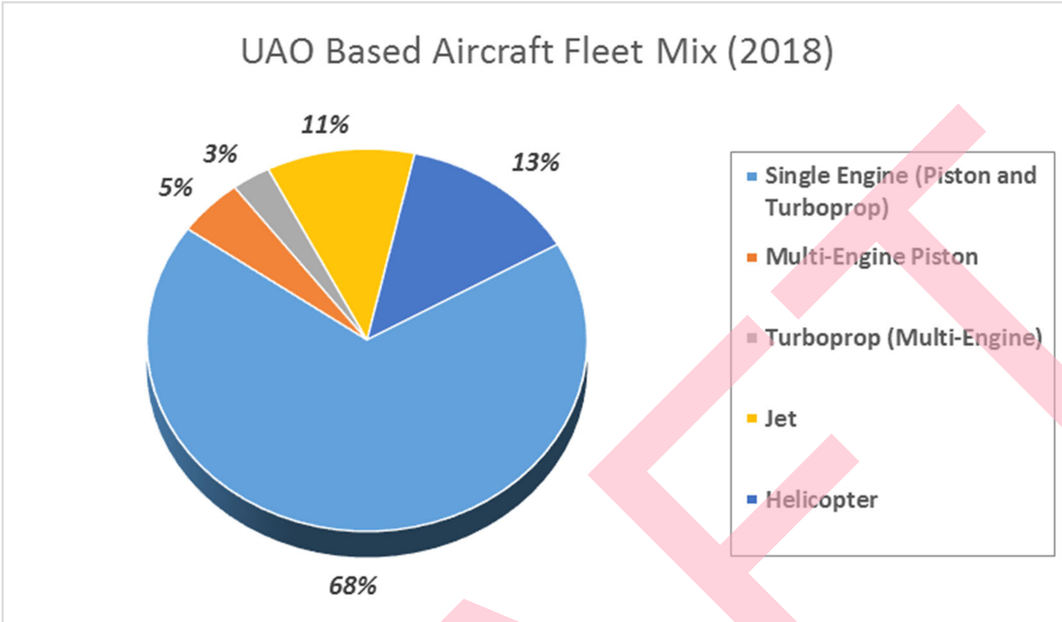
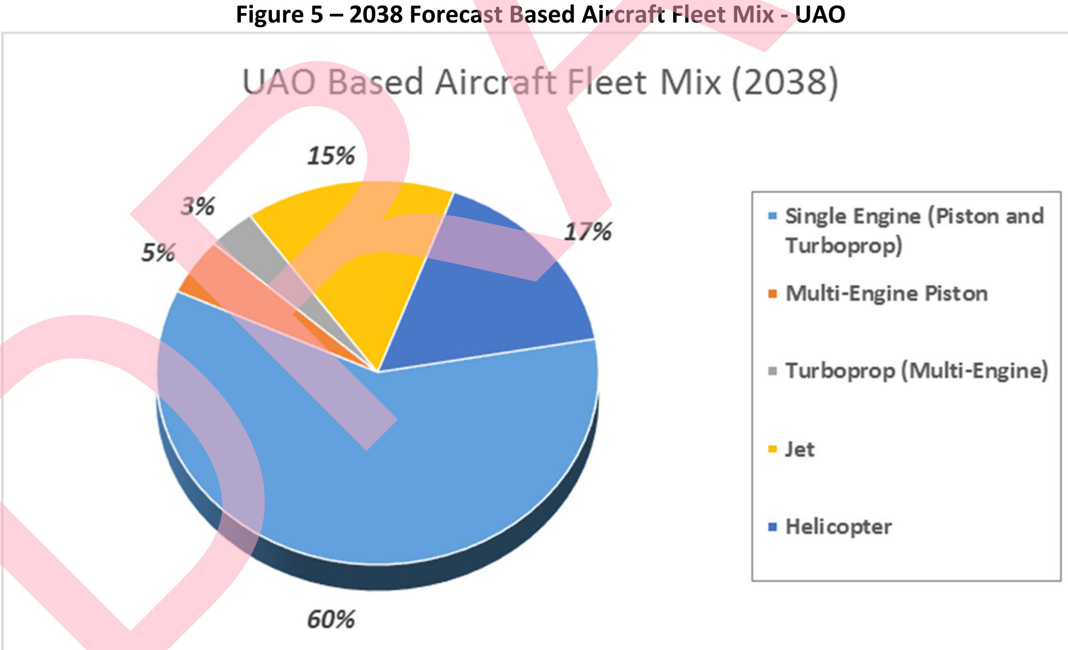


Figure 5 – 2038 Forecast Based Aircraft Fleet Mix - UAO



Aircraft Operations

Three updated aircraft operations forecasts were prepared for this evaluation and comparison to the current FAA Terminal Area Forecast (TAF).

- The first updated projection maintains the 2012 AMP recommended forecast average annual growth rate (1.58% AAR) and applies the rate to the 2018 aircraft operations estimate. The growth rate is higher than current FAA TAF and regional long term forecasts, but provides a reasonable basis for projecting future activity at UAO. This projection increases annual aircraft operations from 66,153 to 90,514 between 2018 and 2038.

- The second updated projection applies the 2018 OPBA (190) derived from the 2018 estimates of aircraft operations and based aircraft, to the recommended based aircraft forecast noted earlier. The growth rate (2.4% AAR) mirrors the projected increase in based aircraft and increases annual aircraft operations from 66,153 to 106,338 between 2018 and 2038. This projection assumes that UAO's level of aircraft utilization will remain similar to current levels during the planning period, particularly that the level of transient activity will grow proportionately with increased based aircraft.

- The third updated projection applies a 5 percentage point increase in the 2018 OPBA ratio (OPBA: 190 to 200) to the recommended based aircraft forecast over the twenty-year forecast period. This projection assumes that the current level of business aircraft utilization will gradually increase (e.g., growth in transient activity, etc.) as ongoing investment in FBO services catering to business aviation is expanded over time. The anticipated growth in new generation experimental and light sport aircraft (LSA) is also expected to contribute to increased aircraft utilization levels. The resulting growth rate (2.68% AAR) is slightly higher than the forecast increase in based aircraft and increases annual aircraft operations from 66,153 to 112,200 between 2018 and 2038.

The updated aircraft operations forecasts, the current FAA TAF, and the 2012 AMP recommended forecast for UAO are summarized in **Table 9** and depicted in **Figure 6**. Based on the factors noted above, **the recommended updated aircraft operations forecast for UAO is the *Increased OPBA* projection**. This forecast anticipates continued strong growth in business aviation and commercial helicopter activity at UAO, which is expected to contribute to higher aircraft utilization ratios. Near term growth is projected to approach 6 percent annually based on the (2023) forecast increase in based aircraft combined with the increase in aircraft utilization, although overall 20-year growth rate averages 2.68 percent through 2038.

