LOOKING OUTSIDE THE COCKPIT: AN IN-DEPTH LOOK AT AIRPORT SIGNAGE

Oliver Austin, TUG '22
ABOUT ME

- San Jose, CA
- Oak Grove High School c/o ’22
- UC Davis c/o ’26 (Aerospace Science and Engineering)
- Student Pilot @ Sundance Flying Club
DISCUSSION OVERVIEW

- Types of signage found on Taxiways and the Ramp/Apron
- Correlations between character/sign design choices and intended usage
- Importance in the introduction of autonomous aircraft
Airport Navigation Crash-Course

(Where and what are Taxiways and the Ramp?)
TAXI DIAGRAMS

- Map of an airport for pilots
- Green indicates the runway(s)
- Yellow indicates the taxiways
- Red indicates the ramp (officially recognized as the “apron” by the FAA and ICAO)

(Color added in post)
LOOKING OUT THE WINDOW

Green – Runway
Yellow – Taxiway
Red – Ramp/Apron
# Airport Sign and Marking – Quick Reference Guide

<table>
<thead>
<tr>
<th>EXAMPLE</th>
<th>TYPE OF SIGN</th>
<th>PURPOSE</th>
<th>LOCATION/CONVENTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 - 22</td>
<td>Mandatory: Hold position for taxiway/runway intersection.</td>
<td>Denotes entrance to runway from a taxiway.</td>
<td>Located L side of taxiway within 10 feet of hold position markings.</td>
</tr>
<tr>
<td>22 - 4</td>
<td>Mandatory: Holding position for runway/runway intersection.</td>
<td>Denotes intersecting runway.</td>
<td>Located L side of rwy prior to intersection, &amp; R side if rwy more than 150' wide, used as taxiway, or has &quot;land &amp; hold short&quot; ops.</td>
</tr>
<tr>
<td>4 - APCH</td>
<td>Mandatory: Holding position for runway approach area.</td>
<td>Denotes area to be protected for aircraft approaching or departing a runway.</td>
<td>Located on taxiways crossing thru runway approach areas where an aircraft would enter an RSA or apch/departure airspace.</td>
</tr>
<tr>
<td>ILS</td>
<td>Mandatory: Holding position for ILS critical area/precision obstacle free zone.</td>
<td>Denotes entrance to area to be protected for an ILS signal or approach airspace.</td>
<td>Located on twys where the twys enter the NAVAID critical area or where aircraft on taxiway would violate ILS apch airspace (including POFZ).</td>
</tr>
<tr>
<td></td>
<td>Mandatory: No entry.</td>
<td>Denotes aircraft entry is prohibited.</td>
<td>Located on paved areas that aircraft should not enter.</td>
</tr>
<tr>
<td></td>
<td>Taxiway Location.</td>
<td>Identifies taxiway on which the aircraft is located.</td>
<td>Located along taxiway by itself, as part of an array of taxiway direction signs, or combined with a runway/taxiway hold sign.</td>
</tr>
<tr>
<td>22</td>
<td>Runway Location.</td>
<td>Identifies the runway on which the aircraft is located.</td>
<td>Normally located where the proximity of two runways to one another could cause confusion.</td>
</tr>
<tr>
<td></td>
<td>Runway Safety Area / OFZ and Runway Approach Area Boundary.</td>
<td>Identifies exit boundary for an RSA / OFZ or rwy approach.</td>
<td>Located on taxiways on back side of certain runway/taxiway holding position signs or runway approach area signs.</td>
</tr>
<tr>
<td></td>
<td>ILS Critical Area/POFZ Boundary.</td>
<td>Identifies ILS critical area exit boundary.</td>
<td>Located on taxiways on back side of ILS critical area signs.</td>
</tr>
<tr>
<td></td>
<td>Direction: Taxiway.</td>
<td>Defines designation/direction of intersecting taxiway(s).</td>
<td>Located on L side, prior to intersection, with an array L to R in clockwise manner.</td>
</tr>
<tr>
<td>22 →</td>
<td>Runway Exit.</td>
<td>Defines designation/direction of exit taxiways from the rwy.</td>
<td>Located on same side of runway as exit, prior to exit.</td>
</tr>
<tr>
<td></td>
<td>Outbound Destination.</td>
<td>Defines directions to take-off runway(s).</td>
<td>Located on taxi routes to runway(s). Never collocated or combined with other signs.</td>
</tr>
<tr>
<td></td>
<td>Inbound Destination.</td>
<td>Defines directions to airport destinations for arriving aircraft.</td>
<td>Located on taxi routes to airport destinations. Never collocated or combined with other types of signs.</td>
</tr>
<tr>
<td></td>
<td>Information.</td>
<td>Provides procedural or other specialized information.</td>
<td>Located along taxi routes or aircraft parking/staging areas. May not be lighted.</td>
</tr>
</tbody>
</table>

*Image courtesy of Justin Kim*

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**Fly Neighborly**

Noise Abatement Plan in effect

Contact Local FBO’s for Full Details

SIGNAGE AROUND THE RAMP/APRON

Images courtesy of Justin Kim
Why Do Signs Look the Way They Do?

(Comparisons between font design and intended usage/location)

Images courtesy of Justin Kim
## TAXIWAY SIGNAGE

<table>
<thead>
<tr>
<th>Color Combination</th>
<th>Description</th>
</tr>
</thead>
</table>
| **White On Red**  | - Used to protect runways/areas of importance  
                   - Red is the universal color for “STOP”  
                   - Stands out from other colors |
| **Yellow On Black** | - Indicates current location/taxiway (if you see it, you’re there!)  
                        - Contrasts against other color combinations |
| **Black On Yellow** | - Used to show intersecting taxiways and display general information  
                        - More yellow (a bright color) than black \rightarrow a more noticeable sign |

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TAXIWAY SIGN STANDARDS

- FAA’s AC 150/5345-44K - Specification for Runway and Taxiway Signs

“An Advisory Circular (AC) provides information and guidance by describing an acceptable means, but not the only means, of demonstrating compliance with the regulations and standards” – International Civil Aviation Organization
RAMP SIGNAGE

Cautionary
- Red, Yellow, or brightly colored text/background
- Usually Geometric, Humanistic, or Monospaced

Instructions
- Duller colors (black, white, sometimes red)
- Large characters
- Neo-Grotesque, Geometric, or Monospaced

General Information
- White on dull background or black on white background
- Neo-Grotesque and/or Humanistic
CAUTIONARY SIGNS
(GENERAL EQUIPMENT)

Images courtesy of Justin Kim
CAUTIONARY SIGNS (AIRCRAFT-SPECIFIC)

Images courtesy of Justin Kim
INSTRUCTIONAL SIGNS

Images courtesy of Justin Kim
Images courtesy of Justin Kim
Why this all matters?

(Onset of Autonomous Aircraft)
HOW AUTONOMOUS VEHICLES WORK

- Vision-Based Navigation Systems Consist of One or More Cameras that Feed Directly into an Onboard Computer

- Use of Cameras Helps Systems Achieve Higher Precision when Controlling Vehicles

- Most Prevalent Use is with Road Vehicles (i.e. Tesla Automobiles)

- Ran machine learning trials on font used for runways
- Data showed current font significantly underperforming in recognition tests*
- Raised questions as to how well other aviation fonts may compare

*In comparison to 30 other randomly selected fonts
TAXIWAY FONT VS HIGHEST PERFORMER

Allumi

0 1 2 3 4 5 6 7 8 9

L C R

2 3 4 5 6 7 8 9 0
THANKS FOR LISTENING!

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