Analysis: Hillsboro Airport Third Runway Project, Capacity, Delay, Forecast (Airport Service Volume)

Airside capacity establishes the ability of the existing airfield facilities (runways and taxiways) to accommodate projected aviation activity demand.

The National Plan of Integrated Airport Systems (NIPAS) states, "The performance of the airport system is affected by many factors, including the layout of individual airports, the manner in which airspace is organized and used, operating procedures, and application technology. The concentration of traffic at an airport can result in congestion and delay."

The Airport Operator (AO) takes a very narrow view of the causes of airport delay and could therefore see the only solutions as building a new runway, helicopter landing area with the attendant taxiway.

The danger in focusing on runways and taxiways is that their construction may actually decrease system capacity and efficiency. As a result of unwarranted construction at one airport, other airports may be adversely impacted. In some cases, the ability to increase operations at one airport can result in additional system controls to regulate volume throughout the area or the air traffic system in order to serve the increased demand at the larger airport. The Assessment should consider all factors that impact aviation in order to ensure that the final outcome represents the true aviation need not only for Hillsboro Airport, but for the entire region.

"In 2005, the Port of Portland completed a Master Plan for Hillsboro Airport that evaluated the Airports' capabilities and role, forecast future aviation demand, and developed a plan for the timely development of new or expanded facilities that would enable the Airport to efficiently serve forecast demand. Among the Master Plan recommendations was the development of a new parallel runway because the airfield was operating at close to 100% of the airfield capacity and would exceed airfield capacity in the future, as defined by Annual Service Volume (ASV).1

1 ASV is a reasonable estimate of an airport's annual capacity. It is the annual level of traffic that results in a given level of average delay."

Other airport operators have defined ASV as: "Annual service volume (ASV) is defined as an estimate of an airport's annual operating capacity, which represents its ability to process aircraft activity on a continual basis."

The problem with ASV is that is an estimate. There are no firm guidelines for establishing ASV, and is susceptible to the biases and outcomes desired by the preparer. ASV is acceptable at airports where there is no accurate method of identifying aircraft activity. Hillsboro has an operating control tower from the hours of 0600 - 2200 seven days a week. As such the daily

traffic count is available and only the operations occurring between 2200 and 0600 should be estimated.

At airports with control towers, accurate operations data is available. The actual operating capacity can be accurately determined though the development of a baseline model against which future airport demand, capacity and efficiency can be measured and determined. As such individual opinions as to what a pilot, operator, flight school, maintenance activity, etc. is not especially relevant in determining future airport demand based on a set of "what if" questions.

ASV does not provide data that is supportable since it is based on a series of assumptions that have little relationship to actual aircraft operations. In our experience ASV is only used as justification for airport expansion when no other, more precise methods, generate the desired outcome.

"The Court upheld many aspects of the FAA's environmental review, but found in the petitioner's favor with respect to the allegation that FAA had failed to adequately account for the possibility that the proposed new runway might cause an increase in aviation activity at Hillsboro Airport."

Airports reach capacity in two primary ways, an increase in air traffic operations or a reduction in available runways. Airports or controllers can reduce capacity by implementing restrictions on activities or limit the number of aircraft in the traffic pattern, extending the traffic pattern, etc. The only reason to construct additional runways is to increase capacity.

Increased capacity reduces delays. Delays occur or increase when airport infrastructure such as runway and taxiways are not available, there is insufficient ramp space to accommodate aircraft parking, bad weather, or an increase in operations.

It should be noted that delay is only recorded for instrument operations, i.e. aircraft landing or departing on an Instrument Flight Rules (IFR) flight plan. As such local and operations conducted under VFR conditions are not used in calculating delay. The main reason for IFR delay is system demand, bad weather, airport closures or flow control etc. which would be under the purview of the FAA's Portland Terminal Approach Control.

