

# PDX Overhead Continuous Descent Approach Report on Trial Period Results

Port of Portland Aviation Noise Management Program  
February 14, 2018

This report summarizes the sound-level data and community response to the expanded use by the Oregon Air National Guard (ORANG) of the Overhead Continuous Descent Approach (known both as OHCDA and as CDOA) between May 1, 2017 and October 31, 2017 at Portland International Airport (PDX). This summary provides information that will serve as the basis for Citizen Noise Advisory Committee (CNAC) recommendations regarding the expansion of these procedures at PDX.

## Executive Summary

Results of the six-month trial period indicated that the noise levels produced by OHCDA procedures are comparable to historical levels in areas of PDX where they have been flown for many years. However, increasing the number of aircraft allowed to fly in formation results in louder operations. Increasing the total number of OHCDA operations may increase community concerns about noise or livability, although military operations in general, rather than the OHCDA specifically, are the underlying concern for some neighbors.

Category	Proposed Modification	Port Noise Recommendation
1. Authorized Aircraft	ORANG and visiting aircraft training with ORANG	Does not support
2. Authorized Runway	28L, 28R, 10L, 10R	Supports
3. Maximum Formation size	4-ship	Does not support
4. Pattern Hours	Sunrise – Sunset daily	Does not support
5. Provision for Closed Pattern	Added for emergency and pilot landing currency	No recommendation offered – safety related.

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## Methodology and Background

Recognizing the complex nature of quantifying the community and noise impacts of ORANG's request, CNAC tasked a subcommittee with developing the information needed by the full group to make sensible, data-based recommendations. The OHCDA Subcommittee developed a framework for each category of ORANG's request, proposing the questions CNAC would need answers to and the data that would be responsive to each question. The format of this report follows the subcommittee's framework, which was adopted by CNAC with slight modifications at the November 9, 2017 meeting.

The OHCDA is a modified version of the standard military "overhead break". An overhead break is a landing procedure used by military pilots to expedite landings in potentially hostile areas. Unlike a traditional "straight-in" arrival where the aircraft lines up on final approach from 8-10 miles out and gradually descends to the runway, a traditional overhead break circles the runway before landing.



*Photo shows an OHCDA pattern to Runway 28 Left.*

Ongoing practice of the overhead-break procedure is required training for military pilots. It is also a preferred arrival procedure as it maximizes efficiency, reducing flight time, fuel-burn, and air emissions. The overhead approach reduces noise exposure for communities below the traditional arrival path – those communities along the final approach – because the aircraft remain higher and faster reducing both the noise level and time overhead.

A PDX-specific variant of the procedure called the OHCDA was developed and tested by the 142nd Fighter Wing in 2008 to reduce the noise impacts to the surrounding communities while meeting training requirements. Aircraft approach the initial fix at 300 knots airspeed and 3,000 feet altitude. At 5 miles from the runway, they descend to 2,500 feet and cross the runway threshold at that altitude. Aircraft then make the overhead break turn, slowing to less than 250 knots and arriving on the downwind leg flying 200-220 knots. The final approach speed varies with fuel weight, but is typically around 150-160 knots and the touchdown speed is between 135-150 knots.

If there are multiple aircraft flying in formation, they will follow a similar pattern spaced about five seconds apart. Since these modifications were implemented in 2008 the procedure has been used regularly at PDX.

## Current Request

In late 2016, ORANG proposed expanding the guidelines for using the OHFDA. The requested changes would allow ORANG to use the procedure more frequently, increasing efficiency by landing aircraft more quickly than conventional straight-in approaches. Such efficiencies mean reduced flying time, which in turn reduces fuel burn, air emissions, and noise. ORANG can meet their training requirements under both the existing and proposed scenarios.

The 2016 proposal included five separate operational changes described in the table below. The proposed changes would not alter the standing weather requirements for OHFDAs. The procedure will continue to be used only during daylight hours, in good weather and under visual flight conditions.

Category	Current Procedure	Proposed Change
1. Authorized Aircraft	ORANG aircraft only	ORANG and visitors training with ORANG*
2. Authorized Runway	28L, 28R	28L, 28R, 10L, 10R
3. Maximum Formation size	2-aircraft	4-aircraft
4. Pattern Hours	0900 - 1700 Local Time, Mon – Fri	Sunrise – Sunset daily
5. Provision for Closed Pattern	None	Added for emergency and pilot landing currency

\*142nd Fighter Wing would be responsible for briefing visiting pilots on the procedure.

## Roles

ORANG took the lead in organizing the trial period, as they initiated the proposal and signed the existing Letter of Agreement with the Portland Tower. ORANG is a long-term tenant of the Port’s on the PDX airfield and has long been an active partner in the PDX noise abatement program. In the context of the OHFDA, ORANG’s role is to decide which procedure guidelines they will modify and adhere to. ORANG comprises the 142<sup>nd</sup> Fighter Wing, which flies F-15C Eagle fighter jets in support of their air defense mission.

The Federal Aviation Administration has sole authority under federal regulations to regulate aircraft in flight, which includes takeoff and landing maneuvers. The FAA regulates US airspace as a system, recognizing that many components must function interdependently for safe and efficient air transportation. Final decision-making for safe operation of an aircraft rests with the pilot-in-command. The FAA role in the OHFDA is to approve or deny requests to fly the procedure on a given day, in accordance with the Letter of Agreement and all applicable regulatory requirements.

The Port of Portland owns and operates PDX in the public interest, consistent with the Port mission “to enhance the region’s economy and quality of life by providing efficient cargo and air passenger access to national and global markets, and by promoting industrial development.” The Port’s OHFDA role is to advise ORANG of the CNAC and Port recommendations.

The Port’s Noise Management team is charged with minimizing, to the extent possible, the noise impacts from aircraft utilizing airports operated by the Port of Portland. This is done in part through encouraging cooperation and collaboration with internal and external partners. The Noise Management

Department role relative to the OHCDA is to provide sound monitoring for the trial period, compile observational data about the procedures, collect community responses and complaints, assist ORANG with community outreach, and analyze the accumulated data to advise CNAC which guidelines, if any, might be revised, consistent with the Port and Noise Management Department missions.

The Citizen Noise Advisory Committee is an advisory committee to the Port and the official forum for working with the community on issues related to aircraft noise. Committee representatives are appointed by various city and county jurisdictions from northwest Oregon and southwest Washington, with four representatives appointed by the Port. Technical assistance is provided by the Federal Aviation Administration and the Oregon Air National Guard. CNAC seeks to limit and reduce the impact of aircraft noise related to PDX in consideration of, and respect for, the community's environment, health and quality of life. CNAC also seeks to raise the community's understanding of aviation noise through education, outreach and advocacy. The CNAC role in the OHCDA is to monitor the trial period progress, consider community feedback, develop a framework for assessing the impacts of guideline modifications, review the Port Noise Management report and consider the Noise team's input, and advise the Port on how it should move forward with recommendations to ORANG.

## Community Outreach and Engagement

Prior to the trial period beginning, the Port and ORANG communicated to interested neighbors and communities in person, at community association meetings, through social media channels, and on the Port website.

