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Compiling Lexical Information for an Aviation English Dictionary

1.   English language proficiency requirements

The communicative needs of aviation English users are probably more strictly defined than user needs in any other domain of English for Specific Purposes (ESP) today. We can hardly imagine any other professional environment in which language plays such a crucial role in ensuring regular and safe day-to-day business. Although English is not officially prescribed as the only language used in the international aviation community, it formally assumed that role five years ago with the introduction of the ICAO (International Civil Aviation Organization) English language proficiency requirements (LPRs), which have not only set higher standards in the field of aviation English but also triggered numerous initiatives for the analysis of user needs and application of new teaching methods and instruments tailored to meet the required level of English and associated language competences.

The language proficiency requirements were the result of extensive research following a number of aircraft accidents where the use of two languages in the same aviation environment or an inadequate level of English led to miscommunication and eventually to the accidents themselves. In 2003 the ICAO issued the English Language Proficiency Requirements – a set of standards and recommended practices governing the use of language – and thus established a minimum proficiency level requirement for everyone involved in international radiotelephony communication (ICAO 2004: ix), i.e. primarily for pilots and air traffic controllers involved in international airspace. As guidance material in reaching the set language standards, the *Manual on the Implementation of ICAO Language Proficiency Requirements* was issued in 2004. In order to be effectively tested, the required language proficiency was delineated in the ICAO Rating Scale (ICAO 2004: A-8), which consists of six levels ranging from Pre-elementary to Expert Level, with the Operational level – Level 4 – being the one all pilots and air traffic controllers must pass in order to keep their licences.

2.   The lexical component of aviation English

Defining the lexical component of aviation English is, however, a challenging task not only because of all the different areas of expertise the field of aviation encompasses, but also because aviation English is not merely a specialized subset of the English language used in an aviation context. It includes both ESP and general English, as well as a standardized set of prescribed phrases and expressions used in all routine aircraft procedures, i.e. radiotelephony phraseology. However, the sub-domains of aviation English are neither all of the same scope nor of the same relevance for effective communication.

The Manual on the Implementation of ICAO Language Proficiency Requirements briefly describes the required vocabulary skills as aiming at an ability to "communicate effectively on common, concrete and work related topics" (ICAO 2004: A-2). In order to assist training organizations in developing an appropriate English language training curriculum for pilots and air traffic controllers, the Manual lists communicative language functions, events and related work do-

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mains, priority lexical domains and language tasks that would suit the communicative needs of pilots and controllers, as well as a list of frequent English four-word clusters applied to aviation communications.

Even if we have a good idea of what the lexical component of the ESP variety in question should minimally include, the ICAO Manual list of the priority lexical domains combines – in a pretty indiscriminate manner – various kinds of lexical and grammatical information (e.g. abbreviations and acronyms, as well as lexical domains such as *animals* and *birds*, *behaviour* and *activities*, *geography*, *modality*, *numbers*, *perception*, *rules*, *protocol*, or *weather* and *natural disasters*), and points up the need for a much more extensive vocabulary organized more systematically. Namely, the internal structure of particular domains or semantic-pragmatic relations between their members is not transparent (e.g. *behaviour* and *activities*, *perception* etc); some are conceived as language functions (e.g. *rules*), while others, like *modality,* clearly require various forms of grammatical expression.

Below is a list of priority lexical domains of general English for air traffic control, as they are listed in the Manual. These domains are broadly relevant to air traffic controller and pilot communications, and should involve work related topics.

