CLEARING THE AIR
APPLIED LINGUISTIC PERSPECTIVES ON AVIATION COMMUNICATION

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As a result of investigations showing that communication problems can be a significant contributing factor to major aviation accidents, the International Civil Aviation Organization (ICAO) has established a set of Language Proficiency Requirements. All pilots and air traffic controllers engaged in international aviation must be certified by their national civil aviation authorities as meeting the requirements by March 2011. This has created a demand for tests designed to assess the speaking and listening skills of aviation personnel, and language testers have become involved as developers and evaluators of the various assessment instruments. The present paper gives an overview of the issues and introduces the themes discussed by the other contributors to this special issue of the journal, covering both the linguistic nature of aviation communication and more practical considerations in test design.

INTRODUCTION

Those who travel by air have a vested interest in aviation safety. High standards in design, manufacture and maintenance ensure that accidents caused by the failure of aircraft systems are relatively rare. The technological advances include systems to automate the process of flying the aircraft to a large degree, to monitor the progress of a flight from start to finish, and to warn of faults and potential hazards. However, pilots and air traffic controllers are far from being made redundant; human factors still play a crucial role in maintaining safety and avoiding mishaps or disasters, and one of the key human factors is accurate and effective communication.

The most important form of communication is between pilots and air traffic control (ATC) on the ground and in the air by way of radiotelephony. A restricted and prescribed linguistic code known as standard phraseology has long been the established means for the parties involved to share information about the routine phases of a flight from departure to arrival at the intended destination. Learning the phraseology is an integral component of the training of pilots and controllers, and for the most part it functions as an efficient means of transmitting the necessary messages, with built-in checks to ensure that critical numerical details such as altitudes, headings and radio frequencies are correctly understood. In non-routine situations, and especially emergencies that are not covered by the standard phraseology, it is expected that pilots and ATC will use "plain language" to identify the nature of the problem and work out how it can be resolved.

The combination of phraseology and plain language is relatively straightforward where pilots and ATC speak the same language proficiently. However, in international aviation that condition very often does not apply and thus English is designated as the lingua franca by international convention. The last few decades have seen the deregulation of an industry that had been dominated by European and North American airlines and the rise of new carriers based in countries where the general level of English proficiency is low. In the late 1990s there was growing concern about the limited proficiency in aviation English of many pilots and controllers operating internationally, fuelled by analyses of air accidents which showed that communication problems were a contributing factor (see Cookson, this issue, for two examples). Thus, the United Nations agency responsible for the regulation of air transport worldwide, the International Civil Aviation Organization (ICAO), undertook a review of the language demands of radiotelephony communication and in 2003 adopted a set of language proficiency requirements (LPRs) for pilots and air traffic controllers.

The centrepiece of the LPRs is a scale which defines six levels of language proficiency (not necessarily in English) in an aviation context. Each level is described in terms of six rating criteria: pronunciation, structure, vocabulary, fluency, comprehension and interactions. The minimum standard is Operational Level 4 (see the appendix for the descriptors at this level; for the full scale, see e.g. http://elpac.info/documents/ICAO_LPR_rating_scale.pdf). The organization has published a manual (ICAO, 2004) which provides a rationale for the LPRs, specifies in some detail the linguistic features of aviation communication and sets out the steps involved in implementing the requirements. Crucially, though, it does not mandate a particular test or assessment procedure to determine whether individual pilots and air traffic controllers have the required level of proficiency. It has been left to the civil aviation authority in each of the 190 member states of ICAO

to decide how the personnel under their jurisdiction should demonstrate that they meet the prescribed LPRs. The original deadline for certifying that pilots and controllers were in compliance with the requirements was 5 March 2008 but, when it became clear in 2007 that many member states would not achieve the deadline, it was in effect extended until March 2011. In the meantime, the LPRs have generated a large amount of test development activity in what has been perceived to be a potentially lucrative international marketplace.