Throughout the trial period, ORANG partnered with the Port Noise Management team to inform the community and answer questions from neighborhood associations and individual residents. At every CNAC meeting the agenda included an update on the trial progress from ORANG and an update on the community response from the Port, as well as expanded public comment periods allowing neighbors to provide feedback directly to the committee.

- Presentation to East Columbia Neighborhood Association April 1, 2017
- Individual meeting with East Columbia residents April 19, 2017
- Port News Release April 26, 2017
- Port of Portland Noise Alert and Twitter Tweet April 28, 2017
- Post Continuous Descent Fact Sheet on Port website May 2, 2017
- Presentation to Cully Association of Neighbors May 9, 2017
- CNAC Meeting and Public Comment Periods May 11, 2017
- Flight Demonstration Day 1 at Helensview High School July 8, 2017
- CNAC Meeting and Public Comment Periods July 13, 2017
- CNAC Meeting and Public Comment Periods September 14, 2017
- Flight Demonstration Day 2 at NE 13<sup>th</sup> and Meadow Lane October 15, 2017
- OHCDA Observation at individual residence October 31, 2017
- CNAC Meeting and Public Comment Periods November 9, 2017

## The ANOMS Noise Management System

The Port Aviation Noise team uses an Airport Noise and Operations Management System (ANOMS) application to track aircraft operations, noise levels, and community complaints. ANOMS collects and displays flight track data from most commercial and general aviation aircraft, but military aircraft are filtered out per federal regulations<sup>1</sup>. ANOMS includes permanent outdoor microphones at ten locations surrounding PDX in Oregon and Washington. For the trial period, the Port supplemented the permanent microphones with portable units at two locations near the Sumner/Cully and East Columbia neighborhoods to measure noise in those locations. ANOMS also records radio communications between air traffic control and aircraft. Military frequencies are not captured by ANOMS, so the Port is unable to record ORANG communications. Finally, ANOMS includes a database for tracking and responding to citizen concerns, complaints and inquiries, along with geographic data for mapping and analyzing operations, noise, and complaint patterns.

### Data Sources – Radar Flight Tracks

Filtered military flight tracks make comprehensive noise analysis difficult, because altitude and distance are essential components of sound propagation and perceived loudness. In addition, the lack of radio transmissions make it challenging to correlate specific noise events recorded by the noise monitors with military operations, as PDX handles over 600 flights in a typical day. The Port requested the military flight tracks pertaining to the trial period but was unable to obtain the data from the FAA.

Portland Tower staff invited Port noise staff on October 25 to view a subset of OHFDA flight tracks from the trial period to show locations of some OHFDA overflight patterns, but for security reasons Port staff were not permitted to copy the data. The radar tracks included 23 days of Runway 28 flow and 10 days of Runway 10 flow, and the results indicated that the majority of OHFDA flights occurred within the boundaries projected by ORANG.

The Port retains some historical F-15 OHFDA flight tracks captured in ANOMS prior to today's stringent restrictions on military flight tracks. This data provides reliable information about the flight pattern altitude and noise exposure which can be analyzed, as the procedure and aircraft have not changed. However, specific weather conditions, air traffic control instructions, and pilot adjustments vary on a per-flight basis, so the data is useful but not predictive.

### Data Sources – Flight Counts

ORANG tracked the number of OHFDAs per day during the trial period, but not the specific times that OHFDAs were performed. Additionally, Port staff made their own observational notes about OHFDAs that were performed within view of the noise office at PDX, and those records included time of day.

### Data Sources – Noise Monitors

Ten permanent and two portable noise monitors measured noise levels throughout the trial period. Noise monitors are technician-calibrated annually and staff are trained in correct placement and configuration of the units. Professional-quality noise monitoring equipment is generally considered more accurate than handheld units and phone-based apps.

Noise microphones are set to record events above a trigger threshold, generating an audio file that can be automatically or manually correlated with a specific flight operation. For the trial period the threshold

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<sup>1</sup> Refer to the Appendix: FAA Memo dated January 16, 2015, page 2, [FAA Sources of Recorded NAS Data](#)

was set at 63 dBA. Normal conversation measured at 1-meter distance typically registers between 60-65 dBA. The 63 dBA threshold in an outdoor environment means that the microphone will be triggered by many events – wildlife, buses, cars, motorcycles, children playing, etc. – and there is no easy way for the analyst to pull aircraft-only events from the audio files without radar track correlations. This makes the task of locating OHFDA events among the 600+ daily aircraft operations and hundreds more community noise events quite difficult. An additional challenge is that background, ambient noise and sometimes coincident noise events contribute to the overall sound energy of an aircraft event. Neither the system nor a noise analyst can reliably discern the relative sound contributions of a military OHFDA that occurs at the same time as a commercial jet takeoff. For information on relative sound-energy levels refer to <http://www.dot.ca.gov/dist2/projects/sixer/loud.pdf>.

**ORANG Overhead CDA Operations during Trial Period**

<b>Month</b>	<b># Events</b>	<b># Aircraft</b>
May	15	61
Jun	10	51
Jul	30	106
Aug	40	189
Sep	22	126
Oct	14	77
<b>Total</b>	<b>131</b>	<b>610</b>

**Comparison of OHFDA to Conventional “straight-in” approach**

<b>LMax Noise Levels (dBA)</b>				
	<b>RMT #104</b>		<b>RMT #103</b>	
<b>F-15</b>	<b>OHFDA</b>	<b>Conv</b>	<b>OHFDA</b>	<b>Conv</b>
1	78.0	79.7	79.7	70.4
2	77.2	87.1	87.1	74.6
3	79.8	78.5	78.5	68.1
4	74.4	79.6	79.6	71.4
5	77.1	79.1	79.1	78.8
6	75.9	77.0	77.0	66.7
7	73.7	81.7	81.7	80.7
8	73.4	79.1	79.1	68.0
9	81.6	85.6	85.6	72.8
10	81.0	72.8	72.8	70.8
11	74.7	82.3	82.3	73.2
12	71.3	84.0	84.0	71.8
13	76.9	73.8	73.8	67.4
14	77.1	76.2	76.2	68.3
15	78.0	77.8	77.8	76.8
<b>AVG:</b>	<b>76.7</b>	<b>79.6</b>	<b>79.6</b>	<b>72</b>



*Photo illustrates the four prescribed OHCDA patterns at PDX and the approximate ground track. Yellow dots indicate the locations of noise-monitoring microphones during the trial period. RMT #104 is in the lower-right corner of the photo and RMT #103 is the yellow dot closest to RMT #104. RMT #138 is in the “C” pattern oval and RMT #139 is within the “D” pattern oval.*

**Community Response**

**Complaints**

During the trial period the noise team used standard department processes for receiving complaints related to OHCDA activity, so that complaints data can be used in other contexts such as the department annual report. Letters and petitions were captured manually and are described in this report, but not counted as discrete complaints, consistent with department policy.

The Noise Management department reports complaint volumes and trends bimonthly at the CNAC meeting as a regular agenda item. Historically, complaints related to military activity are low compared to other categories of aircraft operations. Many of the military complaints are traced to itinerant military aircraft that are unrelated to ORANG and for which the Port noise department typically receives no notification. It is possible for itinerant military pilots to remain unaware of the local noise abatement procedures, despite wide publication. Many more military complaints are related to departure, or

takeoff noise, which is significantly louder than landing noise, regardless of the type of landing procedure used.

