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LEARNING FROM THE PAST: AIRLINE ACCIDENTS & THE ICAO LANGUAGE PROFICIENCY PROGRAM

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In response to multiple airline accidents involving pilot-ATC communication breakdowns, ICAO implemented a worldwide language proficiency program in 2011. The official guide to the program, Document 9835, cites four accidents in which insufficient English proficiency of pilots or air traffic controllers was a contributing factor. The purpose of this study is to investigate the relevance of the four accidents to current airline operations. A survey was distributed to UK-based pilots using BALPA online discussion forums. The survey explored: respondents' awareness of the accidents cited by ICAO; sources of information; and the role played by English proficiency in the accidents. This paper presents the results of the survey and identifies areas for further research.

Between 1976 and 2001, a total of 1,460 people died in a series of airline accidents that involved pilot-ATC communication breakdowns. In response to these accidents, the International Civil Aviation Organization (ICAO) initiated a program to improve the language proficiency of pilots and air traffic controllers. This program was developed in the early 2000s, and came into full effect in 2011. The official program guide, ICAO Document 9835, cites four accidents for which "insufficient English language proficiency on the part of the flight crew or a controller" was a contributory factor (ICAO, 2010, p. 1-1). These accidents were:

- 1977 Tenerife runway collision;
- 1990 Cove Neck, New York, fuel exhaustion crash;
- 1995 Cali, Colombia, controlled flight into terrain (CFIT);
- 1996 Charkhi Dadri, New Delhi, mid-air collision.

Some researchers have questioned the assumptions underlying ICAO's language program and called for further empirical research (Estival, Farris & Molesworth, 2016). The aim of this study is to explore the relevance of the accidents cited by ICAO to present-day operations.

Method

Research Questions

Five research questions were drawn up to investigate airline pilots' awareness of, and attitudes towards, the accidents cited in Document 9835. These research questions were used to design an online survey. The questions were as follows:

RQ1. Is studying past airline accidents important for improving airline safety?

RQ2. Which of the accidents cited by ICAO have pilots heard of?

RQ3. What are pilots' sources of information about these accidents?

RQ4. Did insufficient English proficiency of pilots play a contributing role in these accidents?

RQ5. Did insufficient English proficiency of air traffic controllers play a contributing role in these accidents?

Online Survey

A 31-item questionnaire was created using the SurveyMonkey online survey tool. It was designed to be completed in a short time (i.e. 10-15 minutes). To ensure that the question items were rigorous, they were checked by three applied linguists. The questionnaire was distributed to UK-based pilots via two British Airline Pilots Association (BALPA) online discussion forums. One of the forums is for all BALPA members and the other is for British Airways pilots only. These are closed forums where members (ie: airline pilots) discuss professional issues.

Survey Content

The survey has three sections with a mixture of question types: 5-scale Likert items; yes/no closed items; and multiple choice questions. The first section has a single item:

Q1. Studying past airline accidents is important for improving current airline safety. [Strongly agree / Agree / No opinion / Disagree / Strongly disagree]

The second section has five items that are repeated for each accident. Page skip logic is used so that, if a respondent answers “No” to the initial question, they are not asked any more questions about that accident. These are the questions for the first accident (1977 Tenerife):

Q2. On 27th March 1977, there was a runway collision between KLM Flight 4805 and Pan Am Flight 1736 at Los Rodeos Airport on the island of Tenerife. Have you heard of the 1977 Tenerife accident? [Yes / No]

Q3. Where did you hear about the 1977 Tenerife accident? (You can select more than one answer.) [Accident report / Another pilot / Book / Company training / IATA publication / ICAO publication / Internet / Magazine or newspaper article / TV documentary / TV or radio news / Other (please specify)]

Q4. The 1977 Tenerife accident is relevant to current airline operations. [Strongly agree / Agree / No opinion / Disagree / Strongly disagree]

Q5. Insufficient English proficiency of pilots played a contributing role in the 1977 Tenerife accident. [Strongly agree / Agree / No opinion / Disagree / Strongly disagree]

Q6. Insufficient English proficiency of air traffic controllers played a contributing role in the 1977 Tenerife accident. [Strongly agree / Agree / No opinion / Disagree / Strongly disagree]

The final section includes ten questions about demographics: rank, training appointments, flight hours, age, gender, airline, nationality, native language, other languages known and ICAO language proficiency level.