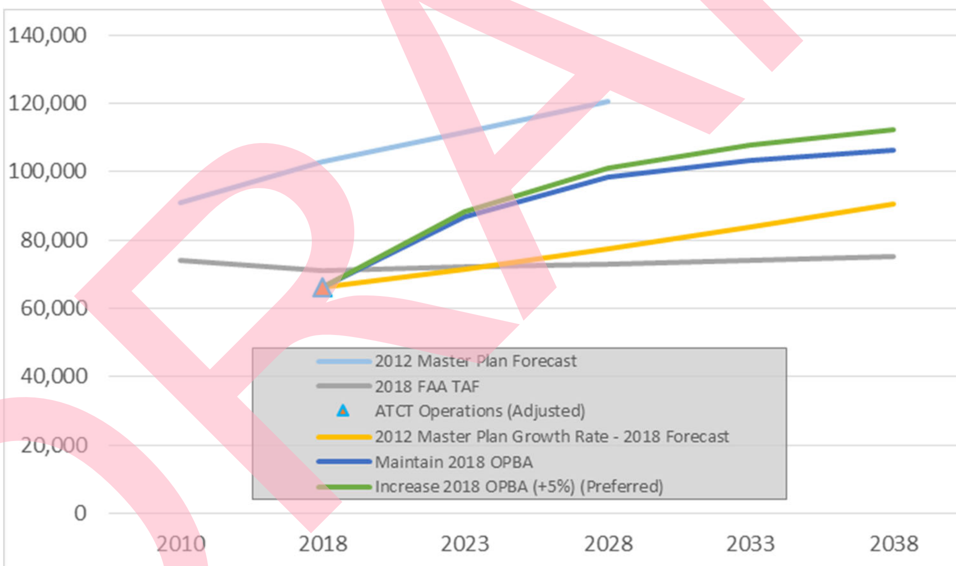
As noted in **Table 2** earlier in the memo, ATCT operations counts at UAO have experienced sharp year-over-year increases since 2016 when full year data became available (+20.2% between 2016 and 2017; +8.3 percent between 2017 and 2018). This spike in activity appears to have closely coincided with recent hangar development and an increase in turbine aircraft activity at the airport. As additional hangar capacity is added over the next five years, annual growth in aircraft operations is expected to be above average, with longer term growth expected to more closely follow national trends for airports with a strong business aviation component.

Table 9 – Existing/Updated UAO Aircraft Operations Forecasts

	2010	2018	2023	2028	2033	2038	*AAR % (20 years)*
Actual (ATCT - Adjusted)		66,153					--
2012 AMP *	90,909	103,056	111,459	120,547	--	--	*1.58%*
2018 FAA TAF	73,895	71,131	72,107	73,112	74,150	75,220	*0.28%*
Updated Forecasts							
2012 AMP Growth Rate *(Applied to 2018 Actual Base)*		66,153	71,547	77,381	83,690	90,514	*1.58%*
Maintain 2018 OPBA		66,153	86,814	98,377	103,305	106,338	*2.40%*
Increase 2018 OPBA (+5%) **Recommended Forecast**		**66,153**	**88,165**	**101,205**	**107,638**	**112,200**	***2.68%***

* *2012 AMP recommended forecast interpolated to match current forecast years*

Figure 6 – Forecast Annual GA Aircraft Operations - UAO



Aircraft Operations Fleet Mix (Recommended Forecast)

The aircraft operations fleet mix is used to identify current and future critical aircraft for runway length planning. As noted earlier, the 2012 AMP identified ARC C-II based on the existing and future critical aircraft (high performance business jet). **Table 10** provides a ten-year summary of select jet aircraft operations at UAO by ARC, as documented in FAA TFMSC instrument flight plan data (not normalized to account for potential data anomalies, e.g., undercounting attributed to split IFR/VFR segments). **Table 11** summarizes the volume of critical aircraft (ARC C-II) or greater operations at UAO for the most recent six years. **The TFMSC data confirms the validity of the ARC C-II designation for Runway 17/35 and provides an established record of demand to support runway length requirements consistent with the aircraft type.**

Table 10– UAO Historical Jet Activity (Select Aircraft)

TFMSC IFR Data - Select Jet Aircraft with Maximum Certificated Takeoff Weight of More than 12,500 Pounds and Select Jet Aircraft over 60,000 Pounds

	Aircraft Design Group	Aircraft Based at UAO	Aircraft Designator	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Average Annual Operations
Embraer ERJ 135	C-II		E135	92	56	12	0	4	6	0	2	2	0	9
Phenom 300	B-II	x	E55P	0	0	0	14	102	96	92	86	122	56	63
Challenger 300	C-II	x	CL30	8	6	4	32	90	64	72	78	104	88	60
Challenger 600	C-II	x	CL60	4	10	42	126	122	36	12	64	80	58	61
Cessna 550 Citation	B-II	x	C550	192	194	154	210	134	162	224	260	158	212	190
Cessna 560 Citation	B-II	x	C560	248	238	344	362	496	460	580	688	772	704	516
Cessna 650 Citation	C-II		C650	152	132	158	90	90	118	144	118	114	98	118
Cessna 680 Citation	B-II	x	C680	6	12	32	64	52	68	72	64	90	138	66
Cessna 750 Citation	C-II	x	C750	4	6	8	60	74	90	94	90	94	104	69
Falcon 20	B-II	x	FA20	12	48	104	90	84	28	14	98	74	76	68
Falcon 50	B-II	x	FA50	18	6	8	10	18	96	220	310	316	276	140
Falcon 900	B-II	x	F900	168	214	254	180	144	48	8	54	80	68	117
Falcon 2000	B-II	x	F2TH	0	4	2	2	14	6	4	6	4	34	8
Astra 1125 - 2012 AMP Design Aircraft	C-II	x	ASTR	182	210	230	178	152	164	114	160	162	96	163
Galaxy 1126	C-II		GALX	2	2	14	8	10	16	0	2	4	0	6
Lear 31	C-I		LJ31	0	8	2	4	2	0	0	6	54	92	19
Lear 35	D-I		LJ35	8	20	20	2	8	16	0	4	6	8	9
Lear 45	C-I	x	LJ45	36	126	138	110	148	180	236	240	208	110	166
Lear 55	C-I		LJ55	0	0	2	0	2	0	0	2	0	4	1
Lear 60	C-I		LJ60	4	0	8	2	4	10	82	36	14	30	21
Lear 75	C-II		LJ75	0	0	0	0	0	0	0	4	10	12	3
Hawker Horizon	C-II		HA4T	0	0	0	2	2	2	0	0	0	0	1
Hawker 800	C-II	x	H25B	56	84	124	224	210	310	118	42	28	34	130
Gulfstream 150	C-II	x	G150	0	4	8	2	0	0	2	2	6	80	12
Gulfstream IV/G400*	C-II		GLF4	10	0	4	4	0	4	0	2	6	2	2
Gulfstream V/G500*	D-III		GLF5	4	2	18	6	10	4	2	0	4	2	5
Gulfstream VI/G600*	D-III		GLF6	0	0	0	0	0	0	0	6	4	2	1
Bombardier Global Express*	B-III	x	GLEX	0	2	4	18	10	4	8	0	14	50	12
Total				**1206**	**1384**	**1694**	**1800**	**1982**	**1988**	**2098**	**2424**	**2530**	**2434**	**2037**
	B-II			644	716	898	932	1044	964	1214	1566	1616	1564	1168
	B-III			0	2	4	18	10	4	8	0	14	50	12
	C-I			40	134	150	116	156	190	318	284	276	236	207
	C-II			510	510	604	726	754	810	556	564	610	572	634
	D-I			8	20	20	2	8	16	0	4	6	8	9
	D-III			4	2	18	6	10	4	2	6	8	4	7

Notes:
1. * MTOW exceeds 60,000

Table 11 – UAO Design Aircraft (Recent Historical Activity)