The topic of aviation communication has been of interest to applied linguists from a variety of perspectives. Clearly, it represents a very specialized and socially significant form of discourse, which has attracted the attention of discourse analysts. For instance, Maurice Nevile of the Australian National University, whose work is cited in two papers in this issue, has conducted extensive research on communication in airline cockpits using conversation analysis, with the practical motivation of contributing to the investigation of air accidents by the Australian Transport Safety Bureau. In addition, the growth in courses to teach English to students in the aviation industry raises issues in course design for specialists in English for Specific Purposes.

However, in recent years, with the adoption of the ICAO LPRs, language testers are the applied linguists who have been the most engaged in work on aviation communication, as consultants, test developers and evaluators of tests. Most of the contributors to this special issue have taken on at least one of these tasks. And it was in the role of evaluator that the leading British language tester, Charles Alderson became involved in the area in 2006. Together with the Language Testing Research Group at Lancaster University, he undertook a validation study of the English Language Proficiency for Aeronautical Communication (ELPAC) test for the European air traffic management organization EUROCONTROL. This led to an interest in what other aviation English tests were available internationally and whether the tests met professional standards of quality. A web-based survey yielded information about just 22 of the estimated 74 tests that were designed or actually used to assess pilots and controllers according to the ICAO requirements. The fact that only five validation reports were supplied was indicative of a more general reluctance to open the tests to external scrutiny. A follow-up survey of national civil aviation authorities in 2008 showed that just over a quarter of them were in compliance with the ICAO requirement to assess the English proficiency of their pilots and air traffic controllers. For further details of these surveys and a critical analysis of their results, see Alderson (2009).

AVIATION ENGLISH TESTS IN AUSTRALASIA

Australia and New Zealand are among the minority of countries whose civil aviation authorities met the March 2008 deadline for implementing the ICAO language requirements. In both countries, the training of pilots from overseas has been a growth industry for both public-sector institutions and private flying schools and inevitably a number of the providers have moved into English language training through either in-house courses or partnerships with language schools. This in turn has led to several test development projects linked to the ICAO guidelines. These projects are not the focus of any papers in this special issue, and so we will survey them briefly here.

In Australia the Civil Aviation Safety Authority (CASA) has the power to determine how applicants for Australian licences are to be assessed for language proficiency. Having applied its own accreditation procedures, CASA has approved four language testing providers to assess candidates in terms of the ICAO requirements. Two of the main providers are Australian universities which have developed tests in conjunction with their language teaching programs in Aviation English. The largest program, established about 15 years ago, is at RMIT University in Melbourne, which offers an extensive array of English courses for aviation personnel in Australia and at numerous overseas locations through RMIT English Worldwide. The RMIT English Language Test for Aviation (RELTA; www.relta.org) was one of the first tests based on the ICAO proficiency requirements to become available internationally and is accepted by 19 civil aviation authorities around the world, in addition to CASA. The other university-based provider is the Griffith University English Language Institute in Brisbane, which has developed the Aviation Language International Test of English (ALITE; www.aviationenglish.com.au).

Both RELTA and ALITE consist of separate listening and speaking tests. The listening tests present a range of aviation-related language use situations, with test items that require the candidates to demonstrate their understanding of what was said. A distinctive feature of the RELTA listening subtest is that it is delivered on computer, with appropriate visuals on the screen to accompany the spoken input. For the speaking assessment both tests employ face-to-face interaction with a single examiner. The ALITE interview is in four parts: an introductory interview, a picture description task, a narrative account of an experience the candidate has had in aviation, and a role play of a typical radiotelephony communication situation.

The third main provider approved by CASA is Assessment Services Pty Ltd (ASL), which is actually the Australian arm of Aspeq, a New Zealand-based company that conducts licensing exams for pilots and other aviation personnel in both countries. In

New Zealand the company is accredited by the Civil Aviation Authority (CAA) as the sole examining agency for the aviation industry, through its local subsidiary Aviation Services Ltd (also ASL). Aspeq took an early interest in developing an English language test based on the ICAO requirements which could be not only used to meet New Zealand's modest assessment needs but also marketed internationally. To make the project cost-competitive, the decision was made to develop a web-based test that could be readily administered and rated at multiple locations remote from the server. This was where we became involved in the project early in 2007 as consultants on the design of the test tasks and development of the rating procedures.