Demographics

There were 92 respondents to this survey, of whom 74 completed all the sections. This a summary of the demographic information:

- 60.8% of respondents were captains and 39.2% were first officers (n=74)

- 23.0% were technical trainers and 2.7% were human factors trainers (n=74)
- 59.5% had 10,000+ flight hours and 18.9% had less than 5,000 flight hours (n=74)
- 47.3% were 46+ years old and 21.6% were 35 or younger (n=74)
- 97.3% were male and 2.7% were female (n=74)
- respondents worked at British Airways (32 pilots), Thomson Airways (17), Virgin Atlantic (5), easyJet (4), Norwegian (2), Air Berlin (1), Qatar (1), flybe (1) and Jet2.com (1) (n=64)
- 87.8% of respondents were British; other nationalities were Dutch (4.1%), Irish (2.7%), Danish (1.4%), German (1.4%), Scottish (1.4%) and Welsh (1.4%) (n=74)
- the native languages of the respondents were English (100% of respondents), Dutch (4.1%), German (1.4%) and Irish (1.4%) (n=74; 3 respondents had 2 native languages and 1 respondent had 3 native languages)

Results

RQ1. Is studying past airline accidents important for improving airline safety?

The first survey item asked whether studying airline accidents is important for improving current airline safety. The respondents think that studying old accidents *is* important:

- 91.3% of respondents strongly agree, and 98.9% agree or strongly agree (n=92)

The respondents were also asked whether each of the four accidents cited by ICAO are relevant to current airline operations. More than 95% think that three accidents are still relevant:

- 1977 Tenerife: 96.6% of respondents agree/strongly agree (n=88)
- 1990 Cove Neck: 96.5% of respondents agree/strongly agree (n=57)
- 1995 Cali: 95.2% of respondents agree/strongly agree (n=63)
- 1996 New Delhi: 79.2% of respondents agree/strongly agree (n=24)

RQ2. Which of the accidents cited by ICAO have pilots heard of?

Respondents were asked if they had heard of the four accidents. All participants know of the 1977 Tenerife collision. A substantial majority have heard of the 1990 Cove Neck and 1995 Cali crashes. However, less than one-third have heard of the 1996 New Delhi accident:

- 100% have heard of 1977 Tenerife (n=92)
- 70.1% have heard of 1990 Cove Neck (n=87)
- 78.1% have heard of 1995 Cali (n=82)
- 32.1% have heard of 1996 New Delhi (n=78)

RQ3. What are pilots' sources of information about these accidents?

The respondents were asked where they had heard about each accident. This a multiple choice question with 11 possible responses including an open "Other (please specify)" comment box. For three accidents, TV documentaries are the most common information source. For the other accident (1995 Cali), company training is the most common and TV documentaries are second. The most common sources are as follows:

- 1977 Tenerife: TV docu. (76.1%), company training (61.4%) & accident report (50.0%) (n=88)

- 1990 Cove Neck: TV docu. (50.9%), accident report (33.3%) & company training (33.3%) (n=57)
- 1995 Cali: company training (66.7%), TV docu. (47.6%) & accident report (46.0%) (n=63)
- 1996 New Delhi: TV docu. (54.2%), accident report (45.8%) & internet (45.8%) (n=24)

Many respondents report multiple sources of information per accident. Aggregating the results for all four accidents, 67.7% of respondents cite two or more sources of information (n=232). Among those who include TV documentaries, the figure rises to 84.9% citing two or more sources (n=139).

RQ4. Did insufficient English proficiency of pilots play a contributing role in these accidents?

Respondents were asked if insufficient English proficiency of pilots played a contributing role in each accident. For three accidents, 58-67% agree with this statement. For one accident (1995 Cali), less than 13% agree, and almost 50% disagree or strongly disagree:

- 1977 Tenerife: 59.1% agree/strongly agree; 19.3% disagree/strongly disagree (n=88)
- 1990 Cove Neck: 66.7% agree/strongly agree; 7.0% disagree/strongly disagree (n=57)
- 1995 Cali: 12.7% agree/strongly agree; 47.6% disagree/strongly disagree (n=63)
- 1996 New Delhi: 58.3% agree/strongly agree; 8.3% disagree/strongly disagree (n=24)

RQ5. Did insufficient English proficiency of air traffic controllers play a contributing role in these accidents?

