Low-Visibility Operations/Surface Movement Guidance and Control System Chart Research

August 1, 2013

This research is funded by the FAA Human Factors Division in support of the Office of Flight Standards.
Background

Objective

- Provide data to support FAA efforts to develop recommendations and best practices for Low-Visibility Operations/Surface Movement Guidance and Control System (LVO/SMGCS) charts

Impact

- FAA will provide results to the International Civil Aviation Organization (ICAO) LVO/SMGCS working group
- FAA will use results in developing regulatory and guidance material
- Supports NextGen Operational Improvements (OIs):
  - Low Visibility Surface Operations (107202)
  - Provide Surface Situation to Pilots, Service Providers and Vehicle Operators for Near-Zero-Visibility (102409)
Research Team

- **Project Technical Sponsor**
  - Bruce McGray & Terry King, Flight Standards Service Flight Technologies and Procedures Division, Flight Operations Branch (AFS-410)

- **Project Manager**
  - Michelle Yeh, FAA Human Factors Division (ANG-C1)

- **Volpe Staff**
  - Stephanie Chase (project manager)
  - Andrea Sparko (task manager)
  - Katarina Morowsky
  - Young Jin Jo
Project Overview

- **Purpose:** Provide data to support development of best practices for LVO/SMGCS chart layout and symbology

- **Previous Research: LVO/SMGCS Chart Usability**
  - Purpose: Provide data on general usability of LVO/SMGCS charts
  - Technical Approach: Simulator studies
  - Coordination with NASA Langley Research Center

- **Current Research: LVO/SMGCS Chart Symbology**
  - Purpose: Provide data on the intuitiveness and usefulness of LVO/SMGCS chart symbology
  - Technical Approach: Online questionnaire
# Chart Symbology

<table>
<thead>
<tr>
<th>Information Type</th>
<th>Symbols in Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clearance Bar</td>
<td>📌📌📌 🏖️ 📌📌📌📌</td>
</tr>
<tr>
<td>Geographic Position Marker (GPM)</td>
<td>⛅️ 🛍️ 3</td>
</tr>
<tr>
<td>Instrument Landing System (ILS) Hold Line</td>
<td>🏖️ 🏖️ 🏖️</td>
</tr>
<tr>
<td>Non-Movement Area</td>
<td>⏯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯</td>
</tr>
<tr>
<td>Runway Guard Light (RGL)</td>
<td>📌📌📌 📌</td>
</tr>
<tr>
<td>Stop Bar</td>
<td>📌📌📌 📌</td>
</tr>
<tr>
<td>Combination RGL and Stop Bar</td>
<td>📌📌📌 📌</td>
</tr>
</tbody>
</table>
Current Research: Chart Symbology

- **Technical Approach: Online Questionnaire**
  - Task 1: Intuitiveness of symbol shapes
  - Task 2: Usefulness of information types depicted on LVO/SMGCS charts

- **Participants**
  - CAT-III qualified pilot volunteers
    - ATP
    - International
    - Military
  - Recruited via fliers distributed with help of FAA Project Technical Sponsor team (Bruce McGray & Philip Saenger)
  - 150 pilot volunteers (as of July 15) with more anticipated
  - 50 pilots will receive $50 gift card, picked via random drawing
## Task 1: Symbol Intuitiveness

### Overview (1/2)

<table>
<thead>
<tr>
<th>Information Type</th>
<th>Symbols within Information Type</th>
<th>Similar Symbols from other Information Types</th>
<th>Foil Symbols</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clearance Bar</td>
<td>![ Clearance Bar Symbols ]</td>
<td>![ Similar Symbols ]</td>
<td>![ Foil Symbols ]</td>
</tr>
<tr>
<td>Geographic Position Marker (GPM)</td>
<td>![ GPM Symbols ]</td>
<td>![ Similar Symbols ]</td>
<td>![ Foil Symbols ]</td>
</tr>
<tr>
<td>ILS Hold Line</td>
<td>![ ILS Hold Line Symbols ]</td>
<td>![ Similar Symbols ]</td>
<td>![ Foil Symbols ]</td>
</tr>
<tr>
<td>Non-Movement Area</td>
<td>![ Non-Movement Area Symbols ]</td>
<td>![ Similar Symbols ]</td>
<td>![ Foil Symbols ]</td>
</tr>
<tr>
<td>Runway Guard Lights (RGL)</td>
<td>![ RGL Symbols ]</td>
<td>![ Similar Symbols ]</td>
<td>![ Foil Symbols ]</td>
</tr>
<tr>
<td>Stop Bar</td>
<td>![ Stop Bar Symbols ]</td>
<td>![ Similar Symbols ]</td>
<td>![ Foil Symbols ]</td>
</tr>
<tr>
<td>Combination RGL &amp; Stop Bar</td>
<td>![ Combination RGL &amp; Stop Bar Symbols ]</td>
<td>![ Similar Symbols ]</td>
<td>![ Foil Symbols ]</td>
</tr>
</tbody>
</table>
Is ⋄ ⋄ a stop bar?

Level 1

Level 2

Level 3

Level 4
Task 1: Symbol Intuitiveness
Level 1

Is 🌐 a geographic position marker (GPM)?

Yes ☐ ☐ No ☐ ☐
Task 1: Symbol Intuitiveness
Level 2

Is ☐ a geographic position marker (GPM)?

Yes ☐ No ☐
Is 7S a geographic position marker (GPM)?

Yes  No
Task 1: Symbol Intuitiveness
Level 4

Is 7S a geographic position marker (GPM)?

Yes  No
Task 2: Usefulness of Information Types

Overview

- Pilot is shown a table of 9 selected information types with definitions
  - 7 information types from Task 1, and
  - 2 additional information types: approach hold and apron holding point

- Pilots are asked to rate the usefulness of each information type
**Task 2: Usefulness of Information Types**

**Example**

Rate the usefulness of the following information on LVO/SMGCS charts.

<table>
<thead>
<tr>
<th>Information Type</th>
<th>Very Useful</th>
<th>Somewhat Useful</th>
<th>Not Very Useful</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geographic Position Marker (GPM):</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pavement marking used to verify aircraft position.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clearance bar:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lights at the holding position of a taxiway/taxiway intersection.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


Project Status

- Pilot recruitment .................. Ongoing (150 pilot volunteers as of 7/15/13)
- Data collection ......................... In progress (ends Aug. 30, 2013)
- Preliminary draft report ........... Sept. 15, 2013
- Revised draft report ............... Oct. 31, 2013