TRINITY COLLEGE DUBLIN

Report Summary

Report on the validation of communication analysis technology using pilot voice data and CRM assessments

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In collaboration with the Safety & Technical Committee of the Irish Air Line Pilots' Association (IALPA), a research team from the Speech and Communications Laboratory at TCD (aka 'Tapoia project'), assembled a group of commercial pilots, with the goal of developing software that could objectively measure communication skills in multi-crew aircraft pilots.

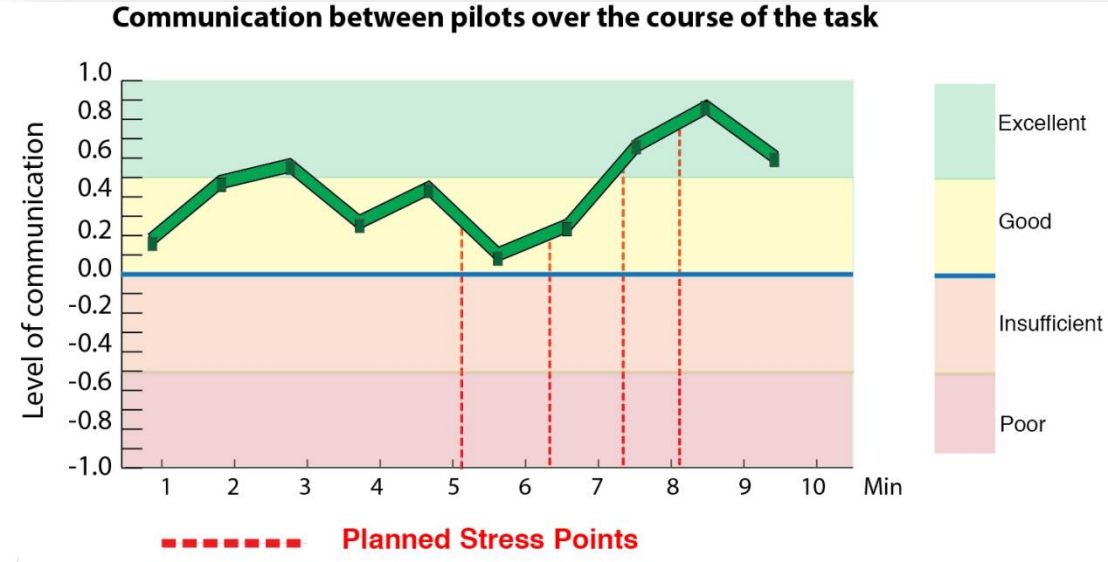
Task: Twelve pilots volunteered to take part in a cooperative communicative task lasting ten minutes, while their vocal interactions were recorded and two aviation psychologists from the APRG group accessed their overall CRM (Crew Resource Management) abilities. Pilots were presented with 15 images of items that they had to order to survive an imaginary shipwreck scenario.

Analysis: Using software developed at TCD, the research team analysed the prosody (pitch, intensity and timing) of the pilots' speech in each interaction. We measured how the prosodic parameters of each pilot changed to become more or less similar (accommodated) to that of the other pilot. The aviation psychologists carried out a Coordination Demand Analysis (CDA), which consisted in evaluating the pilots' CRM skills – their situational awareness, decision making, mission analysis, leadership, adaptability and assertiveness.

Results: Our findings show that voice features can provide good insights in to the vocal performance of pilots, which in turn could be used to augment their CRM skills during training. The voice metrics revealed to be closely related to pilot's global coordination to achieve a task and in particular to their leadership, adaptability and assertiveness.

Output and insights: This research enabled us to develop a set of visualised output metrics that give insight into the vocal performance and communicative ability of multi-crew pilots.

Currently we can provide objective evaluation of the level of communication between pilots, their team and individual speaking and listening quotients and their vocal effort (or individual accommodation to the other pilots' speech prosody).



Sample Pilot Communication Performance Metric

About Tapoia Project

As a group of Speech Communication researchers, we study the human voice to understand how it shapes our everyday lives. As part of a commercialisation project that commenced in 2011 (funded by Enterprise Ireland), we identified the critical role of effective inter-pilot communication skills in operating multi-crew aircraft safely.

We focused our efforts in understanding how 'Prosody' (pitch, rhythm, tone) in the voice influences the ability of multi-crew pilots to communicate effectively. We developed speech analysis software that generates objective measurements of communication effectiveness between crew (represented via a range of performance metrics in graphical format).

We believe this research effort has highlighted the potential for a new communications training dimension that could augment existing multi-crew training. In particular, given the objective nature of the performance data generated by the software, pilots and instructors are now better positioned to have open and robust discussions on non-technical skills and CRM[1] best practices on the flight deck.

This new training technology has the potential to both enhance non-technical skills levels in pilots and assist air transport operators (commercial airlines, business jet operators and Helicopter services) in sustaining a high level of aviation safety to the benefit of their crew and passengers.

Our sincere thanks to the organisations who participated in this research study, including; Safety & Technical Committee of the Irish Air Line Pilot's Association, the Irish Air Corps, Centre for innovative human systems TCD and Simtech aviation.

For more information on this research or a copy of the full report, please contact us at research@tapoia.com

[1] **Crew Resource Management;** is a set of training procedures for use in environments where human error can have devastating effects. Used primarily for improving air safety, CRM focuses on interpersonal communication, leadership, and decision making in the cockpit.