The project involved the creation of two tests (www.aslexam.com). The first has become known as the Level 6 Proficiency Demonstration (L6PD) and was designed to confirm that licensed pilots who were native speakers or highly proficient L2 users were at the top level of the ICAO scale. It is a "semi-direct" speaking test in the sense that the candidates access the server by phone from a test centre and respond to a series of pre-recorded prompts (questions and brief scenarios on aviation topics). A trained human rater then logs in and assesses the candidate's performance according to the ICAO scales. The other test, the Formal Language Evaluation (FLE), assesses candidate proficiency more broadly from around Level 3 to Level 6. It includes a similar semi-direct component to that in the L6PD but also has a direct section conducted by an interviewer who accesses the server at the same time as the candidate. The direct test is intended particularly to elicit evidence that can be used to rate performance on the Comprehension and Interaction scales, since these criteria can mostly be applied only by inference in a semi-direct test. The two tests were developed in time for the original ICAO deadline of March 2008 and have been administered by the ASL companies on both sides of the Tasman since that time.

Our work with ASPEQ and their partners on the L6PD and the FLE had much in common with the Finnish case, as described by Huhta (this issue). The project proceeded under great pressure to meet the 2008 deadline, with the inevitable compromises that the short timeline entailed. We experienced the pleasures and challenges of working co-operatively with aviation personnel on the preparation of the test material and on the negotiation of design issues. On the need for double rating of the FLE, our view eventually prevailed, but we were unable to persuade the ASL managers of the desirability of a separate listening test, as found in RELTA, ALITE and the Finnish test. One particular constraint – which occurs frequently in the development of specific-purpose tests on a relatively small scale – was the difficulty of finding sufficient suitable participants for the test trials. Now that the initial development phase has been completed, we have had

very little continuing involvement with the testing program and, like Huhta in Finland, we have some concerns about whether a good standard of assessment is being maintained in the operational tests.

AN OVERVIEW OF THE SPECIAL ISSUE

This brings us to the papers in this issue, which fall broadly into two sets of three. The first set gives various perspectives on the nature of the linguistic factors involved in communication problems experienced by pilots and air traffic controllers in international aviation, whereas the other three papers take up issues in the design of assessments to meet the ICAO requirements.

The first paper, by Simon Cookson, presents an informative account of two widely discussed aviation disasters caused partly by miscommunication between the pilots and an air traffic controller. Certainly the Tenerife disaster, involving the collision of two Boeing 747 jumbo jets, was major headline news in 1977 and it remains the worst crash in aviation history in terms of loss of life. The earlier mid-air collision over Zagreb in 1976 may not be so well known but it also had a substantial death toll and it has contributed to the case made by ICAO for its language proficiency requirements. Cookson emphasises the fact that airline accidents almost always have multiple causes, so that it is important to see the linguistic factors as contributing elements rather than the main cause.

For those who might see problems in aviation communication as resulting primarily from lack of proficiency in English on the part of non-native speakers, there is grist for their mill in the fact that both of these disasters involved an air traffic controller and one of two cockpit crews who had English as their second language. A sudden code-switch from English to "Serbocroatian" by the controller in one case and unclear instructions from the control tower in the other have been the subject of much debate and they constitute prima facie evidence that deficiencies in the language proficiency of non-native speakers may be cruelly exposed in high-pressure situations such as those which led to the Zagreb and Tenerife crashes. Nevertheless, Cookson suggests right at the end of his paper that there is also a case for language awareness training for native-speaking pilots and controllers engaged in communications with their L2 counterparts.

This point is taken up more directly by Hyejeong Kim and Catherine Elder in the second paper. From their small corpus of radiotelephony communications recorded in Korean airspace, they have selected a particular episode in which an American pilot requested permission from a Korean controller to divert to an alternative airport. This was

classified as an abnormal but not uncommon situation. There were some misunderstandings between the two parties, which prolonged what should have been a fairly straightforward exchange of information, although in the end a satisfactory outcome was achieved without mishap. Nevertheless, Korean expert informants were critical of the style of speaking adopted by the native-speaker pilot, who persisted in using plain English to give information that could have been expressed much more efficiently – and more intelligibly to the non-native-speaking controller – in standard phraseology. This highlights the point that effective communication is a process of co-construction between the parties involved.