• Abbreviations, acronyms
• Animals, birds
• Aviation, flight
• Behaviour, activities
• Cargo, merchandise, packaging, materials
• Causes, conditions
• Geography, topographical features, nationalities
• Health, medicine
• Language, spoken communications
• Modality (obligation, probability, possibility)
• Numbers
• Perception, senses
• Problems, errors, accidents, malfunctions
• Rules, enforcement, infringement, protocol
• Space, movement, position, distance, dimension
• Technology
• Time, duration, schedules
• Transport, travel, vehicles
• Weather, climate, natural disasters

Table 1. Priority lexical domains

How can an aviation English teacher or a materials developer determine possible vocabulary units for the lexical domain of animals and decide whether they are all relevant for the pilot's work environment? Should all pilots know the word for a snail or a pelican? Establishing what animals have their natural habitats in the area where you or your students fly is not the easiest or most reliable way to find out what vocabulary is (ir)relevant for one's job.

3.   *Aviation English terms and collocations* – **project description**

Experience tells us that a lack of specialized dictionaries and of standardized terminology contribute to the ambiguity and misunderstanding in everyday use. In an attempt to make explicit the lexical component of aviation English required by pilots studying for their airline transport pilot license (ATPL), a list of aviation terms and lexical collocations was compiled based on a targeted pedagogical corpus. Our goal was to show how the broader aviation context could be translated into a vocabulary list that would adequately meet pilots' and air traffic controllers' professional

and communication needs and contribute to the compilation of a truly pedagogical specialized dictionary (see Tarp 2005). During the vocabulary analysis, it became evident that, apart from 'proper' terms (either single- or multiword lexical units), collocations were the language units that carried the most relevant semantic information. We therefore decided to compile a list of word combinations that can be considered obligatory in at least a passive vocabulary stock for pilots and controllers.

3.1. The corpus

The corpus in question can be considered a medium range specialized pedagogical corpus. It encompasses pedagogical and other materials compiled according to Joint Aviation Authorities (JAA) requirements for pilots as well as some Air Traffic Control specific material. Since the whole project started off as an exercise in aviation English terminography with students of aeronautics, a certain amount of vocabulary was extracted manually, and for the rest the Wordsmith tool was applied. The corpus was chosen in such a way as not to breach copyright limitations in those cases where permission to reproduce was not granted.

3.2. A broad definition of collocation

The definition of collocations established as the basis for selection in the process of compiling our 'alphabetical checklist' of *Aviation English Terms and Collocations* should be made more explicit at this point. For general purposes the definition of a collocation may be very liberal, and any recurring word cluster may tend to be labeled as a collocation. Since collocations demonstrate varying degrees of cohesiveness and require a certain degree of grading, in the more recent literature various – sometimes even conflicting – views can be found. Thus Marie-Claude L'Homme in her paper on specialized lexical combinations draws a distinction between general language collocations and specialized lexical combinations and states that specialized lexical combinations are not prototypical collocations because "many lexemes defined as co-occurrents can combine with groups of semantically-related terms" (L'Homme 2000: 2). She gives an example from aeronautics, where in French *piloter* can combine both with *aéronef* and with *avion* and *hydravion*.

As opposed to this view, Dirk Siepmann introduces a more liberal definition of a collocation. He considers "any holistic lexical, lexico-grammatical or semantic unit normally composed of two or more words which exhibits minimal recurrence within a particular discourse community" (Siepmann 2005a: 438) to be a collocation. Although he mainly gives examples of general language collocations, the corpora he based his research on also include a corpus of the language of motoring, so we find such a broad classification of collocations to be applicable to LSP as well. We also find Siepmann's view closer to our own because the distinction between collocations and lexical combinations that L'Homme suggests does not seem to be relevant in the research described. In our opinion, the definition of collocation in LSP must be broader than in general language, because usage, and high frequency of occurrence in our corpus, have shown that certain three or four-word collocations cannot simply be reduced to two-word collocations. E.g. *high-intensity runway lights*, *holding pattern airspeed* and *single pilot aeroplane* are always learned and reproduced as wholes, and one cannot leave out any constituent of the collocation without changing the notion of the concepts they represent.

4. Types of collocations in *Aviation English Terms and Collocations*

Aviation English Terms and Collocations include:

1) two-word collocations (usually combinations of nouns and adjectives or nouns and nouns, but also of verbs and nouns, and adverbs with adjectives): *calibrated airspeed*, *airspeed limit*, *aerobatic flight*, *flight deck*, *enter the runway*, *vacate the runway*, *push back*, *dynamically stable*, *best endurance*, etc.