ARC C-II	2013	2014	2015	2016	2017	2018	6-YEAR AVERAGE
Embraer ERJ135	4	6	0	2	2	0	**2**
Bombardier Challenger 300	90	64	72	78	104	88	**83**
Bombardier Challenger 600	122	36	12	64	80	58	**62**
Cessna Citation 650	90	118	144	118	114	98	**114**
Cessna Citation 750	74	90	94	90	94	104	**91**
IAI Astra 1125	152	164	114	160	162	96	**141**
IAI Galaxy 1126	10	16	0	2	4	0	**5**
Learjet 75	0	0	0	4	10	12	**4**
Hawker 4000/ Horizon	2	2	0	0	0	0	**1**
Hawker 800	210	310	118	42	28	34	**124**
Gulfstream 150	0	0	2	2	6	80	**15**
Gulfstream IV/400	0	4	0	2	6	2	**2**
Total ARC C-II	**754**	**810**	**556**	**564**	**610**	**572**	**644**
*More Demanding ARC**	*28*	*24*	*10*	*10*	*28*	*54*	**26**
Total ARC C-II +	**782**	**834**	**566**	**574**	**638**	**626**	**670**

* ARC B-III, D-I, D-III

Table 12 summarizes forecast operations fleet mix by design group and approach category, and aircraft type (fixed wing and helicopter). The distribution of forecast aircraft operations reflects an increase in business aircraft and helicopter activity with a reduced share of activity generated by piston engine aircraft, which is generally consistent with the forecast based aircraft fleet mix. **Table 13** summarizes forecast operations fleet mix by specific aircraft type.

Table 12 - UAO Forecast Annual Aircraft Operations Fleet Mix (BY AAC + ADG)

Representative Aircraft	AAC + ADG	Historical	Forecast			
		2018	2023	2028	2033	2038
Total Airport Operations		**66,153**	**88,165**	**101,205**	**107,638**	**112,200**
Fixed Wing		55,967	74,059	85,012	89,340	93,126
Helicopter		10,186	14,106	16,193	18,298	19,074
Subtotals by AAC (FW + Heli)	A	50,710	66,870	75,943	79,901	82,408
	B	14,498	19,991	23,733	26,074	28,050
	C	933	1,278	1,493	1,615	1,683
	D	12	26	37	48	59
Total AAC		***66,153***	***88,165***	***101,205***	***107,638***	***112,200***
Subtotals by ADG	I	43,060	56,399	63,709	65,550	67,320
	II	12,890	17,633	21,263	23,745	25,750
	III	17	26	40	44	56
	Heli	10,186	14,106	16,193	18,298	19,074
Total ADG		***66,153***	***88,165***	***101,205***	***107,638***	***112,200***

Table 13 - UAO Forecast Annual Aircraft Operations Fleet Mix (By AC Type)

Representative Aircraft	Historical	Forecast			
	2018	**2023**	**2028**	**2033**	**2038**
Total Airport Operations	**66,153**	**88,165**	**101,205**	**107,638**	**112,200**
Jet	3,810	5,209	6,072	6,458	7,854
Turboprop	3,600	4,408	7,084	8,611	8,976
Multi-Engine Piston	3,200	3,527	4,048	4,305	3,366
Single-Engine Piston	45,357	60,834	67,808	69,966	72,930
Helicopter	10,186	14,106	16,193	18,298	19,074
Fleet Mix Percentages					
Jet	6%	6%	6%	6%	7%
Turboprop	5%	5%	7%	8%	8%
Multi-Engine Piston	5%	4%	4%	4%	3%
Single-Engine Piston	69%	69%	67%	65%	65%
Helicopter	15%	16%	16%	17%	17%

A review of the 2012 AMP forecast and recent activity data confirmed the actual growth in critical aircraft operations (ARC C-II or larger jets) at UAO was consistent with forecast expectations. Based on FAA TFMSC instrument flight plan data, Approach Category C and D jet aircraft operations at UAO in 2018 were approximately 46% above 2010 levels (2012 AMP base year). The current and recent historic levels of critical aircraft operations at UAO clearly exceed the threshold of 500 annual operations required by FAA to define critical design aircraft. The updated forecast of aircraft operations indicates that jets currently represent 5 percent of total UAO operations, and are projected to increase to 7 percent of total operations by the end of the 20-year forecast. The updated aircraft operations forecasts reflect adjustments based on actual activity counts provided by UAO ATCT that were not available in the 2012 AMP; prior forecasts were based on air traffic estimates.

Peak Activity

The aircraft operations peaking forecasts are summarized in **Table 14**. The peaking assumptions used in the 2012 AMP were maintained for the forecast update. The peak month for aircraft operations is estimated at 11 percent.

Table 14 - UAO Forecast Annual Aircraft Operations Fleet Mix (By AC Type)

Representative Aircraft	Historical	Forecast			
	2018	**2023**	**2028**	**2033**	**2038**
Annual Operations	66,153	88,165	101,205	107,638	112,200
Peak Month (11%)	7,277	9,698	11,133	11,840	12,342
Design Day	239	318	365	388	405
Design Hour	26	35	40	43	45

Summary

The recommended based aircraft and aircraft operations forecasts are summarized in **Table 15**. The forecasts reflect growth in based aircraft that is largely related to the planned development of approximately 450,000 to 600,000 square feet over the next 5 to 20 years. The aircraft operations forecast reflect a 5 percentage point increase in the average number of operations per based aircraft (OPBA) over the twenty year planning period (OPBA: 190-200). The forecasts assume that increase in annual operations associated individual segments of aircraft activity (single-engine piston, multi-engine piston, jet, helicopter, etc.) will be roughly proportionate the forecast based aircraft fleet mix.

Table 15 – Updated UAO Forecasts (Summary)

	2018	**2023**	**2028**	2033	2038	*AAR % (20 years)*
Based Aircraft						
Single Engine	238	293	323	332	335	*1.72%*
Multi-Engine Piston	17	22	26	26	27	*2.34%*
ME Turboprop	10	15	19	19	20	*2.18%*
Jet	38	65	81	85	87	*4.23%*
Helicopter	46	62	72	83	93	*3.58%*
Total	**349***	**458**	**519**	**545**	**561**	***2.40%***
Aircraft Operations						
Itinerant						
Air Taxi	2,080	2,350	2,660	3,010	3,400	*2.49%*
General Aviation	36,110	48,510	55,760	59,145	61,401	*2.69%*
Military	272	275	275	275	275	*0.0%*
Subtotal	38,462	51,135	58,695	62,430	65,076	*2.66%*
Local						
General Aviation	27,451	36,780	42,260	44,958	46,874	*2.71%*
Military	240	250	250	250	250	*0.0%*
Subtotal	27,692	37,030	42,510	45,208	47,124	*2.69%*
Total	***66,153***	***88,165***	***101,205***	***107,638***	***112,200***	***2.68%***
Operations Per Based Aircraft (OPBA)	*190*	*193*	*195*	*198*	*200*	-
ARC C-II Operations *(Critical Aircraft)*	572	670	785	919	1,076	3.21%
Other More Demanding AAC/ARC Operations (C-III, D-II, B-III)	54	63	73	85	99	3.07%
Total Critical Aircraft + Operations	626	733	858	1,004	1,175	3.20%

** Validated Based Aircraft Count (3/2018)*

AIRSIDE/RUNWAY FACILITY REQUIREMENTS

RUNWAY EXTENSION FACILITY REQUIREMENTS

There are two methodologies described below to identify a recommended runway length to satisfy existing and future demand at Aurora State Airport. The first, is the FAA standard planning methodology identified in FAA Advisory Circular (AC) 150-5325-4B, Runway Length Requirements for Airport Design and the second is the same methodology described and utilized in the 2012 AMP which has been applied the aircraft operations information identified in the TFMSC data. Lastly, several existing non-standard conditions associated with the runway/taxiway network are described and depicted.