Finally, the respondents were asked whether insufficient English proficiency of air traffic controllers was a contributing factor in each accident. The strongest agreement is for the 1977 Tenerife accident, with two thirds agreeing with the statement and only 10% disagreeing:

- 1977 Tenerife: 67.0% agree/strongly agree; 10.2% disagree/strongly disagree (n=88)
- 1990 Cove Neck: 29.8% agree/strongly agree; 36.8% disagree/strongly disagree (n=57)
- 1995 Cali: 33.3% agree/strongly agree; 31.7% disagree/strongly disagree (n=63)
- 1996 New Delhi: 50.0% agree/strongly agree; 16.7% disagree/strongly disagree (n=24)

Conclusion

Learning from the Past

Almost 99% of survey respondents agree that studying past airline accidents is important for improving airline safety, with more than 91% expressing strong agreement. Furthermore, over 95% agree that three of the four accidents cited by ICAO are relevant to current airline operations. The exception is the 1996 New Delhi collision, which less than 80% think relevant.

There is considerable variation in awareness of the four accidents. Less than one-third have heard of the 1996 New Delhi accident, compared with 100% for the 1977 Tenerife collision and more than 70% for the other accidents. One reason for the disparity is that the 1977 Tenerife and 1995 Cali accidents (and to a lesser extent 1990 Cove Neck) are often featured in airline

non-technical skills training programs.¹ A second reason is that English language publications (including accident reports) are readily available for these accidents, but not for the 1996 New Delhi collision (CAD, 1996; CIAIAC, 1978; NTSB, 1991).

Sources of Information

Strikingly, TV documentaries are the most common information source for three of the accidents. Company training is also important, being the most common source of information for the 1995 Cali accident and significant for two other accidents. In addition, accident reports are prominent, being the second or third most important sources for all four accidents.

TV documentaries are attractive for many reasons: they are visual, aural and dramatic; they have movement, spoken language and sound effects; they may be watched in a short time (40-50 minutes); and they represent accidents in a personal style that foregrounds individuality and personality. However, they have limitations as sources of information about accidents. The limitations include: the selective use of CVR/ATC dialogue, with utterances being re-ordered or re-written; the speech of non-native English speakers being translated into English; and the use of an omniscient narrator who knows an accident will happen although the actual participants did not have this awareness (cf. hindsight bias).

Compared with all respondents, those citing TV documentaries as an information source are more likely to cite two or more sources. It is reassuring that TV documentaries are typically not pilots' only source of information about an accident, but this suggests the need for further research to investigate how they integrate multiple sources of information.

Insufficient English Proficiency

The first finding is that a majority of respondents think the English proficiency of pilots played a contributing role in three of the accidents (1977 Tenerife, 1990 Cove Neck and 1996 New Delhi). The exception is the 1995 Cali crash, for which less than 13% agree. The second finding is that a majority think the English proficiency of air traffic controllers played a role only for the 1977 Tenerife runway collision. For the 1996 New Delhi mid-air collision, 50% of respondents agree, and for the other two accidents the proportion was one third or less. Thus, only in the case of the 1977 Tenerife accident is English proficiency perceived as a problem on the part of both pilots and controllers.

1995 Cali stands out because only a small proportion of respondents (a third or less) think that insufficient English proficiency was a contributory factor in the case of both pilots and controllers. One possible reason is that this has become known as an "automation accident", which illustrates the hazards associated with introducing new technology and unexpected failure modes into the cockpit, rather than as a "language accident".² It is noteworthy that the Cali crash is the only one of the four accidents in which all the pilots were native English speakers.

¹ This was reported in responses to RQ3 and in online forum comments.

² The Colombian accident report cites the flight crew's "uso inadecuado de automatizacion" ("inadequate use of automation") in its listing of the probable cause (CAD, 1996, p. 68).

Limitations and Future Research

The survey scale (n=92) was limited and respondents had a narrow range of backgrounds (100% native English speakers, 97% male and 88% British). Furthermore, to make it simple and quick to use, the questionnaire mainly consisted of closed-ended question types. Despite these limitations, interesting results were generated about the respondents' awareness of, and attitudes towards, the accidents cited by ICAO.

To conclude, there is a critical need for continued research on pilot-ATC communication in the context of the ICAO language proficiency program. This exploratory study has raised a number of questions that warrant further investigation:

- (1) How do current airline pilots characterize the accidents cited by ICAO?
- (2) How do pilots integrate accident information that comes from multiple sources?
- (3) When and where do pilots watch TV documentaries about accidents?
- (4) Do they discuss TV documentaries with other pilots? If so, when and where?
- (5) What are the limitations of TV documentaries as information sources?

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