Kim and Elder link this observation to the concept of English as a Lingua Franca (ELF), which constitutes a field of study in applied linguistics associated particularly with European scholars such as Jennifer Jenkins and Barbara Seidlhofer. As a focus of linguistic research, this may involve an analysis of the grammatical and lexical features of the English used by second language speakers to communicate with each other. However, a basic principle in ELF is that native speakers using English for international communication should eliminate idioms, cultural references and syntactic complexity from their speech in favour of a relatively plain form of language, in order to accommodate to the more limited proficiency of their L2 interlocutors. This may mean not so much using pre-specified language forms, as in the standard phraseology, as developing effective communicative strategies that draw on a suitable range of language resources. Such an approach represents a challenge to the ICAO language proficiency requirements, to the extent that they place the onus on L2 speakers to improve their proficiency and by implication give native-speaking aviation personnel no incentive to develop their communicative competence in ELF terms.

Another perspective on communication issues in aviation radiotelephony is provided in the third paper, by Dominique Estival and Brent Molesworth, who focus on General Aviation rather than commercial airline operations. In this first phase of a larger project, they surveyed both native speaker and EL2 pilots at an airport in Sydney to elicit self-reported difficulties in communication with air traffic controllers. The researchers found that language background was not a determining factor in whether the pilots experienced difficulties. Regardless of whether they were second language users or native speakers, pilots found it challenging to communicate by radio with controllers, as evidenced by the need to repeat a message themselves or to ask for a repetition by ATC. However, the pilots surveyed reported that it was even more difficult for them to understand radio transmissions by other pilots.

In a similar vein to the previous authors, Estival and Molesworth suggest that one important means of reducing the communication problems for EL2 pilots is not so much an improvement in their own proficiency but rather consciousness-raising and training for air traffic controllers, introducing them to strategies that would improve their comprehensibility over the radio for all the pilots that they interact with, regardless of language background.

The second set of papers centre more on issues in language assessment, with particular reference to the challenges involved in implementing the ICAO Language Proficiency Requirements. In their paper, Carol Moder and Gene Halleck point out ways in which the formulation of the ICAO policy has been influenced by political considerations that reflect the relationship between the organization and its member states. In particular, the decision to adopt a proficiency scale but not to mandate a particular test has created uncertainties for test developers about the type of assessment that will meet the ICAO goal of ensuring that pilots and controllers in international aviation can communicate adequately through radiotelephony in a variety of situations.

A specific concern for Moder and Halleck is how to define the domain of Aviation English, in order to provide a basis for selecting the test tasks and content. First, there is the question of whether, and to what extent, the standard phraseology should be incorporated into a language proficiency test. Can it be assumed, for instance, that air traffic controllers handling international flights are already proficient in the phraseology in English? Secondly, some further specification is required of the nature of "plain English" in an aviation context. Does it mean that it is sufficient to assess controllers' ability to talk fluently and comprehensibly about aviation topics to an examiner with no background in the industry, or should the test tasks simulate more closely actual communications between pilots and ATC? From a small-scale study using an English test they have developed for the assessment of aviation personnel, Moder and Halleck present some clear evidence that controllers perform quite differently according to the type of task they are set. The authors argue that both mastery of phraseology in English and the ability to communicate effectively in emergency situations are essential components of a valid Aviation English test.

The other two papers in this issue discuss two specific projects to produce English tests tailored to the ICAO requirements. Ari Huhta reports on his experience as a member of the task force charged with developing a test for the Finnish Civil Aviation Authority (FCAA). There are several features of the Finnish case that are worth noting. The task force involved aviation experts and language educationists working together, as is normally recommended for specific-purpose teaching and testing projects, with some inevit-

able tensions between their respective professional standards. Another feature was that the test development work had to be carried out under great time pressure. This resulted in little time being available for trialling the test materials and setting standards before the test needed to be used operationally. It should also be noted that, although the test was developed under the auspices of the FCAA, the authority has accredited two alternative tests for use in Finland and in principle could approve others as well.