Runway Length Advisory Circular Methodology

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. For general aviation airport runways used by large aircraft (typically aircraft with maximum takeoff weights between 12,500 pounds and 60,000 pounds), the FAA recommends a planning evaluation based on the "family of aircraft" approach which captures the most common aircraft within a particular category. For Aurora State Airport, the design aircraft identified in the 2012 Airport Master Plan is a medium size business jet (above 12,500 pounds), such as a Astra 1125. FAA Advisory Circular (AC) 150-5325-4B, Runway Length Requirements for Airport Design identifies a group of "airplanes that make up 75 percent of the fleet" and a group of "airplanes that make up 100% of fleet". **Table 1** summarizes representative aircraft within these groups. The AC goes on to provide guidance on selecting the appropriate group of aircraft and runway length curves. It states that designers should use 75% of Fleet curves when the aircraft under evaluation are not found in the 100% of Fleet aircraft group. If a relatively few airplanes under evaluation are listed in the 100% of Fleet aircraft group, then the 100% of Fleet length curves should be used.

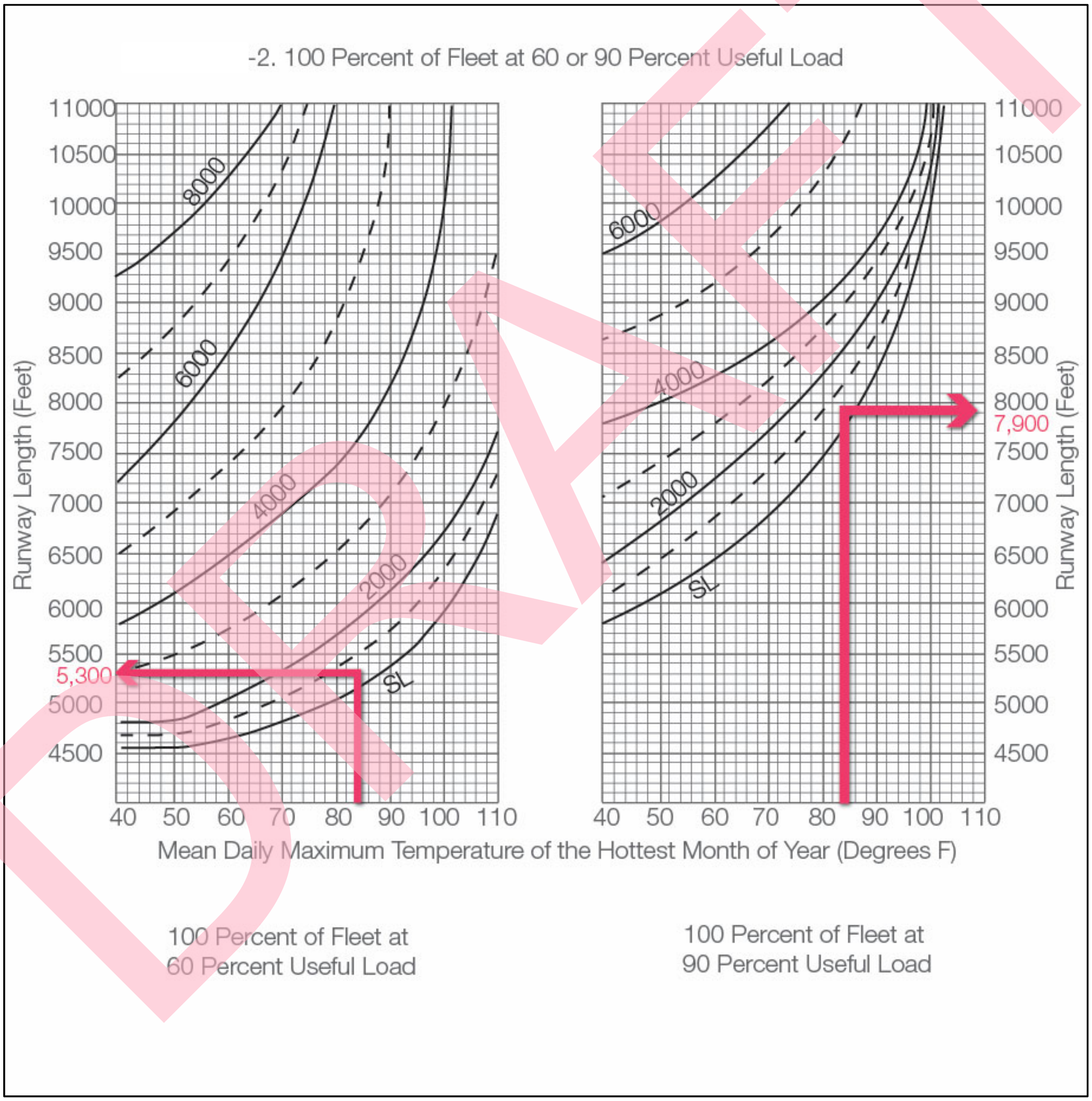
Table 1 – 75% of Fleet and 100% of Fleet Aircraft

AC 150/5325-4A 75% and 100% of Fleet Aircraft	
75% of Fleet	**100% of Fleet**
British Aerospace – Bae 125-700	British Aerospace - Bae Corporate 800, 1000
Beechcraft, Mitsubishi - Beechjet – 400A, Premier I	Bombardier - Challenger 600, 601/601-3A/3ER, 604
Bombardier – Challenger 300	Cessna - S550 Citation S/II, 650 Citation III/IV, 750 Citation X
Cessna – Citation I, II, III, V, VII, CJ-2, Bravo, Excel, Encore, Sovereign	Dassault - Falcon 900C/900EX, 2000/2000EX
Dassault – Falcon 10, 20, 50	IAI - Astra 1125, Galaxy 1126
Israel Aircraft Industries – Jet Commander 1121, 1123, 1124	Learjet - 45 XR, 55/55B/55C, 60
Learjet - 20 series, 30 series, 40, 45	Raytheon Hawker - Horizon, 800/800 XP, 1000
Raytheon Hawker – Hawker 400, 600	Sabreliner - 65/75
Rockwell - Saberliner 75	
Notes: 1. Red Text indicates aircraft operating at UAO according to sampled TFMSC data.	

A search of the FAA Traffic Flow Management System Counts (TFMSC), which provides operations information based on filed IFR flight plans, shows regular operations from aircraft in the 100% of Fleet group. As such it is appropriate to use the 100% of Fleet length curves to determine runway length at Aurora State Airport.

The runway at Aurora State Airport is located at 199.8' MSL, the mean max temp is 84°F, and the difference in runway high and low points is 3.3'. Using these inputs and the runway length curves for 100% of fleet, unadjusted runway lengths of 5,300 and 7,900' were identified to accommodate 100% of the fleet at 60% and 90% of useful loads, respectively (Figure 1).