The complaint volume related to military activity and specifically related to OHCDA's increased during the trial period. One measure of significance is the number of new individuals contacting the noise department. During the trial period we heard from 46 people for the first time. Historically, complaints increase when reports of changes or actual changes to procedures are made, with the level of complaint activity dropping back to baseline levels as people acclimate to the change, take actions to mitigate the noise impacts, or conclude that registering complaints will not resolve the situation satisfactorily. The same pattern occurred during and after the 2008 OHCDA demonstration and pattern change.

Complaints were submitted repeatedly from fewer than ten residents who reported extreme disruption due to the OHCDA. Four of those were individuals from the Cully neighborhood who have been actively and consistently opposed to the OHCDA procedures flown since 2008. Three were from the East Columbia neighborhood. The Port also received a number of noise complaints about the OHCDA before any overheads had been flown, indicating a high level of miscommunication around a technical and nuanced flight procedure.

During the trial period the Port and ORANG received messages of support from residents. A CNAC subcommittee captured a sample of the message stream from the online community message board at NextDoor.org. An analysis of those messages indicated both complaints and support for the procedure and the comments are included as an appendix to this report.

### **Petitions & Letters**

The Port received several neighborhood petitions and notifications of official "positions of opposition" by neighborhood groups.

East Columbia Neighborhood Association posted a web petition early in the trial period and presented 200 signatures at the May CNAC meeting, 11 days into the trial period. The Port attempted to follow up with each petitioner to acknowledge their opposition and to answer questions and concerns but received little feedback. The language of this petition stated opposition to "loud jets" and "dangerous flights" which are understandable concerns in general, though less helpful when it comes to the specific context of the OHCDA proposed changes. The petition text is provided as an appendix.

A Change.org petition to "Stop the Fighter Jets Flying Over Portland Neighborhoods!" (<http://chn.ge/2zbLSxd>) garnered 181 signatures as of Nov 22, 2017 and some 224 signatures as of January 15, 2018. The claim of the petition to stop fighter jets over Portland is a false premise, and the language describes alarming repercussions and a slippery slope argument. Online comments suggested petitioners have a wide range of motivations and goals in signing, as many of the comments do not relate to the OHCDA specifically. The petition text is provided as an appendix.

The property management company that owns the Columbia River RV park submitted a letter of opposition on behalf of their 220 units on May 4. After the trial period ended a company representative said that takeoff noise is probably the most prominent concern.



The Port received several letters of opposition from residents and associations that are included as an appendix. A letter written on behalf of the Cully Association of Neighbors Airport and Quality of Life Committee was subsequently rescinded.

## Trial Results and Response to CNAC Framework Questions

### #1 – Authorized Aircraft

Questions	Data and Responses																																																																																																																																																																																																																																																																																																																
1. What were the complaints during visitor periods?	Complaints by visitor week: F18: June 20-30 (28 Complaints) F16: September 9-22 (6 Complaints) F16: October 11-25 (6 Complaints)																																																																																																																																																																																																																																																																																																																
2. Do visitors fly the pattern the same as local pilots?	Noise data by week for OHCDAs, correlated with complaints by location. <b>Complaints by Week</b> <table border="1" data-bbox="435 751 1430 1822"> <thead> <tr> <th></th> <th>Day</th> <th>May-17</th> <th>Jun-17</th> <th>Jul-17</th> <th>Aug-17</th> <th>Sep-17</th> <th>Oct-17</th> <th>Nov-17</th> <th></th> </tr> </thead> <tbody> <tr> <td rowspan="7">Week 1</td> <td>1</td> <td></td> <td></td> <td></td> <td>2</td> <td>1</td> <td></td> <td>1</td> <td></td> </tr> <tr> <td>2</td> <td></td> <td></td> <td></td> <td>1</td> <td></td> <td>2</td> <td>1</td> <td></td> </tr> <tr> <td>3</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>4</td> <td>4</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>1</td> <td></td> </tr> <tr> <td>5</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>1</td> <td></td> <td></td> </tr> <tr> <td>6</td> <td></td> <td>1</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>2</td> </tr> <tr> <td>7</td> <td></td> <td>1</td> <td>1</td> <td></td> <td>1</td> <td></td> <td></td> <td></td> </tr> <tr> <td rowspan="7">Week 2</td> <td>8</td> <td></td> <td></td> <td>3</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>9</td> <td></td> <td></td> <td>2</td> <td>2</td> <td></td> <td></td> <td>2</td> <td></td> </tr> <tr> <td>10</td> <td></td> <td></td> <td></td> <td>2</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>11</td> <td>1</td> <td></td> <td>1</td> <td>1</td> <td>2</td> <td></td> <td></td> <td></td> </tr> <tr> <td>12</td> <td>1</td> <td></td> <td>6</td> <td></td> <td>1</td> <td></td> <td></td> <td></td> </tr> <tr> <td>13</td> <td></td> <td></td> <td></td> <td></td> <td>1</td> <td></td> <td></td> <td></td> </tr> <tr> <td>14</td> <td></td> <td></td> <td>1</td> <td></td> <td>2</td> <td></td> <td></td> <td></td> </tr> <tr> <td rowspan="7">Week 3</td> <td>15</td> <td>2</td> <td></td> <td></td> <td>2</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>16</td> <td></td> <td></td> <td></td> <td>2</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>17</td> <td></td> <td></td> <td>2</td> <td>4</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>18</td> <td></td> <td></td> <td>2</td> <td>1</td> <td></td> <td>1</td> <td></td> <td></td> </tr> <tr> <td>19</td> <td></td> <td></td> <td>2</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>20</td> <td></td> <td>1</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>21</td> <td></td> <td>4</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td rowspan="7">Week 4</td> <td>22</td> <td></td> <td>10</td> <td></td> <td></td> <td></td> <td></td> <td>5</td> <td></td> </tr> <tr> <td>23</td> <td>4</td> <td></td> <td></td> <td>2</td> <td></td> <td>1</td> <td></td> <td></td> </tr> <tr> <td>24</td> <td></td> <td></td> <td>3</td> <td>2</td> <td></td> <td>1</td> <td></td> <td></td> </tr> <tr> <td>25</td> <td></td> <td></td> <td>3</td> <td>3</td> <td></td> <td>3</td> <td></td> <td></td> </tr> <tr> <td>26</td> <td></td> <td></td> <td></td> <td>2</td> <td>2</td> <td>7</td> <td></td> <td></td> </tr> <tr> <td>27</td> <td></td> <td></td> <td>3</td> <td>8</td> <td>3</td> <td>2</td> <td></td> <td></td> </tr> <tr> <td>28</td> <td></td> <td></td> <td></td> <td>1</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td rowspan="3">Week 5</td> <td>29</td> <td></td> <td>8</td> <td></td> <td>4</td> <td></td> <td></td> <td>1</td> <td></td> </tr> <tr> <td>30</td> <td></td> <td>5</td> <td></td> <td>1</td> <td></td> <td>2</td> <td></td> <td></td> </tr> <tr> <td>31</td> <td>1</td> <td></td> <td></td> <td>1</td> <td></td> <td>2</td> <td></td> <td></td> </tr> <tr> <td></td> <td>Total</td> <td>13</td> <td>30</td> <td>29</td> <td>41</td> <td>13</td> <td>22</td> <td>13</td> <td>161</td> </tr> </tbody> </table> <p>Note: visitor weeks are shaded in grey.</p>		Day	May-17	Jun-17	Jul-17	Aug-17	Sep-17	Oct-17	Nov-17		Week 1	1				2	1		1		2				1		2	1		3									4	4						1		5						1			6		1						2	7		1	1		1				Week 2	8			3						9			2	2			2		10				2					11	1		1	1	2				12	1		6		1				13					1				14			1		2				Week 3	15	2			2					16				2					17			2	4					18			2	1		1			19			2						20		1							21		4							Week 4	22		10					5		23	4			2		1			24			3	2		1			25			3	3		3			26				2	2	7			27			3	8	3	2			28				1					Week 5	29		8		4			1		30		5		1		2			31	1			1		2				Total	13	30	29	41	13	22	13	161
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	<p>ORANG Response: I would say yes, visitors fly the pattern the same as local pilots. There may be some adjustments in speed and/or power settings for separation or safety reasons.</p>
<p>3. What has ORANG done to ensure visitors are briefed adequately?</p>	<p>ORANG list of briefing materials and their process for feedback to pilots on compliance.</p> <p>ORANG Response: Visiting units are given a 60-minute PowerPoint brief with specific instructions regarding the local area and flying operations. Emphasis is placed on noise abatement procedures for departure as well as the OHFDA. An experienced 142FW Instructor Pilot gives the brief and informs the unit that their execution of the procedures is highly visible in the noise-sensitive areas surrounding the airport. Pilots are shown the desired ground track to minimize overflight of populated areas. Extra emphasis is also given to the procedures for minimizing noise during the procedure. Additionally, units are informed that the overhead will be turned off if they are unable to effectively execute the procedures.</p>
<p>4. Are visitor OHFDAs louder than those performed by local pilots?</p>	<p>Noise data by week and by aircraft type.</p> <p>Port Response: Noise data for a specific military aircraft type is not available, nor do we know which aircraft variants training units fly. Different aircraft have different noise levels and characteristics. Also, pilot technique and OHFDA proficiency can impact noise, as can weather conditions and ATC instructions at the time of the approach.</p>
<p>5. What provisions exist for ORANG to limit visitor OHFDAs if non-compliant?</p>	<p>ORANG list of briefing materials and their process for feedback to pilots on compliance.</p> <p>ORANG Response: Operations supervisors monitor patterns of visiting units and inform their leadership of any observed deviations. If deviations are unacceptably gross, or persist, the pattern is turned off for visiting units.</p>
<p>6. What are the benefits of visitor OHFDAs?</p>	<p>ORANG Response: Execution of the OHFDA for visiting units allows optimization of fuel and time efficiency in recovering aircraft. With visiting aircraft in the radar traffic pattern, ATC can be responsible for greater than 20 aircraft. Under current guidance, visiting units would come back as separate 2-ship formations to a visual 10 mile straight-in. This significant addition to ATC work load is much easier if visiting units can recover to the visual overhead as 4-ship formations. The traffic separation requirements between formations is greatly reduced, which means that other commercial aircraft in the radar pattern can land earlier.</p> <p>Correspondence from PDX TRACON [FAA's Terminal Approach Radar Control] regarding the expanded OHFDA procedures: "I spoke with [PDX air traffic] controllers and Management regarding the Overhead procedure. As far</p>