The FCAA test can be described as conventional in its design, representing standard practice in the assessment of reading, listening and speaking proficiency for specific purposes. It includes a face-to-face speaking test, which means that training of examiners and ongoing standardization of their ratings are necessary to maintain the validity of the assessment, especially in the absence of routine double-rating of each candidate's performance. Like Moder and Halleck, the FCAA decided that knowledge of phraseology in English should be explicitly assessed as part of the test battery, although in this case for practical reasons it is conducted by means of a written test. The need to assess the candidate's ability to handle unexpected situations is catered for by one of the picture-based speaking tasks and also by an instruction to the examiners to make a sudden switch of topic in the interview phase of the test.

By contrast with the FCAA test, the instrument described by Alistair Van Moere, Masanori Suzuki, Ryan Downey and Jian Cheng is more innovative in its design and administration. The Versant Aviation English Test (VAET) is based on sophisticated technology for the automated delivery and rating of spoken language assessments originally developed by a specialized California-based company Ordinate (now part of the Pearson education and media group). The VAET is a semi-direct test, with candidates respond to pre-recorded prompts presented to them by phone or computer, rather than interacting live with a human interlocutor. On the face of it, this represents a challenge to the validity of a test that is supposed to assess Interactions as one of the six rating criteria prescribed by ICAO. In other testing contexts, test-takers are reported to have mixed views on the acceptability of the semi-direct approach to assessing their speaking skills, as Van Moere and his colleagues acknowledge. However, the authors argue that key elements of the ability to engage in radiotelephony interaction can indeed be assessed through the VAET and that the semi-direct test has definite advantages over a human-administered interview in terms of consistency of measurement. Similarly, they make the case that the VAET's automated scoring system can distinguish the six analytic criteria in the ICAO proficiency scale more objectively than human raters are able to and it achieves levels of reliability that are very comparable with those of human ratings.

The VAET represents one model of state-of-the-art language testing, which undoubtedly points the way to a time when automated assessments will be more widely and routinely used for a variety of testing purposes. However, there will still be a place for the foreseeable future for the more conventional approach typified by the Finnish test. In any event, the whole topic of oral communication in an aviation context is likely to engage the attention of language testers and other applied linguists for some time to come.

APPENDIX

ICAO RATING SCALE FOR OPERATIONAL LEVEL 4

A speaker will be rated at Operational Level 4 if the following criteria are met:

PRONUNCIATION:

> (Assumes a dialect and/or accent intelligible to the aeronautical community.)

> Pronunciation, stress, rhythm, and intonation are influenced by the first language or regional variation but only sometimes interfere with ease of understanding.

STRUCTURE:

> (Relevant grammatical structures and sentence patterns are determined by language functions appropriate to the task.)

> Basic grammatical structures and sentence patterns are used creatively and are usually well controlled. Errors may occur, particularly in unusual or unexpected circumstances, but rarely interfere with meaning.

VOCABULARY:

> Vocabulary range and accuracy are usually sufficient to communicate effectively on common, concrete, and work-related topics. Can often paraphrase successfully when lacking vocabulary in unusual or unexpected circumstances.

FLUENCY:

> Produces stretches of language at an appropriate tempo. There may be occasional loss of fluency on transition from rehearsed or formulaic speech to spontaneous interaction, but this does not prevent effective communication. Can make limited use of discourse markers or connectors. Fillers are not distracting.

COMPREHENSION:

> Comprehension is mostly accurate on common, concrete, and work-related topics when the accent or variety used is sufficiently intelligible for an international community of users. When the speaker is confronted with a linguistic or situational complication or an unexpected turn of events, comprehension may be slower or require clarification strategies.

INTERACTIONS:

> Responses are usually immediate, appropriate, and informative. Initiates and maintains exchanges even when dealing with an unexpected turn of events. Deals adequately with apparent misunderstandings by checking, confirming, or clarifying.

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