Zoom Online Meeting Basics

Please mute your microphone to limit feedback noise when not talking.

You can chat with the participants in the meeting by clicking Chat.
Zoom Online Meeting Basics

How to raise your hand
Introductions

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Introductions

• Name
• Organization
• Role
Meeting Agenda

• Existing Taxiway Network
• TAC Meeting #2 Summary
• Holding Bay and Arm/dearm pad alternatives
• TDG and UFC pavement requirements
• Refined Taxiway Network Alternatives

Meeting Goals:
• Ensure user needs and wants have been documented
• Gather stakeholder feedback on refined taxiway layout alternatives
• Select preferred alternatives for detailed planning
Existing Taxiway Network
Taxiway Design

• Good design practices keep taxiway intersections simple.
• Complex layouts increase the possibility of pilot error.
• Three-node concept – A pilot has no more than 3 choices at an intersection – ideally, left, right and straight ahead.
• Intersection angles – Design turns to be 90 degrees wherever possible.
Design to Reduce Runway Incursions

- Increase situational awareness, keep taxiway systems simple.
- Avoid wide expanses of pavement.
- Limit runway crossings.
- Avoid “dual purpose” pavements
- Avoid “high energy” intersections (middle 1/3 of the runway).
- Avoid direct access to runways
- Increase visibility – Right angle intersections provide the best visibility.
FAA Non-Standard features
Hot Spot 1 – Complex Intersection

**Hot Spot:** History or potential risk of collision or runway incursion
Airplane Design Group (ADG) and Taxiway Design Group (TDG)

What are they, and how do they influence taxiway design?
How do they influence the location of taxiway signs and lights?
Aircraft Design Group (ADG) & Taxiway Design Group (TDG) Influence Design

- **Aircraft Design Group** (wingspan & tail height)
  - influences separation standards

- **Taxiway Design Group** (main gear width & cockpit to main gear distance)
  - influences pavement width and fillets
<table>
<thead>
<tr>
<th>Civilian Aircraft</th>
<th>TDG 2</th>
<th>TDG 3</th>
<th>TDG 4</th>
<th>TDG 5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CRJ-700</td>
<td>A-319</td>
<td>MD-90</td>
<td>A-330</td>
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<td><img src="image" alt="CRJ-700" /></td>
<td><img src="image" alt="A-319" /></td>
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<td><img src="image" alt="A-330" /></td>
<td></td>
</tr>
</tbody>
</table>
## UFC Classification of Aircraft

<table>
<thead>
<tr>
<th>UFC / Military Aircraft</th>
<th>Class A</th>
<th>Class B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class A</td>
<td>UC-35</td>
<td>F-16</td>
</tr>
</tbody>
</table>

- **UC-35**
- **F-16**
- **C-5**
DLH Critical Aircraft

**Civilian – A319**
- ADG III
- TDG 3

**Military – F-16**
- ADG I
- TDG 1A
- Class B
Aircraft Operations

Grouped by TDG
Larger TDG aircraft also operate at DLH

Annual Operations by Larger TDGs

Higher number in 2015 contributed to Allegiant’s use of MD-80 series aircraft. (Note: Allegiant now has an all-Airbus A-320 family fleet which is TDG 3)
Average Annual Operations of TDG 4 Aircraft (2016-2019) 

rounded to the next whole number

- B752 - Boeing 757-200, 7
- B753 - Boeing 757-300, 1
- K35R - Boeing KC-135 Stratotanker, 8
- MD82 - Boeing (Douglas) MD 82, 1
- MD83 - Boeing (Douglas) MD 83, 2
- MD87 - Boeing (Douglas) MD 87, 2
- MD88 - Boeing (Douglas) MD 88, 2
- MD90 - Boeing (Douglas) MD 90, 5
Average Annual Operations of TDG 5 Aircraft (2016-2019)

*rounded to the next whole number*

- **DH8D - Bombardier Q-400, 5**
- **A333 - Airbus A330-300, 1**
- **A359 - Airbus 350-900, 1**
- **B742 - Boeing 747-200, 1**
- **B744 - Boeing 747-400, 2**
- **B763 - Boeing 767-300, 2**
- **B772 - Boeing 777-200, 1**
- **B764 - Boeing 767-400, 1**
## TDG requirements by aircraft type

<table>
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<tr>
<th>Civilian Aircraft Requirements</th>
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<tr>
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<td>UC-35</td>
</tr>
<tr>
<td>TDG 2 CRJ-700</td>
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</tr>
<tr>
<td>Pavement Width</td>
<td>35'</td>
</tr>
<tr>
<td>Paved Taxiway Shoulder Required</td>
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<td>Total pavement width</td>
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<tr>
<td>TDG 3 A-319</td>
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<tr>
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</tr>
<tr>
<td>Paved Taxiway Shoulder Width</td>
<td>20'</td>
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<tr>
<td>Total pavement width</td>
<td>90'</td>
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<td>TDG 4 MD-90</td>
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**Notes:**
1. Air Force taxiways devoted exclusively for fighter and trainer aircraft
2. Army and Air Force airfields
Taxiway A
Design Alternatives
• Final alignment of Taxiway A and its connectors will be finalized with a preferred alternative, connector design would remain the same