Figure 1 – 100 Percent of Fleet Runway Length Curve



Further adjustments of the above lengths are required to account for effective runway gradient and wet and slippery conditions. It should be noted that these adjustments are not cumulative since the first adjusts for takeoffs and the latter adjusts for landings. After both adjustments have been independently applied, the larger resulting runway length is the recommended length.

Runway gradient is addressed by increasing the unadjusted runway length at a rate of 10' for each 1' of difference between runway high and low points. The runway has an elevation difference of 3.3' resulting in adjusted runway lengths of 5,333' and 7,933'. Adjustments for wet and slippery conditions increase the runway length by 15% up to 5,500' at 60% useful load and 7,000' at 90% useful load. For 60% useful load, the runway length recommendation should be increased to the maximum 5,500'. For 90%, the recommended length will remain at 7,900' as it already exceeds the limit for wet/slippery condition adjustment.

Based on local conditions and the methodology outlined in **AC 150/5325-4A,** a runway length of 5,500' feet is needed to accommodate 100 percent of large airplanes (60,000 pounds or less maximum gross takeoff weight) at 60 percent useful load. A length of 7,933' feet is needed to accommodate 100 percent of large airplanes (60,000 pounds or less maximum gross takeoff weight) at 90 percent useful load. At 5,004 feet, Runway 17/35 is 496 feet shorter than the length identified to accommodate the 60 percent useful load profile and 2,929 feet shorter than the length for the 90 percent useful load profile (Table 2).

Table 2 – Runway Length Adjustments

UAO Runway Length Adjustment		
Percent Useful Load	**60%**	**90%**
Unadjusted Runway Length	5,300'	7,900'
Gradient Adjustment	33'	33'
Wet/Slippery Conditions Adjustment	200'	0'
Adjusted Runway Length (Gradient)	5,333'	7,933'
Adjusted Runway Length (Wet/Slippery)	5,500'	7,900'
Final Adjusted Runway Length	**5,500'**	**7,933'**

The FAA states that the selection of the 60- or 90-percent of useful load curves is based on the haul lengths and service needs of critical design aircraft. Assuming a typical haul length of 500 miles or less, it appears that 60 percent of useful load profile for the 100-percent of the fleet is most consistent with current and forecast activity. Reasonable justification would be required to demonstrate to FAA that the typical operational requirements of the design aircraft family are consistent with the higher useful load assumptions. As noted earlier, the FAA establishes a "substantial use threshold" of 500 annual itinerant takeoffs and landings for the design aircraft or family of design aircraft. To pursue a runway extension based on the higher demand profile, the State would need to document sufficient activity (either aircraft currently using the airport that are regularly constrained by current runway length or new aircraft unable to operate at the airport due to runway length) to meet the FAA substantial use threshold.

TFMSC Operations Analysis – Runway Length

In order to evaluate the ability of the runway to meet the needs of the current fleet at Aurora State Airport, further analysis of the Airport's TFMSC data by select jet aircraft with a maximum certificated takeoff weight of more than 12,500 pounds and other select aircraft over 60,000 pounds is presented in Table 3 below and provides additional understanding of the frequency of larger more demanding jet aircraft operating at the Airport.

In summary, on average over the past 9 years, there have been 803 annual operations by aircraft requiring 5,723 feet or more runway length. Furthermore, there have been 599 average annual operations by aircraft requiring 5,901 feet or more of runway length. The majority of these operations (69%) are conducted by aircraft that require 6,000 feet or more of runway during given conditions. On average there are 415 annual operations per year by aircraft that require 6,000 feet or more of runway. Based on the FAA threshold of 500 annual operations, this data suggests a minimum runway length of 5,901 is justified based on available existing Airport activity data.

Table 3 – TFMSC Runway Length Analysis Table

TFMSC IFR Data - Select Jet Aircraft Operations Table

	Aircraft Design Group	Aircraft Based at UAO	Aircraft Designator	Maximum Takeoff Weight (MTOW)	Takeoff Distance (at MTOW)	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Average Annual Operations
Embraer ERJ 135	C-II		E135	41,887	6,177	92	56	12	0	4	6	0	2	2	0	17
Phenom 300	B-II	x	E55P	17,968	3,625	0	0	0	14	102	96	92	86	122	56	57
Challenger 300	C-II	x	CL30	38,850	5,538	8	6	4	32	90	64	72	78	104	88	55
Challenger 600	C-II	x	CL60	45,100	6,544	4	10	42	126	122	36	12	64	80	58	55
Cessna 550 Citation	B-II	x	C550	13,300	4,133	192	194	154	210	134	162	224	260	158	212	190
Cessna 560 Citation	B-II	x	C560	20,000	4,121	248	238	344	362	496	460	580	688	772	704	489
Cessna 650 Citation	C-II		C650	22,000	5,912	152	132	158	90	90	118	144	118	114	98	121
Cessna 680 Citation	B-II	x	C680	30,775	4,200	6	12	32	64	52	68	72	64	90	138	60
Cessna 750 Citation	B-II	x	C750	36,600	5,901	4	6	8	60	74	90	94	90	94	104	62
Falcon 20	B-II	x	FA20	28,650	5,853	12	48	104	90	84	28	14	98	74	76	63
Falcon 50	B-II	x	FA50	37,480	5,413	18	6	8	10	18	96	220	310	316	276	128
Falcon 900	B-II	x	F900	45,503	5,723	168	214	254	180	144	48	8	54	80	68	122
Falcon 2000	B-II	x	F2TH	41,000	6,016	0	4	2	2	14	6	4	6	4	34	8
Astra 1125 - 2012 AMP Design Aircraft	C-II	x	ASTR	24,650	6,084	182	210	230	178	152	164	114	160	162	96	165
Galaxy 1126	C-II		GALX	35,450	6,314	2	2	14	8	10	16	0	2	4	0	6
Lear 31	C-I		LJ31	15,500	3,915	0	8	2	4	2	0	0	6	54	92	17
Lear 35	D-I		LJ35	18,000	5,740	8	20	20	2	8	16	0	4	6	8	9
Lear 45	C-I	x	LJ45	20,500	4,845	36	126	138	110	148	180	236	240	208	110	153
Lear 55	C-I		LJ55	21,500	6,096	0	0	2	0	2	0	0	2	0	4	1
Lear 60	C-I		LJ60	23,500	6,153	4	0	8	2	4	10	82	36	14	30	19
Lear 75	C-II		LJ75	21,500	5,114	0	0	0	0	0	0	0	4	10	12	3
Hawker Horizon	C-II		HA4T	39,500	6,027	0	0	0	2	2	2	0	0	0	0	1
Hawker 800	C-II	x	H25B	28,000	6,176	56	84	124	224	210	310	118	42	28	34	123
Gulfstream 150	C-II	x	G150	26,100	5,770	0	4	8	2	0	0	2	2	6	80	10
Gulfstream IV/G400*	C-II		GLF4	73,200	6,257	10	0	4	4	0	4	0	2	6	2	3
Gulfstream V/G500*	D-III		GLF5	76,850	6,877	4	2	18	6	10	4	2	0	4	2	5
Gulfstream VI/G600*	D-III		GLF6	91,600	6,785	0	0	0	0	0	0	0	6	4	2	1
Bombardier Global Express*	B-III	x	GLEX	92,500	7,232	0	2	4	18	10	4	8	0	14	50	11
Total						**1206**	**1384**	**1694**	**1800**	**1982**	**1988**	**2098**	**2424**	**2530**	**2434**	**1954**
Annual operations by aircraft requiring 5,000' or more runway length						724	806	1024	1036	1048	1022	894	1080	1126	1122	988
Aircraft Identified in Table 3-2 of AC 150/5325-4B - Figure 3-2 Recommended Runway Length 5,500'						410	460	620	756	732	820	640	584	590	596	621
Annual operations by aircraft requiring 5,500' or more runway length						706	800	1016	1026	1030	926	674	766	800	834	858
Annual operations by aircraft requiring 5,723' or more runway length						698	794	1012	994	940	862	602	688	696	746	803
Annual operations by aircraft requiring 5,901' or more runway length						510	508	626	720	704	770	578	530	530	514	599
Annual operations by aircraft requiring 6,000' or more runway length						354	370	460	570	540	562	340	322	322	312	415

