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Frequency and Variance of Communication Characteristics in Aviation Safety Events

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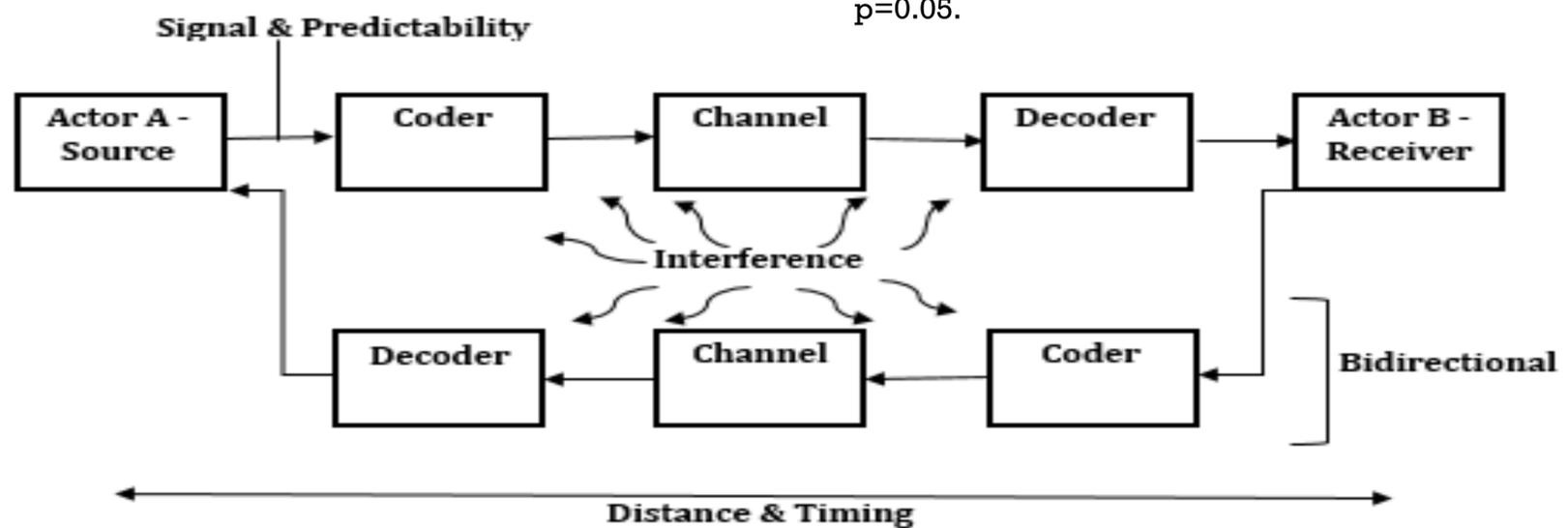
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Introduction

In the aviation sector communications plays a critical role, and training and education include communication theory and practice. Studies suggest that communication problems contribute into 70% to 80% of safety occurrences, but literature does not provide further information about the types and frequencies of the corresponding communication variables. Our objective was to develop a relevant tool to be used for post analyses of safety (investigation) reports. This way, the efforts of practitioners and scholars could be targeted to the weakest areas.

Methodology

We developed a tool which is based on literature and includes communication variables related to actors, distance, timing, flow of information, form, senses involved and media. After achieving an inter-rater agreement of 91,7%, 103 safety investigation reports from Australia, Canada, the Netherlands, United Kingdom and United States of America were analysed. In those reports, 256 communication problems were identified. In addition to frequency analysis, Chi-square and Fischer's exact tests were used to test associations with Region, Time Period, Severity, and Type of Operation. The statistical significance level was set to $p=0.05$.



Tool

Communication variable	Values
Actors	Human, Technical, Representation Media
Signal	Visual, Audio, Force, Electrical
Coder	Verbal, Non-Verbal
Channel	Radio, Phone, Internet, Air, Force, Other-wire, Other-wireless
Decoder	Visual, Audio, Taste, Smell, Touch, Non-human
Distance	Local, Remote
Timing	Synchronous, Asynchronous
Predictability	Common, Uncommon
Interference	Yes, No

Results

On average 2 communication problems were recorded per report. No variance of the number of problems was found over time and across regions, event severity, and type of operation. The table below shows where significant associations were found, marked with "X".

Communication variables	Associated variables			
	Region: AU, CA, NL, UK, USA	Time Period: ≤2006, 2007-2009, ≥2010	Severity: incident, serious, accident	Type of operation: commercial, non-commercial
Actors	X	-	X	-
Signal	X	X	X	X
Coder	X	-	X	X
Channel	X	X	X	-
Decoder	X	X	X	X
Direction	X	X	X	X
Timing	-	-	-	-
Distance	X	-	X	-
Predictability	X	X	X	-
Interference	-	-	-	-

Indicative references

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Applicability and future work

The tool can be used by all industry sectors to distil and analyse data from mandatory and voluntary reports, so that weak communication areas can be identified and improved. Depending on the findings we can alert designers, inform management, warn operators about the most frequent communication pitfalls, and also steer respective training programs. Also, the theoretical foundation of the tool might be used as an inclusive reference to communication theory and can comprise a basis for future academic research.