It is important to note that FAA data indicated that between the beginning of 1999 and the end of 2012 a total of 66 aircraft were delayed for an average of 28.47 minutes each. Of the 66 aircraft, 60 were delayed awaiting takeoff. In the 14 years of date reviewed, only 2 delays were attributed to runway availability. The majority of delay was caused by volume of aircraft in the airspace used for instrument aircraft operations and the subsequent limitations on additional aircraft allowed into that airspace by the Air Traffic Control system. In our opinion the majority of this traffic volume is aircraft into and out of PDX. (See HIO Delay 1999-2112 attached Exhibits 1 and 2)

The additional runway, will increase the capacity of the airport and the increased capacity will allow and possibly attract additional operations. The addition of the proposed parallel runway will allow all local operations to move to that runway freeing the existing runway to

accommodate an increase in operations at least equal to the local operation currently using that runway. Based on the number and cause of HIO delays, an additional runway will have almost no impact on delay.

The proposed closure of air traffic control tower(s) by the FAA in locations such as Troutdale can result in the relocation of pilots who prefer to conduct operations while being controlled by skilled air traffic controllers.

The National Plan of Integrated Airport Systems (NIPAS) states***, "Experience shows that delay increases gradually with rising levels of traffic until the practical capacity of an airport is reached, at which point the average delay per aircraft operation is in the range of 3 to 5 minutes. Delays increase rapidly once traffic demand increases beyond this level. An airport is considered to be congested when average delay exceeds 5 minutes per operation. Beyond this point delays are extremely volatile, and a small increase in traffic, adverse weather conditions, or other disruptions can result in lengthy delays….."***

The airport should not try to use VFR operations to support a claim of runway delays. NIPAS is referring to air carrier airports not general aviation airports where the majority of operations are conducted under Visual Flight Rules (VFR).

"FAA Advisory Circular 150/5060-5 g/23/83 states:

1-4. CAPACITY, DEMAND, DELAY RELATIONSHIPS, As demand approaches capacity, individual aircraft delay is increased. Successive hourly demands exceeding the hourly capacity result in unacceptable delays. When the hourly demand is less than the hourly capacity, aircraft delays will still occur if the demand within a portion of the time interval exceeds the capacity during that interval, Because the magnitude and scheduling of user demand is relatively unconstrained, reductions in aircraft delay can best be achieved through airport improvements which increase capacity."

Aircraft delays actually increase when the actual air traffic demand at any given time exceeds the runway capacity. ASV speaks to annual volume and assumes that delays will occur only when that volume is reached or increased.

NIPAS identified several alternative measures to address airfield congestion. According to NIPAS, ***"The construction of new runways is not the only response to airfield congestion. The continued application of certain measures, termed alternative measures, will help to limit delay without substantial investment."***

NIPAS list the following alternatives to runway and taxiway construction.

- Modifying air traffic control procedures.
- Improve the flow of aircraft in terminal and en route areas.
- Free flight in the en route phase of flight.
- New instrument approach procedures for adverse weather.
- New safety and capacity program for aircraft taxiing in low visibility conditions.

- Technology advances in automation, information systems, communications, navigation and surveillance and weather.
- Redistribution of air traffic among airports.
- Reliever airport development.
- Aircraft substitution and up gauging.
- Aircraft hubs. (banking of arrivals and departures)
- Reduce peaks and valleys in aircraft demand.
- Pricing incentives.

The above recommendations are appropriate for air carrier airports and for aircraft operating on and IFR flight plan.

Table 3.1 provides data on the airport's existing annual service volume versus projected 2025 annual operations. It should be noted that aircraft remaining in the airport traffic pattern (local air traffic operations, including helicopter operations) should not be counted as operations that impact airport capacity. Local training operations can be rescheduled or accommodated at other locations and not allowed to impact other airport operations. Helicopter operations do not require the use of a runway and do not impact airport capacity.

In situations where the proponent attempts to use helicopter operations as a factor in adding to the complexity of the operation due to increased workload, specific helicopter routes that do not interfere with the runway operations can be developed and an separate air traffic control position that controls only helicopters can be established.

The addition of the proposed runway, as previously stated, would allow all local (traffic pattern training) operations to use the new runway and the existing runway could accommodate an number of operations equal to the total operations being conducted without the new parallel runway. Note that Table 3-1 does not break out local operations or helicopter operations but lumps all the operations together in order to suggest that the current runways are operating at or near capacity and that the only alternative is to build an additional runway.

