Voice Activated Cockpit Management Systems

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“Over the past 10 years, 45% of business jet accidents have occurred during landing. Since 2012 this accident rate has increased dramatically to 58%.” (Breiling)

NextGen voice activated cockpit technologies improve efficiency and minimize human factors contribution to critical decision making.

FLY-BY-VOICE
SAA Product Applications Across Industries

Aviation, Air Transport, and Airports:
FLY-BY-VOICE™ Platforms provide airframe and avionics manufacturers of commercial and military aircraft a variety of cockpit voice systems for use by pilots during flight operations. Developers of pilot and air traffic controller training and simulation systems use FLY-BY-VOICE™ platforms for training and certification testing of personnel.

Human-Centered Field Automation:
FLY-BY-VOICE™ Platforms provide equipment inspectors, mechanics, pilots, and examiners, with interactive transfer of control authority during operational procedures.

Defense & Public Safety:
FLY-BY-VOICE™ Platforms provide military personnel with noise-robust embedded voice solutions for military applications like command and control in mission flight environments.

MedEvac:
FLY-BY-VOICE™ Platforms provide MedEvac personnel with instant alert response and interactive solutions in a variety of applications, from doctors’ reports to entry of data for patient medical records, and semi-automation of emergency protocols.
SAA Technology Meets The Highest Standards

FLY-BY-VOICE™ INTO NEXTGEN CENTURY

National Competition Award for Best Technology

Phase I (2012)
(top 10% of 220 awards out of 11,000 applications)

Phase II (2014)
(top 10% of 98 Phase II awards progressing forward out of the 220 Phase I awarded, The only accelerated Phase II award out of 98)

Phase III (2015)
Commercial Entry
All Commercial, Industrial, Display, Protocol, and Nav. Cockpit Functions have been Voice Enabled using SAA’s proprietary VOICE-ARINC Architecture
• The VOICE recognition has been rendered speaker-independent

• The system achieves a “continuous utterance” recognition rate of 96-98% regardless of the number of tri-phones in an utterance

• The recognition system allows the chaining of 36 command words in an single utterance and a correction of a misspoken command in the same utterance with 98% accuracy
FLY-BY-VOICE Technology abetted by a heuristic method, achieves command accuracy of more than **96% in the cockpit during flight**

- Off-Line Voice Recognition Solution (Non-Cloud Based)
- Flexible/Continuous Speech Recognition
- No Accent Bias
- Cockpit Grammar
- Cockpit Vocabulary
- Phonetic Distance Recognition
- Perplexity Recognition
- No Training Required

FLY-BY-VOICE has been tested in Cirrus, Diamond, Beechcraft, Cessna Citation, Airbus, and Boeing B747 environments, at noise levels of up to 136dB and various configurations (run-up, climb, cruise, descent, high and low altitude), for a total of 750 flight hours to date.
Cockpit Procedures Voice Management System

- **Automated** Emergency and Standard (Flight) Procedures/Protocols
- **Self-Sustaining** Cockpit Interface for (Aircraft) Systems
- **Actuation, Monitoring and Control** of Cockpit Instruments and Systems
- Heuristic Challenge Response for **Advanced Safety**
# Flight Management System

## Voice Function Solutions

<table>
<thead>
<tr>
<th>Command Function</th>
<th>Lexicon (syntax / words)</th>
<th>Accuracy (% of command recognition)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set Altimeter</td>
<td>1800 / 5400</td>
<td>96.5</td>
</tr>
<tr>
<td>Set Altitude</td>
<td>1029 / 3087</td>
<td>98</td>
</tr>
<tr>
<td>Set Arrival</td>
<td>2882 / 5764</td>
<td>99.63</td>
</tr>
<tr>
<td>Set Decision Height Altitude</td>
<td>1600 / 6400</td>
<td>100</td>
</tr>
<tr>
<td>Set Heading</td>
<td>1800 / 9000</td>
<td>100</td>
</tr>
<tr>
<td>Set Mode To</td>
<td>8 / 24</td>
<td>100</td>
</tr>
<tr>
<td>Set Speed</td>
<td>500 / 2000</td>
<td>100</td>
</tr>
<tr>
<td>Set Transponder Code</td>
<td>10104 / 70728</td>
<td>100</td>
</tr>
<tr>
<td>Set Vertical Speed</td>
<td>380 / 2660</td>
<td>100</td>
</tr>
<tr>
<td>Tune Frequency</td>
<td>13536 / 121824</td>
<td>98</td>
</tr>
<tr>
<td>Direct to Airport (i.e.NW)</td>
<td>505 / 2524</td>
<td>96.94</td>
</tr>
<tr>
<td>Direct to Fix (All US AirSpace)</td>
<td>5366 / 21464</td>
<td>98.6</td>
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<tr>
<td>Direct to WayPoint (i.e.NW)</td>
<td>300 / 1200</td>
<td>97.07</td>
</tr>
<tr>
<td>Landing/Takeoff Clearance</td>
<td>1932 / 9660</td>
<td>100</td>
</tr>
<tr>
<td>Map Centering</td>
<td>20 / 40</td>
<td>100</td>
</tr>
<tr>
<td>Display Format</td>
<td>19 / 114</td>
<td>100</td>
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<tr>
<td>Display Checklist</td>
<td>22 / 66</td>
<td>100</td>
</tr>
<tr>
<td>ATC Grammar</td>
<td>12789 / 679000</td>
<td>96.4</td>
</tr>
</tbody>
</table>
The problem is that the knowledge gets backed into the network rather than into us
THANK YOU
SAA TEAM
NASA
collaborators