Notes:
1. * MTOW exceeds 60,000
2. Aircraft Identified in Table 3-2 in AC 150/5325-4B Justifying Runway Length Analysis with Figure 3-2: 100 Percent of Fleet at 60 or 90 Percent Useful Load Identified by blue highlight
3. Aircraft requiring 6,000' or more of runway length identified by green highlight
4. Takeoff Distance Calculations utilized previous data and methodology provided in 2012 Airport Master Plan

A case for continued growth by these aircraft is supported by the aviation activity forecasts previously presented. The forecasts project sustained growth in air taxi operations, which commonly utilize the aircraft identified above as requiring at least 6,000 feet of runway length. By applying the air taxi average annual growth rate (1.58%) to the average operations count for these aircraft shows that it is reasonable to expect the 500 operations threshold to be surpassed within 10 years, with average annual 501 operations estimated to occur around 2029 or sooner.

Recommendation: Based on the FAA threshold of 500 annual operations, the data suggests a minimum runway length of 5,901 is justified based on available existing Airport activity data. Given that aircraft operations requiring 6,000 feet of runway are forecasted to exceed 500 annual operations by 2029, it is our recommendation to move forward with the full extension to 6000 feet as identified in the 2012 Airport Master Plan.

Non-Standard Conditions Associated with Runway Extension

The FAA defines several recommended standards for airport design in AC 150/5300-13A, Airport Design. Some of the most critical standards are those related to the design of runways and taxiways, which are listed below.

- Runway Safety Area (RSA)
- Object Free Area (OFA)
- Object Free Zone (OFZ)
- Runway Protection Zone (RPZ)

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

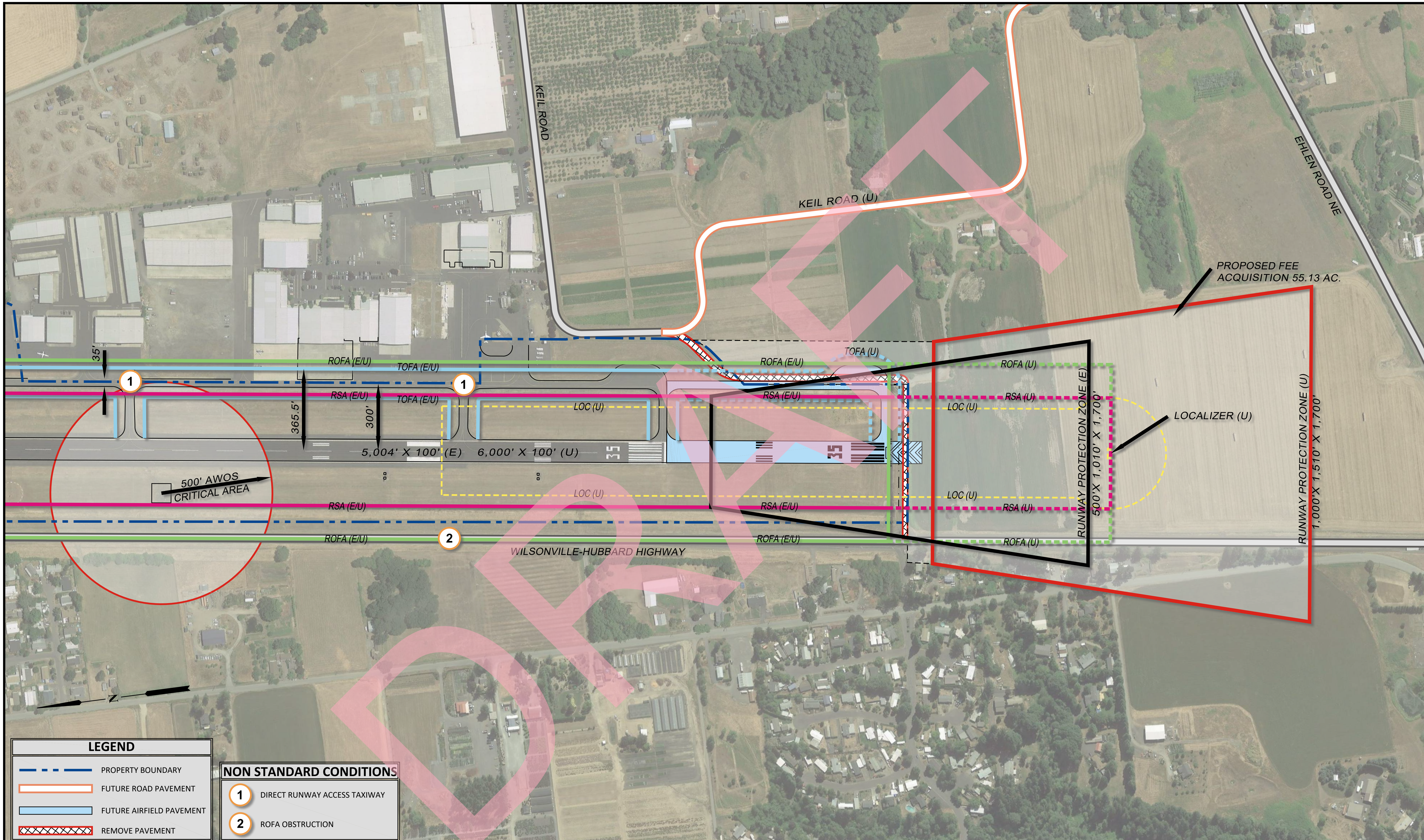
The Object Free Area (OFA) is an area on the ground centered on the runway, taxiway, or taxilane centerline that is provided to enhance the safety of aircraft operations. No above ground objects are allowed except for those that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes.

The Obstacle Free Zone (OFZ) is a volume of airspace that is required to be clear of obstacles, except for frangible items required for the navigation of aircraft. It is centered along the runway and extended runway centerline.

The Runway Protection Zone (RPZ) is a trapezoidal area off each runway end intended to enhance the protection of people and property on the ground. The dimensions of an RPZ are a function of the runway ARC and approach visibility minimums. The FAA recommends that RPZs be clear of all residences and places of public assembly (churches, schools, hospitals, etc.) and that airports own the land within the RPZs.

At Aurora State Airport, the existing runway design meets standards with the exception of two issues associated with the ROFA and direct runway access. First, there are two areas on the airfield where taxiway standards should be addressed. The FAA recommends that taxiways not lead directly from an apron without requiring a turn. Such configurations can lead to confusion when a pilot expects to encounter a parallel taxiway but instead accidentally enters a runway. There are two direct runway access points on the airport, from Taxiway A at Connectors A3 and A4. These taxiways should be reconfigured to remove the direct runway access points. Second, Wilsonville-Hubbard Highway runs along the west edge of the ROFA and the north-bound lane of the highway is located within the Object Free Area and as such, is not allowed by FAA Design Standards for C-II runway.