	<p>as preferences toward/against the procedure, I found that no one dislikes the procedure or had a negative response. The responses varied in that several controllers liked and preferred the Overhead procedure, while some others were ambivalent towards the operation. The procedure itself does not increase workload, but does add a certain complexity to the operation, i.e. faster traffic on final overtaking slower aircraft. This complexity though wasn't a major concern and several controllers felt the procedure actually reduced their workload. Also, the inclusion of a 4 ship operation did not produce negative responses and was preferred over restricting the procedure to a 2 ship only option.</p> <p>There was consensus though that including the visiting groups was a much needed improvement, in that the complexity between some returning flights allowed to perform the Overhead and others not allowed created increased workload by itself. I believe the overall consensus is that the controllers would prefer to keep the Overhead procedure as an option.</p>
7. Will OHCDAs increase the amount of aircraft visiting PDX?	ORANG Response: No. PDX will have the same schedule for visiting aircraft going forward. This is typically 2-3 units per year.

## #2 – Authorized Runway

Questions	Data
1. How many more complaints and new complaints were received over neighbors that were overflowed by OHCDAs?	<p>Complaints and new complainants, by neighborhood</p> <p>Port Response: The noise office received 161 noise complaints from 70 individuals specifically opposed to the expanded use of the OHCA. This includes 46 first time callers who accounted for 77 (48%) of the 161 complaints.</p> <p>See the table “Complaints by Week” in the above section #1 – Authorized Aircraft, Question 2 - Do visitors fly the pattern the same as local pilots?</p>
2. What increases and decreases were observed from typical complaint location patterns?	<p>Historical comparison</p> <p>Port Response: During the May, 2017 – November, 2017 period the Port received 255 complaints related to military activities from 128 different individuals, considerably more military complaints than in prior years.</p> <p>Complaints coded as “military” in ANOMS refer to ORANG local and visiting aircraft, as well as other military flights about which ORANG has no knowledge. Those are typically itinerant military flights that do not use ORANG facilities.</p>

The below table summarizes military complaints by Neighborhood, sorted by number of complaints for each year.

Military Complaint Counts by Neighborhood between May - November (2015, 2016, 2017)								
2015			2016			2017		
Neighborhood	Complaints	Individuals	Neighborhood	Complaints	Individuals	Neighborhood	Complaints	Individuals
Concordia	8	3	North Salmon Creek	4	1	Cully	134	46
CPO 8	5	2	Woodlawn	4	1	Sumner	22	7
Wilkes	4	3	Central Point-Leland-New Era	3	1	East Columbia	19	12
Roseway	3	2	CPO 8	3	1	Concordia	15	10
Cully	2	2	Gresham - Powell Valley	3	3	Forest Park	9	1
Harney Heights	2	1	Harney Heights	3	1	Roseway	6	6
Ashcreek	1	1	Gresham Northeast	2	1	Woodlawn	5	4
Bridgeton	1	1	Piedmont	2	2	Kenton	5	3
CPO 6 Cooper Mtn-Aloha N	1	1	Arbor Lodge	1	1	Beaumont-Wilshire	4	4
CPO 9 Hillsboro	1	1	Bridgeton	1	1	Piedmont	3	3
Esther Short	1	1	Cully	1	1	King	3	3
Evergreen Highlands	1	1	Fairgrounds	1	1	Arbor Lodge	3	3
Foster-Powell	1	1	Gresham - Rockwood	1	1	St. Johns	2	2
Gladstone	1	1	Hough	1	1	Harney Heights	2	1
Gresham-Centennial	1	1	North Gresham	1	1	Dubois Park	2	2
Hayhurst	1	1	Northwest Heights	1	1	Damascus	2	2
Lents	1	1	Rock Creek	1	1	CPO 9 Hillsboro	2	2
Mill Park	1	1	Sauvie Island	1	1	Bridgeton	2	2
Mt. Scott-Arleta	1	1	Sumner	1	1	Wilkes	1	1
North Salmon Creek	1	1	Wilkes	1	1	Wildwood	1	1
Savanna Oaks	1	1				Vernon	1	1
Sherwood	1	1				Southwest Hills Residential League	1	1
Sumner	1	1				Savanna Oaks	1	1
						Salmon Creek	1	1
						Sabin	1	1
						Parkrose	1	1
						Park View	1	1
						North Gresham	1	1
						Maywood Park	1	1
						Gresham - Rockwood	1	1
						Gresham - Northeast	1	1
						Evergreen Shores	1	1
						Carter Park	1	1
<b>Total</b>	<b>41</b>	<b>30</b>	<b>Total</b>	<b>36</b>	<b>23</b>	<b>Total</b>	<b>255</b>	<b>128</b>