TABLE 3-1
Original (2010) Environmental Assessment/2005 Hillsboro Master Plan Forecast

Year	ASV[a]	Annual Runway Operations [b]	Total Forecast Operations [c]	Percent ASV [d]	Average Delay (minutes)	Total Aircraft Delay (hours/year)
2007	169,000	166,033	240,735	98%	1.2	3,321
2010	176,000	196,600	270,300	112%	1.9	6,200
2012	174,000	203,594	277,294	117%	2.3	7,804
2015	174,000	214,600	288,300	123%	3.6	12,900
2025	171,000	249,300	323,000	146%	6.0	24,900

a ASV varies with changes in fleet mix over the forecast period.
b Runway operations = total operations less estimated helicopter training operations.
c Total forecast operations includes all activity using the runway system, as well as helicopter training operations.
d Percent ASV represents the percentage of annual runway operations relative to ASV.
Source: Original (2010) Final Environmental Assessment (Table 1-4)

Table 3-1 states that total delay in 2007 will be 3,321 hours and in 2010 the total will increase to 6,200 hours. FAA OPSNET data reveals that actual delay in 2007 was 0. In 2010 actual delay

was 122 MINUTES. In fact the total delay for all 14 years (1999-2012) was 1,819 MINUTES. The table also provides forecast operations. In 2007 the total operations recorded by the FAA was 238,605; very close to the volume forecast. In 2010 the forecast was for 270,300 operations. The FAA recorded 220,213 actual operations. The table forecasts 277,294 operations in 2012. The actual 2012 volume was 202,967. The 2012 forecast delay was 7,804 hours while the FAA recorded an actual delay in 2012 of 482 MINUTES.

Note that the average delay in 2025 is forecast to be 6.0 minutes. The document states, ***"At air carrier airports the 6.0 minutes of delay consideration of a new runway occurs."*** Other options are also available at air carrier airports such as a modification of procedures, scheduling, airspace design etc. Los Angeles Airport is a prime example of an air carrier airport where flight delays were exceptionally high. The FAA restructured the airspace (Dual CIVIT) and the delays decreased The 6.0 minutes of delay in Table 3-1 would not require a busy air carrier airport to even consider an alternative until somewhere near the year 2025. In our opinion the parallel runway is not required at this time or in the foreseeable future, if valid operational figures of runway use were employed. The Palomar Airport in California accommodates approximately 240,000 operations per year with one runway.

In our opinion a full environmental review should be required, using actual operations from tower logs and the actual capacity of the proposed infrastructure analyzed to show the increases in capacity that the airport owner is understating. Additionally, historical operations years should be shown as in many cases airports were accommodating more operations in the 1990-2001 years then in the years since early 2002.

OPSNET : Delays : Standard Report

From 01/1989 To 12/2012 | Facility=HIO

			System Impact Delays							System Impact Delays										
					Occurred At Delays					By Class				By Cause					Time	
Calendar Year	Facility	Total Ops	Total Delays	TMI To	Dep	Abrn	TMI From	Total Occ At	Abrn Dest To Delays	AC	AT	GA	Mil	Wx	Vol	Equip	Rwy	Other	Avg (Min)	Total (Min)
1999	HIO	56778	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0
2000	HIO	244511	9	4	5	0	1	6	0	0	0	9	0	4	0	5	0	0	25.33	228
2001	HIO	235383	2	1	1	0	1	2	1	0	1	1	0	2	0	0	0	0	39.00	78
2002	HIO	223589	4	0	4	0	0	4	4	0	0	4	0	3	0	1	0	0	24.25	97
2003	HIO	218118	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0
2004	HIO	192853	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.00	0
2005	HIO	219227	1	0	0	1	3	4	3	0	0	1	0	1	0	0	0	0	33.00	33
2006	HIO	211493	2	0	2	0	6	8	1	0	2	0	0	2	0	0	0	0	20.00	40
2007	HIO	238605	0	0	0	0	4	4	1	0	0	0	0	0	0	0	0	0	0.00	0
2008	HIO	260957	3	0	3	0	12	15	0	0	0	3	0	0	1	0	2	0	154.33	463
2009	HIO	222271	2	0	2	0	8	10	3	0	0	2	0	2	0	0	0	0	21.00	42
2010	HIO	220213	4	0	4	0	9	13	1	0	0	4	0	2	2	0	0	0	30.50	122
2011	HIO	214243	14	0	14	0	17	31	2	0	2	12	0	1	7	0	0	6	21.00	294
2012	HIO	202967	25	0	25	0	19	44	0	0	5	20	0	4	15	0	0	6	19.28	482
Sub-Total for HIO		2961208	66	5	60	1	80	141	17	0	10	56	0	21	25	6	2	12	28.47	1879
Total :		**2961208**	**66**	**5**	**60**	**1**	**80**	**141**	**17**	**0**	**10**	**56**	**0**	**21**	**25**	**6**	**2**	**12**	**28.47**	**1879**