It should also be noted that the existing runway 35 RPZ is intersected by Wilsonville-Hubbard Highway, and runway 35 ultimate RPZ is intersected by Wilson-Hubbard Highway and Boones Ferry Road. "Interim Guidance on Land Uses within Runway Protection Zone (2012)" identifies public roadway as an incompatible land use which should be mitigated. However, in these cases the incompatible land uses are located in the non-critical area of the RPZ, which lies outside of the extended ROFA. While still technically considered an incompatible use, roadways in the non-critical areas are regarded as lower risk and may be allowed by the FAA on case by case basis. Concerning the existing RPZ, the land use was previously allowed and is shown on the current approved ALP, as such no action is required. The ultimate runway 35 RPZ has a larger footprint due to planned lower visibility minimums. Expanding the RPZ will introduce an additional incompatible land use (I.e. Boones Ferry Road) but it will again be located in the RPZ non-critical area.



NON STANDARD CONDITIONS
FIGURE 1-2

AURORA STATE AIRPORT

OREGON DEPARTMENT OF AVIATION

NOTE

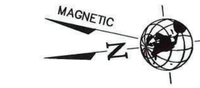
THE PREPARATION OF THIS DOCUMENT MAY HAVE BEEN SUPPORTED, IN PART, THROUGH THE AIRPORT IMPROVEMENT PROGRAM FINANCIAL ASSISTANCE FROM THE FEDERAL AVIATION ADMINISTRATION (PROJECT NUMBER 3–41–0004–015) AS PROVIDED UNDER TITLE 49, UNITED STATES CODE, SECTION 47104. THE CONTENTS DO NOT NECESSARILY REFLECT THE OFFICIAL VIEWS OR POLICY OF THE FAA. ACCEPTANCE OF THIS REPORT BY THE FAA DOES NOT IN ANY WAY CONSTITUTE A COMMITMENT ON THE PART OF THE UNITED STATES TO PARTICIPATE IN ANY DEVELOPMENT DEPICTED THEREIN NOR DOES IT INDICATE THAT THE PROPOSED DEVELOPMENT IS ENVIRONMENTALLY ACCEPTABLE IN ACCORDANCE WITH APPROPRIATE PUBLIC LAWS.

Declared Distances (800-feet Displaced Threshold to Runway 17)

	Runway 35		Runway 17	
	Existing	Ultimate	Existing	Ultimate
Takeoff Run Available (TORA)	5,004'	5,004'	5,004'	5,804'
Takeoff Distance Available (TODA)	5,004'	5,004'	5,004'	5,804'
Accelerate-Stop Distance Available (ASDA)	5,004'	5,804'	5,004'	5,804'
Landing Distance Available (LDA)	5,004'	5,004	5,004'	5,004'

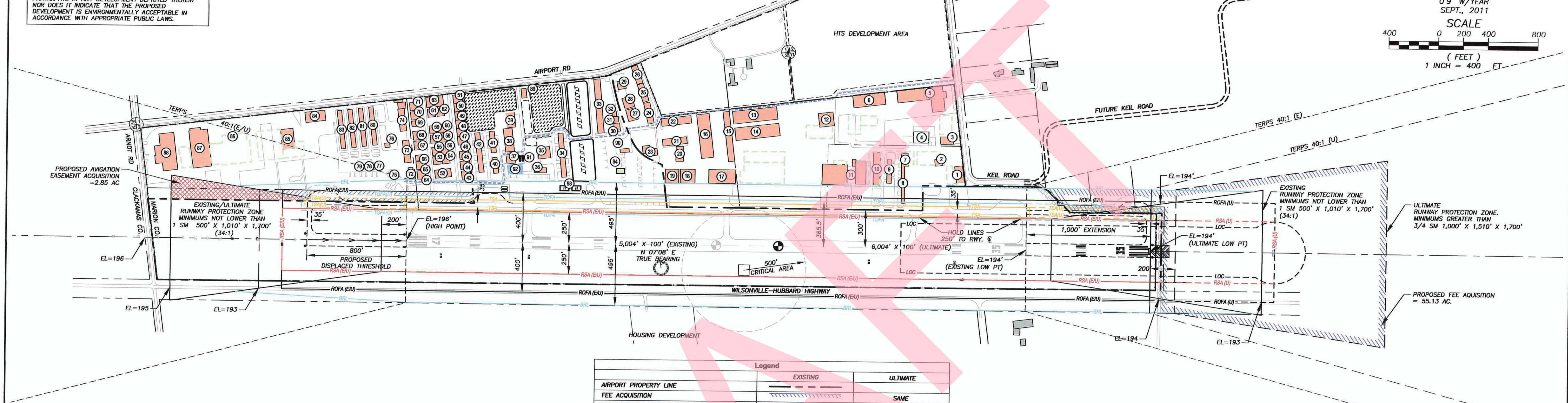
Declared Distances (1,000-feet Extension to Runway 35)

	Runway 35		Runway 17	
	Existing	Ultimate	Existing	Ultimate
Takeoff Run Available (TORA)	5,004'	6,004'	5,004'	6,004'
Takeoff Distance Available (TODA)	5,004'	6,004'	5,004'	6,004'
Accelerate-Stop Distance Available (ASDA)	5,004'	6,004'	5,004'	6,004'
Landing Distance Available (LDA)	5,004'	6,004'	5,004'	6,004'



MAGNETIC DECLINATION
16.7° EAST CHANGING
0°9' W/YEAR
SEPT., 2011

SCALE
400 0 200 400 800
(FEET)
1 INCH = 400 FT



Legend

	EXISTING	ULTIMATE
AIRPORT PROPERTY LINE		
FEE ACQUISITION		SAME
AVIGATION EASEMENT ACQUISITION		SAME
AIRPORT ENVIRONS BUILDING		
OFF–AIRPORT ENVIRONS BUILDING		
FENCE		SAME
AIRPORT REFERENCE POINT		
BUILDING RESTRICTION LINE (35' AGL) (BRL)	BRL	SAME
RUNWAY SAFETY AREA (RSA)	RSA	RSA
RUNWAY OBJECT FREE AREA (ROFA)	ROFA	ROFA
RUNWAY PROTECTION ZONE (RPZ)		
EXTENDED RUNWAY CENTERLINE		SAME
DISPLACED THRESHOLD	N/A	
TAXIWAY HOLDLINE		SAME
TAXIWAY SAFETY AREA (TSA)	TSA	TSA
TAXIWAY OBJECT FREE AREA (TOFA)	TOFA	TOFA
SERVICE ROAD	N/A	
HANGAR DEVELOPMENT AREA		SAME
APRON / TIEDOWN AREA		
WINDCONE & SEGMENTED CIRCLE		SAME
VASI		SAME
PAPI	N/A	
REIL		SAME
ODAL		
LOCALIZER		
LOCALIZER CRITICAL AREA	LOC	SAME
CARGO APRON	N/A	
PAVEMENT		
PAVEMENT REMOVAL		SAME
FUEL TANKS		
HELICOPTER PARKING	N/A	

Airport Data

	Existing	Ultimate
Airport Elevation (MSL)	196'	Same
Airport Reference Point (ARP)		
Latitude	45°14'54.085"N	45°14'44.758"N
Longitude	122°46'11.405"W	122°46'13.040"W
Mean Maximum Temperature	84°	Same
Airport Reference Code (ARC)	C-II	C-II
Airport Service Level	General Aviation	Same
Design Aircraft	IAI Astra 1125	Cessna Citation X

Notes

Per guidance from the Oregon Aviation Board, this Airport Layout Plan depicts a proposed 800-feet displaced threshold to Runway 17 and a proposed 1,000-feet extension to Runway 35. These projects are mutually exclusive and it is the preference of the Board to pursue the displaced threshold option. However, if the FAA does not approve the requested modification to standards to allow the displaced threshold, the extension to Runway 35 will be pursued.