The below table summarizes the same military complaint data, sorted alphabetically by Neighborhood for each year.

Alphabetized Military Complaint Counts by Neighborhood between May - November (2015, 2016, 2017)								
2015			2016			2017		
Neighborhood	Complaints	Individuals	Neighborhood	Complaints	Individuals	Neighborhood	Complaints	Individuals
Ashcreek	1	1	Arbor Lodge	1	1	Arbor Lodge	3	3
Bridgeton	1	1	Bridgeton	1	1	Beaumont-Wilshire	4	4
Concordia	8	3	Central Point-Leland-New Era	3	1	Bridgeton	2	2
CPO 6 Cooper Mtn-Aloha N	1	1	CPO 8	3	1	Carter Park	1	1
CPO 8	5	2	Cully	1	1	Concordia	15	10
CPO 9 Hillsboro	1	1	Fairgrounds	1	1	CPO 9 Hillsboro	2	2
Cully	2	2	Gresham - Powell Valley	3	3	Cully	134	46
Esther Short	1	1	Gresham - Rockwood	1	1	Damascus	2	2
Evergreen Highlands	1	1	Gresham Northeast	2	1	Dubois Park	2	2
Foster-Powell	1	1	Harney Heights	3	1	East Columbia	19	12
Gladstone	1	1	Hough	1	1	Evergreen Shores	1	1
Gresham-Centennial	1	1	North Gresham	1	1	Forest Park	9	1
Harney Heights	2	1	North Salmon Creek	4	1	Gresham - Northeast	1	1
Hayhurst	1	1	Northwest Heights	1	1	Gresham - Rockwood	1	1
Lents	1	1	Piedmont	2	2	Harney Heights	2	1
Mill Park	1	1	Rock Creek	1	1	Kenton	5	3
Mt. Scott-Arleta	1	1	Sauvie Island	1	1	King	3	3
North Salmon Creek	1	1	Sumner	1	1	Maywood Park	1	1
Roseway	3	2	Wilkes	1	1	North Gresham	1	1
Savanna Oaks	1	1	Woodlawn	4	1	Park View	1	1
Sherwood	1	1				Parkrose	1	1
Sumner	1	1				Piedmont	3	3
Wilkes	4	3				Roseway	6	6
						Sabin	1	1
						Salmon Creek	1	1
						Savanna Oaks	1	1
						Southwest Hills Residential League	1	1
						St. Johns	2	2
						Sumner	22	7
						Vernon	1	1
						Wildwood	1	1
						Wilkes	1	1
						Woodlawn	5	4
<b>Total</b>	<b>41</b>	<b>30</b>	<b>Total</b>	<b>36</b>	<b>23</b>	<b>Total</b>	<b>255</b>	<b>128</b>

3. What time of day do complaints correlate to ? Were they correlated to takeoff or landing times?

Complaints, by time of day.  
 CNAC requested correlating complaint times to takeoff and landing times, because many complainants are annoyed by departure noise, mistaking it for OHFDA-related noise.  
 CNAC requested the Port include background about the confusion between takeoff and landing noise levels in the report for context.

OHFDA Complaints by Hour, May-November	
Hour	Count
0 (midnight)	0
1	0
2	0
3	0
4	0
5	0
6	3
7	2
8	6
9	27
10	28
11	13
12 (noon)	20
13	39
14	16
15	1
16	1
17	2
18	1
19	1
20	0
21	1
22	0
23	0

Port Response: We could not formulate a definitive conclusion about this data. ORANG F15s generally depart daily between 8-9am and again between noon-1pm. The jets return to PDX approximately 60-90 minutes after departure. Assuming that people submit complaints close in time to hearing an event, we would expect complaints corresponding to OHFDA events to arrive during the highlighted times. That appears to be the case, as the 0900-1000 hours and 1300-1400 hours shows the highest complaint activity. However, departure-related

complaints would also be received in the 0900 hour and the 1200-1300 hours periods, and those hour blocks also show high complaint levels relative to other times. What is certain is that 79% of the complaints were received between the hours of 9am and 1:59pm during the trial period.

4. What feedback has ORANG and Next Door received?

The Appendix: Social Media Responses contains social media feedback from the trial period.

5. Is the noise level for each runway similar to the noise level that other neighborhoods - especially Cully - have historically experienced with OHCDAs?

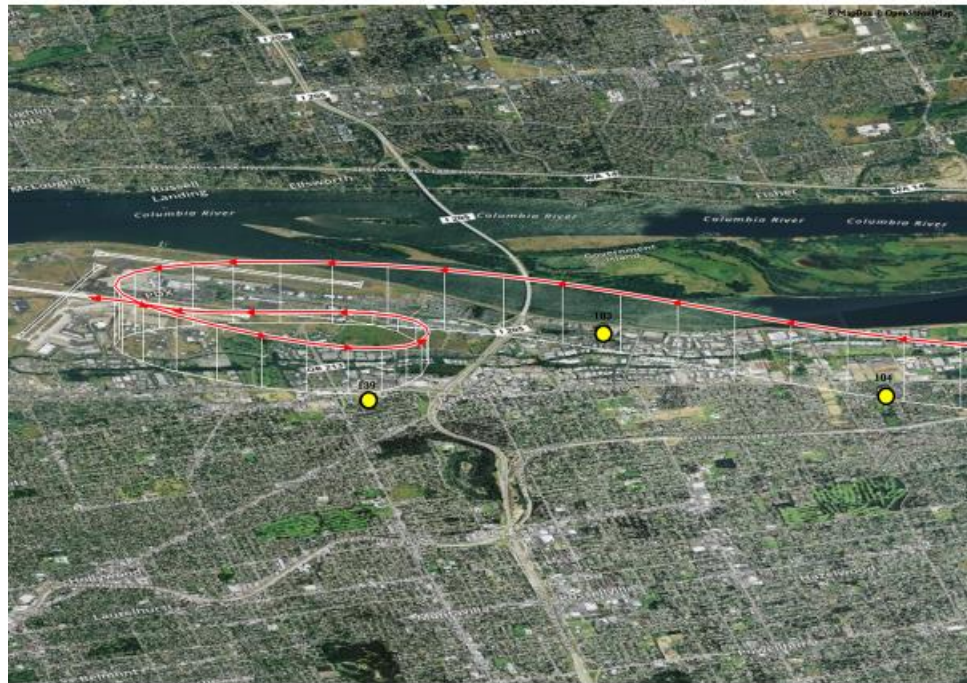
Noise data by neighborhood

**OHCDAs: From Helensview (RMT #139)**

		Avg.	Avg. T.A.
Config	# Events	Lmax	63 dBA
1 Ship	13	70.8	39
2 Ship	87	72.5	44
3 Ship	9	76.5	103
4 Ship	10	80.5	119