Key : Abrn = Airborne; AC = Air Carrier; AT = Air Taxi; Avg = Average; Dep = Departure; Dest = Destination; Equip = Equipment; GA = General Aviation; Mil = Military; Min = Minute; Occ= Occurred; Ops = Operations; Rwy = Runway; TMI = Traffic Management Initiative; Vol = Volume; Wx = Weather.
More information about this report.

Report created on Wed Apr 10 16:35:22 EDT 2013
Sources: The Operations Network (OPSNET)

Exhibit 1

OPSNET : Airport Operations : Standard Report

From 01/1989 To 02/2013 | Facility=HIO

		Itinerant					Local			
Calendar Year	Facility	Air Carrier	Air Taxi	General Aviation	Military	Total	Civil	Military	Total	Total Operations
1990	HIO	0	1,946	87,979	903	90,828	120,015	766	120,781	211,609
1991	HIO	0	3,039	87,479	712	91,230	121,054	499	121,553	212,783
1992	HIO	0	2,899	85,964	706	89,569	109,124	748	109,872	199,441
1993	HIO	0	3,112	86,797	634	90,543	102,632	628	103,260	193,803
1994	HIO	0	3,562	87,746	755	92,063	118,523	724	119,247	211,310
1995	HIO	0	3,371	89,467	1,068	93,906	127,233	715	127,948	221,854
1996	HIO	0	4,175	88,148	1,491	93,814	119,630	378	120,008	213,822
1997	HIO	0	5,631	96,284	735	102,650	129,381	364	129,745	232,395
1998	HIO	0	5,710	85,619	1,133	92,462	138,105	599	138,704	231,166
1999	HIO	0	6,553	89,386	871	96,810	154,123	824	154,947	251,757
2000	HIO	0	7,230	83,201	1,103	91,534	151,645	1,332	152,977	244,511
2001	HIO	12	7,931	84,639	873	93,455	141,880	48	141,928	235,383
2002	HIO	6	9,078	82,493	426	92,003	131,495	91	131,586	223,589
2003	HIO	0	9,386	78,942	450	88,778	129,141	199	129,340	218,118
2004	HIO	0	8,287	72,444	834	81,565	111,250	18	111,268	192,833
2005	HIO	0	9,689	68,940	227	78,856	140,311	60	140,371	219,227
2006	HIO	0	8,773	65,008	262	74,043	137,421	29	137,450	211,493
2007	HIO	3	6,571	69,755	219	76,548	162,032	25	162,057	238,605
2008	HIO	0	7,615	76,256	268	84,139	176,791	27	176,818	260,957
2009	HIO	0	5,749	68,724	295	74,768	147,478	25	147,503	222,271
2010	HIO	0	5,738	63,619	176	69,533	149,579	1,101	150,680	220,213
2011	HIO	4	6,235	69,770	330	76,339	137,822	82	137,904	214,243
2012	HIO	16	6,283	68,696	383	75,378	127,555	34	127,589	202,967
2013	HIO	0	280	7,478	82	7,840	16,082	4	16,086	23,926
Sub-Total for HIO		41	138,843	1,844,834	14,936	1,998,654	3,100,302	9,320	3,109,622	5,108,276
Total:		**41**	**138,843**	**1,844,834**	**14,936**	**1,998,654**	**3,100,302**	**9,320**	**3,109,622**	**5,108,276**

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Sources: The Operations Network (OPSNET)

Exhibit 2