2) multiword collocations (three and four-word combinations): *flight crew member*, *private pilot licence*, *maximum climb angle speed*, *expedite vacating the runway*, *best rate of climb*, etc.

3) collocations with abbreviations and acronyms: *ATC clearance*, *ATC radar*, *military ATC facility*, *IFR weather conditions*, *special VFR flight*, *VOR/DME area navigation*, *international NOTAM office*, etc.

When compared to some of the well-known aviation English dictionaries, the number of collocations extracted in this manner far exceeds the number of collocations or two-word lexical combinations presented in these dictionaries and compiled by traditional lexicographic methods. This can be illustrated by the examples listed in the table below:

AE Terms and Collocations (Bratanić et al. 2009)	The Cambridge Aerospace Dictionary (Gunston 2004)	Dictionary of Aviation (Crocker 2007)	English-Croatian Aviation Dictionary (Eleršek 2008)

airline *n*
    airline crew
    airline deregulation act
    airline operations centre [AOC[1]]
    airline operator
    airline passenger
    airline pilot
    airline radio operator
    airline transport pilot licence [ATPL]
    commercial airline
    hub-and-spoke airline system
	airline	airline
		 airline representative
		 airline security area
		 Airline Transport Pilot's Licence
			airline
			 airline cargo
			 airline charter
			 airline commuter
			 airline domestic
			 airline feeder
			 airline international
			 airline scheduled
			 airline transport pilot

airspace *n*
    advisory airspace [ADA]
    airspace boundary
    airspace capacity
    airspace chart
    airspace class
    airspace classification
    airspace congestion
    airspace design
    airspace reservation
    airspace restriction
    air traffic services airspace
    approach control airspace
    ATS airspace
    block of airspace
    classification of airspace
    controlled airspace [CAS[2]]
    (…) 37
	airspace
	 airspace denial
		airspace	airspace
			 airspace classification
			 airspace control area
			 airspace restrictions
			 airspace vertical division
			 airspace warning area
			 advisory controlled airspace

runway *n*
    active runway
    available runway length
    downhill runway slope
    grass runway
    inactive runway
    intersecting runway
    landing runway
    paved runway
    precision approach runway
    runway category
    runway centre line
    runway code
    runway direction
    runway end lights
    runway in use
    runway layout
    runway marking
    runway touchdown zone
    runway visual range [RVR]
    unpaved runway
    (…) 111
	runway
	 runway alignment
	 runway alert system
	 runway alignment factor
	 runway alignment indicator
	 runway basic length
	 runway capacity
	 runway condition
	 runway controller
	 runway designator
	 runway direction numbers
	 runway-edge lights
	 runway end
	 runway-end lights, REIL
	 runway-end safety area
	
	 (…) 29
		active runway
		 alignment with the runway
		 clear runway
		 a level runway
		 runway
		 runway visual range
		 runway in use
			runway
			 runway alignment indicator
			 runway arresting gear
			 runway basic length
			 runway centerline
			 runway centreline lighting
			 runway centreline lights
			 runway condition reading
			 runway control van
			 runway controller
			 runway designation marking
			 runway edge lights
			 runway end identifier lights
			 runway end light
			