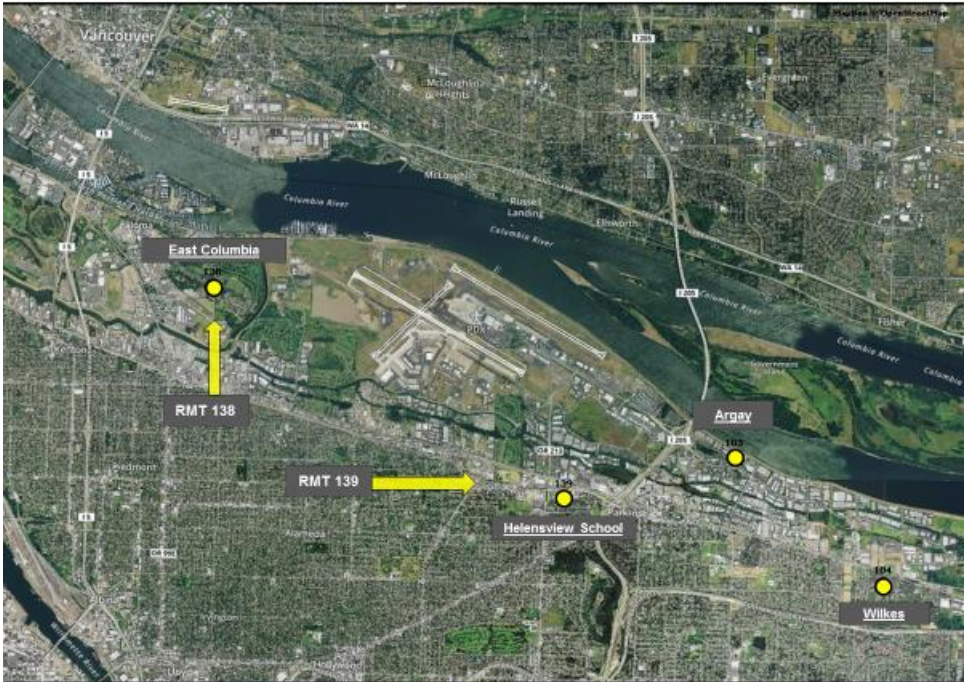
**OHCDAs: From Meadow Lane (RMT #138)**

		Avg.	Avg. T.A.
Config	# Events	Lmax	63 dBA
1 Ship	2	69.9	20
2 Ship	13	70	25
3 Ship	No Events		
4 Ship	2	71	84



Altitude in feet at RMT 104: 2,570; RMT 103: 2,359; RMT 139: 1,599

### #3 – Maximum Formation Size

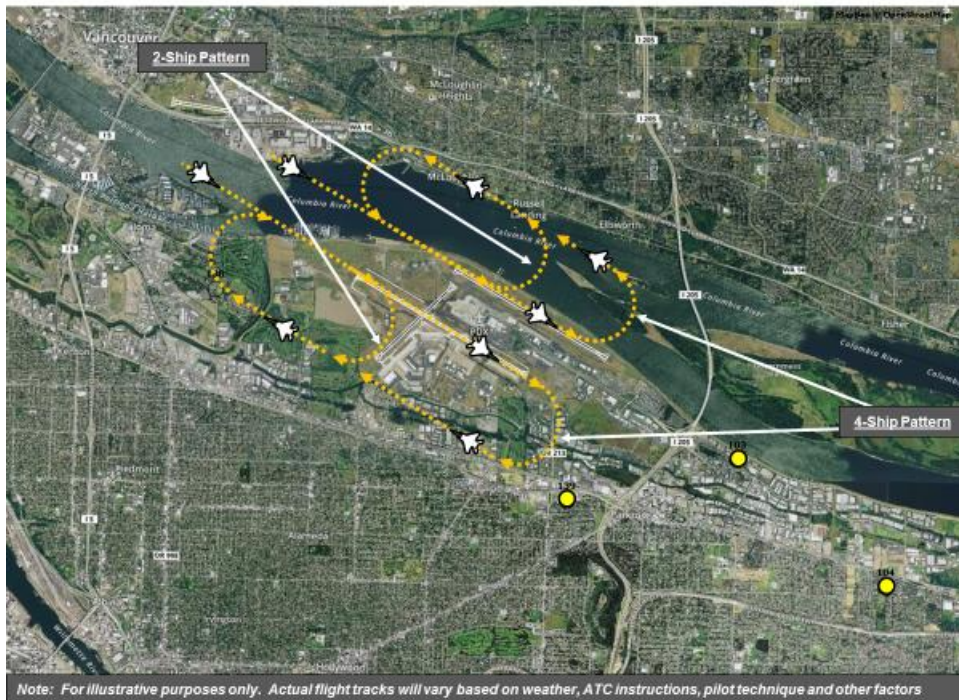
Questions	Data																				
<p>1. What is the benefit of 4-ship over 2-ship?</p>	<p>FAA and ORANG to respond</p> <p>ORANG Response: 4-ship formations allow ATC [Air Traffic Control] to decrease the IFR [Instrument Flight Rules] separation required between formations (typically 10 miles) between airborne entities. In other words, instead of having 2 formations of 2-ships separated by 10 miles, you now have a single 4-ship entity. This allows ATC to more expeditiously sequence aircraft into the PDX pattern and get more aircraft on the ground on-schedule.</p>																				
<p>2. What is the noise impact of a single 4-ship versus 2 x 2-ship formations?</p>	<p># of Ops by formation size and date. Compare sound data using SEL, LMax, and Time Above 63dB levels for each formation. Assess impact of ORANG using OHCDAs and only 2-ship formations in east flow and only straight-in approaches in west flow, when weather conditions would allow OHCDAs.</p> <table border="1" data-bbox="367 926 1463 1089"> <thead> <tr> <th></th> <th colspan="2">Helensview (RMT #139)</th> <th colspan="2">Meadow Ln (RMT #138)</th> </tr> <tr> <th></th> <th>Avg. Lmax</th> <th>Avg. T.A. 63 bBA</th> <th>Avg. Lmax</th> <th>Avg. T.A. 63 bBA</th> </tr> </thead> <tbody> <tr> <td>4 ship</td> <td>80.5</td> <td>119 sec.</td> <td>71</td> <td>84 sec</td> </tr> <tr> <td>2 ship (x2)</td> <td>72.5</td> <td>88 sec</td> <td>70</td> <td>50 sec</td> </tr> </tbody> </table> 		Helensview (RMT #139)		Meadow Ln (RMT #138)			Avg. Lmax	Avg. T.A. 63 bBA	Avg. Lmax	Avg. T.A. 63 bBA	4 ship	80.5	119 sec.	71	84 sec	2 ship (x2)	72.5	88 sec	70	50 sec
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4 ship	80.5	119 sec.	71	84 sec																	
2 ship (x2)	72.5	88 sec	70	50 sec																	



**Count of Go Size**

# of Aircraft in Go	Count of Go's	Total Aircraft
2	28	56
3	12	36
4	29	116
5	11	55
6	26	156
7	6	42
8	6	48
9	2	18
10+	7	79
<b>Total</b>	<b>127</b>	<b>606</b>

Port Response: A “Go” is ORANG parlance for a series of departures grouped together. Multiple aircraft are typically involved, and if conditions permit OHCDA approaches when they return to PDX, pilots will request that and group themselves into formations of two or more aircraft to land using OHCDA to whichever runway is active at the time. The below photo illustrates why the 4-ship formation is larger than the 2-ship formation.