Existing runway end coordinates and existing ARP taken from obstruction chart 5722 for the Aurora State Airport. Surveyed May 1992, published January 1993. Horizontal datum is NAD 1983, vertical datum is NGVD 1929.

The Airport is flat. Elevations / ground contours vary by less than 5 feet and are not shown. Drainage features are typically 2-3 feet lower than adjacent land.

Building restriction line is based on a 35-foot building located 495 feet from the runway centerline not penetrating FAR Part 77 surfaces for the Airport.

Runway 17/35 Data

	Existing	Ultimate
Percent Effective Gradient	0.06%	Same
Percent Wind Coverage (10.5 kts)	98.93%	Same
Maximum Elevation Above MSL	196'	Same
Runway Length	5,004'	See Declared Distances Table
Runway Width	100'	Same
Runway Surface Type	Asphalt	Same
Runway Strength (Dual Wheel Gear)	45,000 lbs	60,000 lbs
FAR Part 77 Approach Category		
Runway 17	C (NP)	Same
Runway 35	C (NP)	D (NP)
Approach Type	Nonprecision	Same
Runway 17	Not lower than 1 sm	Same
Runway 35	Not lower than 1 sm	Not lower than 3/4 sm
Approach Slope (Required / Clear)	34:1 / 34:1	Same
Runway Lighting	MIRL	Same
Runway Marking	Precision	Same
Taxiway Lighting	MITL / Reflectors	Same
Taxiway Marking	Standard	Same
Navigation Aids	LOC/DME, NDB	ODALS, PAPI, REIL
Visual Aids	ODALS, VASI, REIL	Same
Runway Safety Area Dimension	500' x 1,000' beyond rwy end	Same
Runway Object Free Area Dimension	800' x 1,000' beyond rwy end	Same
Runway Obstacle Free Zone (OFZ)	No OFZ Penetrations	Same
Runway End Coordinates		
Runway 17 Latitude	45°15'14.166"N	Same
Longitude	122°46'07.828"W	Same
Runway 17 Displaced Latitude	N/A	45°15'22.005"N
Threshold Longitude	N/A	122°46'06.438"W
Runway 35 Latitude	45°14'25.148"N	45°14'15.350"N
Longitude	122°46'16.515"W	122°46'18.251"W

Modifications to Standards

	Standard Being Modified	Proposed Action
1	Advisory Circular (AC) 150/5300-13, para 307 (Runway Object Free Area)	The standard runway object free area (OFA) for Airport Reference Code C-II airports is 800 feet. Highway 551 runs north/south parallel to Runway 17/35; the approximate distance from the Runway 17/35 centerline to the Highway 551 centerline is 400 feet. As the airport geometry is not changing from the current condition, the Oregon Department of Aviation (ODA) requests a modification of the OFA design standard to allow the runway and highway to remain in their current positions.
2	AC 150/5300-13, Appendix 14 (Declared Distances)	The ODA requests the existing threshold for Runway 17 be referenced in determining FAR Part 77 surfaces and design standard surfaces referenced in AC 150/5300-13 (*i.e.*, RSA, RPZ, OFA, OFZ).

Airport Facilities and Buildings Legend

Building No. Existing	Building No. Ultimate	Name / Owner	Use	Estimated Top Elevation (AGL)
1		Leased by Aurora Jet Center	Maintenance, Aircraft Storage	27'
2		Aurora Jet Center	Fixed Base Operator	22'
3		Private Southend Hangar	Aircraft Storage	19'
4		Hogan's Hangar	Aircraft Storage	23'
5		Van's Aircraft	Business	30'
6		Artex	Business	26'
7, 8		Foxtrot Hangars / Southend Airpark	Aircraft Storage	21'
9		Hangar Row G / Southend Airpark	Aircraft Storage	13'
10		Hangar Row H / Southend Airpark	Business, Aircraft Storage	21'
11		Hangar India, Juliet & Kilo / Southend Airpark	Business, Aircraft Storage	38'
12		Winco	Business	29'
13		Hangar November / Southend Airpark	Business, Aircraft Storage	29'
14		Hangar Mike / Southend Airpark	Business, Aircraft Storage	31'
15 – 17		Airport Aviation Condo Association	Aircraft Storage	32'
18		Airport Aviation Condo Association	Aircraft Storage	32'
19		Aurora Aviation	Maintenance	26'
20 – 22		Airport Aviation Condo Association	Aircraft Storage	25'
23		Columbia Aviation Association	Clubhouse	21'

Airport Facilities and Buildings Legend

Building No. Existing	Building No. Ultimate	Name / Owner	Use	Estimated Top Elevation (AGL)
24 – 26		Meridian Condos	Business	23'
27 – 29		Pacific Coast Aviation	Business	26'
30 – 33		Oregon Dept. of Aviation	Aircraft Storage	25'
34		Columbia Helicopters	Aircraft Storage	22'
35		Columbia Helicopters	Maintenance	28'
36		Aurora Aviation	Fixed Base Operator	16'
37		Pitts Hangar	Aircraft Storage	26'
38 – 42		Aurora Business Park	Aircraft Storage	25'
43 – 71		Wylee Condo Association	Aircraft Storage	27'
72		Civil Air Patrol Building	Aircraft Storage	26'
73		Sunset Helicopters	Business	26'
74		Aerometal	Business	27'
75		Willamette Aviation	Aircraft Fueling	7'
76		Willamette Aviation	Fixed Base Operator	12'
77 – 83		Willamette Aviation	Aircraft Storage	16'
84		Marlow Treit	Aircraft Storage	22'
85 – 88		Columbia Helicopters	Business	30'
89		Fire Suppression Tanks	Fire Suppression	12'
	90	Aurora Rural Fire Protection District	Emergency Response	TBD
	91	Aurora Aviation	Aircraft Fueling	16'
	92	Oregon Dept. of Aviation	Cargo Apron	N/A
	93	Oregon Dept. of Aviation	Helicopter Parking	N/A
	94	Oregon Dept. of Aviation	Air Traffic Control Tower	TBD

** FINAL DRAFT **

[DATE: 10/7/2011 10:04 AM] [AUTHOR: riwasaki] [PLOTTER: \\pdx-print\Designjet-color] [STYLE: WHP-Standard.ctb]
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REVISIONS

NO.	BY	DATE	REMARKS

AIRPORT LAYOUT PLAN DRAWING

OREGON DEPARTMENT OF AVIATION
AURORA STATE AIRPORT ~ MASTER PLAN UPDATE

PROJECT NUMBER	DRAWING FILE NAME	SCALE
034317	034317-XREF-MSTR-ALP	1"=400'

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