			 (…) 52

Table 2. Comparison with other dictionaries – extent of the vocabulary

One of the frequent questions arising in the lexicographic presentation of collocations is related to the choice of headwords. In LSP, concepts are often represented by a term comprising more than one lexical unit (Thomas 1993), so the question of which element of the collocation should be considered the base and selected as the headword of the dictionary entry, is obviously very important. A strictly formal approach will not always do the job, especially from the user's point of view. If we look at the collocation *anti-icing equipment*, it is hard to decide which constituent is semantically stronger – is this the equipment used for anti-icing, or is it the act of anti-icing for what we use some kind of equipment more relevant? The same type of problem can be seen in the collocations *anti-icing measure*, *approach area* or *danger area*. The problem was solved by listing all collocations under all constitutive elements, which was later found to be supported by Siepmann, who states that "For ease of use and memorisation, it may in any case be preferable to give the entire set of collocations for each concept or lexeme at the entry for that concept or lexeme" (Siepmann 2005b: 24). Since abbreviations are very common in aviation, it is not uncommon that they become lexicalized into words and used as such. Although a few English dictionaries of aviation also list some of the most important aviation collocations with abbreviations, this research has encompassed these combinations in a much larger scope.

AE Terms and Collocations (Bratanić et al. 2009)	Jane's Aerospace Dictionary (Gunston 1988)	Dictionary of Aviation (Crocker 2007)
ATC *abbr* air traffic control	ATC clearance	
ATC clearance		
ATC instruction		
ATC radar		
military ATC facility		
student ATC licence		
ILS *abbr* instrument landing system		
ILS approach	ILS integrity	ILS glideslope
ILS DME	ILS point (A, B, C, D)	ILS locator beacon
ILS glide path	ILS reference datum	ILS marker beacon (*as a part of a definition*)
ILS glide slope	ILS reliability	
ILS indicator		
IFR *abbr* instrument flight rules		
IFR aircraft		
IFR approach procedure		
IFR clearance		
IFR communication		
IFR departure clearance		
IFR flight		
IFR flight plan		
IFR weather conditions		

Table 3. Comparison with other dictionaries – collocations with abbreviations

5. Conclusion

The motivation for compiling *Aviation English Terms and Collocations* was primarily the analysis of the needs of users – student pilots and professional pilots alike – preparing to meet the requirements for fluent and unambiguous use of English in daily professional communication. The underlying assumption in our approach towards the compilation of an exhaustive but firmly substantiated list of lexical combinations – either fully terminologized or simply more or less typical aviation English expressions – was that these specialized lexical combinations (be they free lexical co-occurences or more restricted and thus, according to many authors, more collocation-like lexi-

cal patterns) represent the LSP vocabulary expected to be mastered by members of the aviation community but much less commonly described in aviation English dictionaries and glossaries.

What makes this enterprise unique is that the compilers of the list – or, rather, a type of LSP dictionary of terms and collocations – were also student pilots and student air traffic controllers themselves. The intention was to address two main requirements: to include all the most frequent or relevant (not always overlapping) vocabulary that future licensed pilots and controllers should be familiar with, and to present the vocabulary in the most user-friendly manner.

Taking into consideration that student pilots are not trained to use dictionaries but do know a lot about the subject matter, a wordlist of this kind, organized around more central concepts/terms, also has a pedagogical dimension. The users can easily find the term they need and see how it creates lexical and grammatical links with other terms in its semantic field. Thus they can learn that *light* is usually preceded (predetermined) by lexemes such as: *approach*, *cabin*, *centre line*, *landing*, *caution*, *threshold*, *warning*, etc. but that it can also act as a predeterminer itself in collocations such as *approach light system*, *approach light beacon*, *approach light facilities* etc.

The list of aviation English terms and collocations compiled in this way is, in our opinion, of great potential benefit in the making of fully corpus-based bilingual aviation dictionaries since it can serve as a left side for any dictionary with English as a source language. Due to the fact that the lexical information is taken from the obligatory materials student pilots use during their course of study, it guarantees a coverage of the relevant aviation-related vocabulary that by far exceeds the traditional terminological approach and is presented in an easily accessible form.

Finally, we believe that the project in question successfully illustrates the communicative model of lexicography as described by Yong/Peng (2007), as it can be said to genuinely "generate the possibility of observing the dictionary as an entire entity from three different but interdependent standpoints, i.e. from the position of *compiler*, from the position of *user*, and from the position of *context*" (2007: 9).

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