*Photo illustrates the different sizes of 2-ship and 4-ship patterns in an east flow scenario. Yellow dots indicate noise monitoring microphones.*

<p>3. Is there a way to make OHCDA conditions and events more predictable and advertised publicly (ATIS)?</p>	<p>ORANG and Port Noise Management to respond</p> <p>ORANG Response: We will continue to post the dates when we have visiting units in town, as well as night flying operations. However, the ability to forecast the exact time an overhead pattern will take place is unreasonable and not good operating practice for security purposes.</p> <p>Port Noise Response: Interested parties may call the recorded PDX ATIS at 503-284-1711 to determine whether conditions are likely to permit approval of OHCDA requests during that hour.</p>
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**#4 – Pattern Hours and Days**

Questions	Data																																																																																																															
<p>1. How often will ORANG fly OHCDA's on summer nights?</p>	<p>Last year's schedule of flying outside of 9am-5pm Monday-Friday.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th colspan="3">2016</th> <th colspan="3">2017</th> </tr> <tr> <th></th> <th>Monthly Scheduled Departures</th> <th>Weekday Est. Arrivals After 5 PM</th> <th>Weekend Scheduled Departures</th> <th>Monthly Scheduled Departures</th> <th>Weekday Est. Arrivals After 5 PM</th> <th>Weekend Scheduled Departures</th> </tr> </thead> <tbody> <tr><td>Jan</td><td>130</td><td>32</td><td>6</td><td>211</td><td>62</td><td>24</td></tr> <tr><td>Feb</td><td>128</td><td>42</td><td>0</td><td>208</td><td>40</td><td>17</td></tr> <tr><td>Mar</td><td>220</td><td>66</td><td>20</td><td>59</td><td>0</td><td>13</td></tr> <tr><td>Apr</td><td>187</td><td>46</td><td>18</td><td>151</td><td>90</td><td>21</td></tr> <tr><td>May</td><td>124</td><td>0</td><td>4</td><td>248</td><td>36</td><td>28</td></tr> <tr><td>Jun</td><td>206</td><td>0</td><td>17</td><td>247</td><td>0</td><td>6</td></tr> <tr><td>Jul</td><td>167</td><td>0</td><td>0</td><td>248</td><td>4</td><td>38</td></tr> <tr><td>Aug</td><td>110</td><td>3</td><td>17</td><td>288</td><td>0</td><td>24</td></tr> <tr><td>Sep</td><td>184</td><td>30</td><td>18</td><td>237</td><td>38</td><td>24</td></tr> <tr><td>Oct</td><td>178</td><td>18</td><td>32</td><td>246</td><td>24</td><td>24</td></tr> <tr><td>Nov</td><td>204</td><td>22</td><td>24</td><td>238</td><td>30</td><td>36</td></tr> <tr><td>Dec</td><td>202</td><td>44</td><td>18</td><td>229</td><td>40</td><td>12</td></tr> <tr> <td>Totals</td> <td>2040</td> <td colspan="2">477 (23.4%)</td> <td>2610</td> <td colspan="2">631 (24.2%)</td> </tr> </tbody> </table> <p>Note: Summer months are highlighted.</p>								2016			2017				Monthly Scheduled Departures	Weekday Est. Arrivals After 5 PM	Weekend Scheduled Departures	Monthly Scheduled Departures	Weekday Est. Arrivals After 5 PM	Weekend Scheduled Departures	Jan	130	32	6	211	62	24	Feb	128	42	0	208	40	17	Mar	220	66	20	59	0	13	Apr	187	46	18	151	90	21	May	124	0	4	248	36	28	Jun	206	0	17	247	0	6	Jul	167	0	0	248	4	38	Aug	110	3	17	288	0	24	Sep	184	30	18	237	38	24	Oct	178	18	32	246	24	24	Nov	204	22	24	238	30	36	Dec	202	44	18	229	40	12	Totals	2040	477 (23.4%)		2610	631 (24.2%)	
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<p>2. How have training hours</p>	<p>ORANG Response: The 142FW flew many more hours this year than in the previous decades. This has nothing to do with the OHCDA. The 142FW is improving its readiness posture and striving to be the best prepared, best trained F-15C unit in the world. Coupled with well above average flying weather this summer, we were able to</p>																																																																																																															

<p>changed this year?</p> <p>a) Good weather</p> <p>b) Visitors</p> <p>c) Increase in readiness needs</p>	<p>accomplish a high number of OHCDAs. However, the vast majority of our patterns were to a RWY 28L flow, which has been the norm since 2012. Very few of the patterns have been to RWY 10. With a high number of takeoffs occurring this summer, it is understandable that noise levels and awareness has increased. However, these factors have nothing to do with the proposal for expansion of our overhead procedures.</p> <p>Port Response: The total number of 2017 departures compared with the 2016 schedule indicates an increase of 27.9% in 2017, based on this data.</p>
<p>3. What % of the flying window was outside of 9am-5pm Monday-Friday for the year?</p>	<p>Last year's schedule of flying outside of 9am-5pm Monday-Friday.</p> <p>Port Response: Based on the above table 24.2% of 2017 operations returned after 5pm on weekdays or on weekends. This compares with 23.4% of operations in 2016.</p>

**#5 – Closed Pattern**

<b>Questions</b>	<b>Data</b>
<p>1. How many closed pattern events occurred during trial period?</p>	<p>Not captured, but estimated at six or fewer events during the trial period.</p>
<p>2. How loud were the events on average?</p>	<p>Not measured.</p>
<p>3. How does closed pattern noise compare to a normal go-around event?</p>	<p>Not measured.</p>

## Recommendations

The Aviation Noise Management program has long used acoustic data in conjunction with subjective measures to assess the community impacts of aircraft noise. Non-acoustic factors also influence attitudes, such as noise sensitivity, location and time of day, socio economics, and expectations – both prior to moving to an area exposed to aircraft noise and for the future – and these non-acoustic factors may be as important as the noise exposure level. The non-acoustic measures are difficult to assess because they involve broad spheres such as community annoyance and individual reactions, such as how a particular person feels about the source of the noise. In addition, people’s individual responses may change over time, the aviation fleet and airport operations continually evolve, and the community annoyance baseline also moves.