• Taxiway C connector would meet design considerations for the Runway 3/21 Taxiway Network

• Taxiway A3 future and ultimate conditions
  • Existing ADG III / TDG 3
  • Future design could be larger
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How is Taxiway A Designed Today?
Existing Taxiway A Pavement

With Shoulders

Without Shoulders
Taxiway Sign Standards

- FAA Advisory Circular on Specification for runway and taxiway signs
- Signs have different sizes and different “modes”
  - Mode 1 (100 mph wind load)
  - Mode 2 (200 mph wind load)
  - Mode 3 (300 mph)
- Mode 3 can only be used in special circumstances where an elevated jet blast risk occurs
- Signs must still be frangible
- If needed, can model jet blast in specific areas and on signs

Figure 17. Typical Sign and Component Parts
Taxiway Signage and Lighting Location

**Taxiway Signs**
- Signs can be placed anywhere from:
  - 10-20' from the pavement edge for Size 1 or,
  - 20-35' for Size 2

**Taxiway Lights**
- 2’ to 10’ from edge of full strength taxiway pavement
- DLH uses (L-861 and L-862), these are rated up to 300 mph of wind velocity
  - Lights are as strong as a mode 3 sign
Aircraft Modeling

- All TDG 4, TDG 5 and TDG 6 aircraft that operated at DLH from 2016-2019 are shown
- C5 was also modeled
- Based on modeling, these aircraft can operate safely on the existing Taxiway A1
90-degree Fillet Design
(Standard TDG Width)
90-degree Fillet Design
(75’ Width Taxiway)
Taxiway A (straight portions)

75’ Wide Taxiway
10’ Wide Shoulders
UFC Class B Fighter Aircraft Standards

75’ Wide Taxiway
25’ Wide Shoulders
UFC Class B Standards

75’ Wide Taxiway
30’ Wide Shoulders
TDG 5 Standards
Taxiway A (turning portions)
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Taxiway A Network Alternatives
Taxiway A Alternative

• Existing Alignment of Taxiway A will not be evaluated in more detail based on stakeholder feedback
Taxiway A – Alternative 2A
Taxiway A – Alternative 2B
Taxiway A2 - Relocation Alternative

• Runway Exit Design Interactive Model (REDIM) Tool developed by the FAA
• Analyzes data from ASDE-X at 37 U.S. airports during 2015 and 2016 to calculate distance aircraft exit a runway
• Tool does not account for human preference
  • i.e. commercial aircraft landing Runway 9 and rolling to the end to exit closer to the terminal

• Taxiway A2 alternative is placed to mitigate impacts of wetlands between Taxiway A and Runway 9/27
  • Landing Distance Runway 9 – 3,230’
  • Landing Distance Runway 27 – 6,772’
Taxiway A2 Relocation Alternative (REDIM)

• DLH Operations from 2015-2019 used for fleet mix (>500 average annual operations)
• FAA is not allowed to give out military aircraft data, excluded from analysis
Taxiway A2 Relocation Alternative

Fleet Mix

- A319 - Airbus A319
- AT43 - Aérospatiale/Alenia
- ATR 42-200/300/320
- BE9L - Beech King Air 90
- CRJ2 - Bombardier CRJ-200
- CRJ7 - Bombardier CRJ-700
- CRJ9 - Bombardier CRJ-900
- PC12 - Pilatus PC-12
- SR22 - Cirrus SR 22
- SW4 - Swearingen Merlin 4/4A Metro2
Taxiway A2 Relocation Alternative – REDIM Evaluation

Landing Runway 9

- Existing Taxiway A2
- Proposed Taxiway A2
- Taxiway A3/B
- Taxiway A4
- Taxiway C
- Runway 3/21
Taxiway A2 Relocation Alternative – REDIM Evaluation

Landing Runway 27

- Existing Taxiway A2
- Proposed Taxiway A2
- Taxiway A3/B
- Taxiway A4
- Taxiway C
- Runway 3/21
Arm and Dearm Pad / Holding Bay

Taxiway A1
Runway 9 Holding Bay and Arm and Dearn Pad Alternatives

• Preliminary meetings held with the FAA and 148th
• Goal is to meet or exceed both the civilian (Advisory Circular) and military (UFC) design standards
• Design to accommodate the civilian critical aircraft and UFC Class B Fighter aircraft.
• Marking plan to be developed for the selected pad and coordinated with the 148th and the FAA
• Further analysis needed for perimeter road relocation in each alternative
Holding Bay / Arm and Dearm Pad Alternatives
Arm and Dearm Pad / Holding Bay Alternatives
Holding Bay & Taxiway A ADG Design

Wingtip Clearances

Average Annual Operations of ADG IV, V and VI (2016-2019)

- ADG IV, 409
- ADG V, 4
- ADG VI, 7
Holding Bay & Taxiway A ADG Design
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Next Steps

• Detailed planning of selected preferred alternatives

• Develop apron layouts using preferred taxiway network alternatives
Questions and Discussion
Thank You!