From a sound/noise level perspective, OHCDAs performed in 2017 very closely matched the procedures as measured in 2008, yielding an average L<sub>max</sub> of approximately 73 dBA at the Helensview microphone. This suggests both consistency in the measurement protocols and a baseline for considering impacts, as the neighborhoods closest to the Helensview location had historically low complaint levels, with approximately 2-4 outspoken opponents and a majority who never contacted the noise office. When the 2017 trial was announced, some concerned neighbors invested time and energy to mobilize their communities, resulting in additional complaints, letters and petitions. However, submissions also contained factual inaccuracies or were drafted in the first weeks of the trial before many OHCDAs had been flown. The wording on the petitions is alarming enough that a person, with no prior knowledge or awareness, would likely feel compelled to sign, making it hard to ascertain what specific OHCA-related actions petitioners desire. It is reasonable to conclude that where options exist to reduce military jet noise, many community members are supportive of reductions.

Complaint levels spiked during the 2017 trial period, just as they did during the 2008 Fly Days. During the 2017 Fly Day events, some neighbors expressed surprise that the OHCA was neither terrifying nor excessively loud, although others criticized the event as “a staged performance” or as “perfect conditions”. Weather conditions, air traffic considerations, terrain variations and pilot variability mean that no demonstration event can represent a full range of potential conditions and experiences. In the months following the 2008 trials, complaints returned to historic levels, although it is likely that some neighbors remained impacted and annoyed, and decided not to complain.

Many of the concerned neighbors we spoke with were neither specifically aware of nor opposed to the OHCA changes, but rather opposed to the loud noise military jets cause, especially departure noise. We also heard a wide continuum of safety, air quality, neighborhood livability and political concerns. This broader list of concerns is often associated with concerns about growth in general (that list typically also includes traffic, housing affordability, noise from various sources, etc.) which can make it difficult to distinguish among various factors associated with quality of life. A smaller subset of neighbors perceive and experience specific adverse impacts and are therefore opposed to changing the OHCA procedures.

Compared with a straight-in approach, the OHCA is quieter farther out, and louder as it nears the runway end on the base-to-final turn. Both phenomena are largely explained by the altitude differences between the two procedures, as distance directly correlates to sound energy at a receptor such as a microphone or human ear.

**Recommendation #1 – Authorized Aircraft: ORANG pilots only**

The Port noise office does not support the use of OHCDAs by visiting pilots, while training with ORANG and after a local noise briefing by ORANG. The reason is that it increases OHFDA noise events during visitor periods. Visitor training periods increase the noise burden on neighbors and communities perceive higher impacts during those periods. Episodes of visiting pilots flying larger, less precise OHFDA patterns than local pilots reinforce the community perception that the pattern is large, or that ORANG is less concerned with the impact.

**Recommendation #2 – Authorized Runways: Both parallel runways, both flows allowed**

The Port noise office supports the use of both parallel runways and both flows (10L, 10R, 28L and 28R) for OHCDAs. Expansion of the OHFDA on the south runway, from only 28L to both 28L and 10R is reasonable because the sound levels measured on the 10R (west) side were similar to the sound levels measured on the 28L (east side) where OHCDAs have been performed for many years. Using the north runway keeps the procedure largely over the Columbia River, which has served as a noise abatement corridor for three decades. It is anticipated that this expansion will help balance the number of OHCDAs flown to either runway end, although we recognize that the prevailing easterly winter weather patterns mean that fewer OHFDA patterns will be flown in winter months relative to summer months.

**Recommendation #3 – Maximum Formation Size: 2 aircraft maximum**

The Port noise office recommends against expansion of the OHFDA formation size from two aircraft to four. The 4-ship formation results in a longer and noisier pattern as compared to the two 2-ship formation. Additionally, it overflies a much larger residential area requiring additional thrust due to the length of the pattern.

**Recommendation #4 – Pattern Hours: Retain existing hours**

The Port noise office does not support the proposed expansion of pattern hours. We recognize that this request would not likely result in a meaningful change to the number of OHCDAs flown, given the current daily training schedule. However, neighbors will benefit from respite periods during which they are assured no OHCDAs will be flown.

**Recommendation #5 – Provision for Closed Pattern: No recommendation offered**

The Port noise office did not make a recommendation in this category, because the request is not an OHFDA procedure and appears to be safety-related. Procedures related to safety are outside of the scope of this analysis.

<b>Category</b>	<b>Proposed Modification</b>	<b>Port Noise Recommendation</b>
1. Authorized Aircraft	ORANG and visiting aircraft training with ORANG	Does not support
2. Authorized Runway	28L, 28R, 10L, 10R	Supports
3. Maximum Formation size	4-ship	Does not support
4. Pattern Hours	Sunrise – Sunset daily	Does not support
5. Provision for Closed Pattern	Added for emergency and pilot landing currency	No recommendation offered – safety related.

## Additional Context and Conditions

PDX is an urban airport surrounded by land uses that include residential zoning to the south, east, and west. Military aircraft operations create higher noise levels than other aircraft types. For many years, ORANG has been a strong supporter of PDX noise abatement efforts and the Port has appreciated ORANG's willingness to engage with the community to develop workable solutions that meet operational needs. We do look forward to that partnership and spirit of engagement and compromise continuing many decades into the future.

The 2017 OHFDA six-month trial occurred during a period of increased operational tempo for ORANG, as the unit prepared for deployments and trained to execute their assigned mission. For that reason, the number of OHFDA events may be higher than if the trial had been performed in previous years. The number of military flight operations will always fluctuate in response to variables as diverse as defense budgets, weather conditions and global events. With that in mind, these recommendations are provided with the goal of providing ORANG with additional flexibility to meet their training and operational needs, while at the same time protecting community livability.

## Glossary of Terms

**ATCT** – Air Traffic Control Tower

**CAN** – Cully Association of Neighbors

**CDOA** – Continuous Descent Overhead Approach (older acronym); same as OHFDA

**CNAC** – Citizen Noise Advisory Committee

**dBA** – The A-weighted Decibel (dBA) is the most common unit used for measuring environmental sound levels. It adjusts, or weights, the frequency components of sound to conform with the normal response of the human ear at conversational levels. dBA is an international metric that is used for assessing environmental noise exposure of all noise sources.

**ECNA** – East Columbia Neighborhood Association

**FAA** – Federal Aviation Administration, an agency of the US Department of Transportation

**Lmax** - "'Maximum Noise Level (Lmax)' measures noise at its highest level during one noise event.

**OHFDA** – Overhead Continuous Descent Approach (new acronym); same as CDOA

**ORANG** – Oregon Air National Guard

**PDX** – Portland International Airport

**Runway 28 L/R and 10 L/R** – The two main parallel runways at PDX. The runway on the north side of the airport is referred to both as 10 Left and 28 Right, depending on which end is active. The south runway is referred to both as 10 Right and 28 Left, again depending on which end is active.

**SEL** - The equivalent continuous noise level of an event including all the actual noise then referenced to a notional duration of 1 second.

**Time Above (T.A.)** – The TA metric identifies the cumulative amount of time above a selected threshold of noise exposure, thereby describing the duration of noise exposure. For this analysis, 63 dBA was used as the threshold.

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