"How about getting those guys in the tower to speak English?" Miscommunication, ELF and Aviation Safety

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Abstract

This study describes the organisation of air traffic control (ATC) communication through qualitative conversational analysis of 17 exchanges between air traffic controllers in English as a Lingua Franca. Since ATC communication is both a public safety issue (Arminen *et al.* 2010) and an ELF issue (Kim and Elder 2009), the aim of the study is to explore how air traffic controllers negotiate their understanding of operations with other controllers. The results show evidence of atypicality from a procedural perspective which may contribute to potential miscommunication. The conclusion assesses how an ELF approach can contribute to possible improvements in training procedures.

Keywords: ELF; ATC; airspeak; miscommunication.

1. The nature of ATC communication

Aviation English is a public safety issue. Lack of linguistic competence by aviation personnel with different linguistic backgrounds has been shown to be a factor of miscommunication contributing to three accidents in which a total of 1006 people were killed (Ripley and Finch 2004) and to numerous other aviation incidents (see Jones, 2003: 237ff, for a full list, and Breul 2013:72-3).

This study addresses the problem of miscommunication *between air traffic controllers* (ATCs). Early research into aviation discourse (Predmore 1991; Helmreich 1994) looked at communication *between flight crew* by classifying particular actions in the cockpit (e.g. flight planning, checking procedures) and then coding the functions of specific speech acts (e.g. questioning, ordering) during these actions. Talk involving ATCs has only been studied more recently, concentrating initially on communication *between pilots and air traffic controllers* (see for example Nevile 2002, 2004). However,

Arminen, Arvinen and Palukka (2010) have recently focussed on interaction *between controllers* looking at how they use repair as an interactional resource for dealing with emerging operational traffic problems. Their argument is that "the aviation industry – air traffic control and aircraft carrier flight operations – involves organised ways of coordinating technically assisted teamwork that counteracts potentially hazardous errors and safety gaps" (p.444). ATC communication between controllers is thus very much a problem-solving operation in which, as Arminen et al show, controllers seek to establish reciprocity of perspectives, checking each other's states of knowledge about the information to which they may have access.

ATC communication, then, involves coordinating talk and actions within a complex and interlinked multimodal system. Air traffic controllers work in an ATC Centre that is responsible for a particular area of air space. They pick up aircraft as they move into the Centre's air space and track them as they move into another airspace or guide them towards landing in their own. In doing this, they move aircraft to different altitudes making sure that they are clearly separated. This maintenance of an orderly flow of air traffic is carried out through verbal interaction and coordination of incoming information. When necessary, interaction makes use of corrective practices designed to address the potential dangers emerging from the operations that are being carried out. Key to ATC communication success is for controllers to be able to maintain a shared orientation regarding the operations that aircraft need to carry out. This orientation is negotiated in English as a Lingua Franca[1], using information available on radar screens, shared background knowledge and previous experience, acquired by training and the use of standard protocols[2].

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[1] ATC communications are under the control of the International Civil Aviation Organisation (ICAO). According to ICAO regulations, controllers may only use the native language of controllers working in a particular country for internal flights within that country. English is used in all other circumstances, i.e. for communication with international flights or between controllers working in different countries.

[2] See Alderson (2009: 172ff.) for details of proficiency standards and testing procedures. The "annotated references" provide particularly useful pointers to the ICAO documentation outlining proficiency requirements and testing implementation.

Two points need to be stressed here. The first is that the important role played by the operational environment of ATC should be included in the analysis and description of the English being used. Some researchers claim that "aviation discourse" is not natural English. Breul (2013), for example, argues that the specialised language used by flight crews, colloquially known as "Airspeak", is a "semi-artificial sub-language" (p.74), and lists the ways in which the lexical, phonological and syntactical features and procedures of Airspeak deviate from standard English. However, by separating the linguistic features of Airspeak from their professional context, Breul ignores the analytical imperative of examining them in their interactional environment. It is argued here that ATC discourse needs to be treated as naturally-occurring, workplace talk rather than as a hybrid of "standard English plus Airspeak" and to be analysed using the appropriate methods of applied conversation analysis (CA) (Richards and Seedhouse 2005).

A second, related question is that of native and non-nativeness in aviation discourse. Although Alderson (2009) claims that "numerous aviation incidents and accidents have involved miscommunication between pilots and air traffic controllers, *many of whom are not native speakers of the language*" (p.168, my emphasis), the rest of his wide-ranging survey highlights the fact that non-nativeness *is not in itself a factor which predisposes to miscommunication*[3]. The same, highly significant point is made anecdotally by an RP-speaking Pakistani pilot, quoted in Helmreich and Merritt (1998: 204), who, on finding the pronunciation of American ATCs hard to understand suggested "how about getting those guys in the tower to speak English?". A similar critique of English NSs from an ELF perspective, particularly their perceived reluctance to use standard phraseology, is set out in Kim and Elder (2009).

Misunderstanding and miscommunication in ATC, then, are more about communicative clarity/competence in the workplace, . more a complex matter of language, culture and professional practices, than about nativeness. Since ATC talk is conducted almost entirely

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[3] Alderson cites an incident in which, despite the "incomprehensibility" of a Chinese pilot's English, an American air traffic controller's "lack of sensitivity to the Chinese pilots' problems reveals a degree of communicative incompetence" (Alderson 2009:170).

in English as a Lingua Franca and since much ELF research has dealt with ELF speakers' negotiation of reciprocal understanding, an ELF-oriented analysis of ATC talk is likely to offer insight into the way ATC controllers achieve successful communication. As Kim and Elder (2009: 23.14) observe, "it may be more helpful to think of aviation English as a lingua franca than as a restricted specific purpose code".

In line with the above CA/ELF orientation, the aim of this study is to explore the architecture and organisation of ATC communication using qualitative CA to describe how ATCs use the linguistic resources at their disposal to carry out their operations. The analysis will pay particular attention to atypical features of the negotiation of the call and assess how insights from ELF research can shed light on the deployment of these features. The corpus of data on which the description and analysis are based is a set of 17 conversations between AT controllers working at an Italian airport and controllers working in other Mediterranean airports[4]. All conversations were conducted in English and all speakers were English NNS.

2. The interactional architecture of ATC talk

Most ATC talk between centres involves the transmission of information about flight paths. Since much of this information has now been automatised, not every movement of a flight from one airspace to another requires verbal contact between operators. Calls between ATC centres take place only in particular circumstances, usually involving requests for authorisation and exchanges of information regarding plane altitude. This means that an operator who receives a call knows that there is a limited set of operations that the caller will be referring to and that the call is likely to unfold in a predetermined sequence.

Thirteen of the seventeen calls involved *permission requests*. These calls exhibited a three part structure common to many service

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[4] The corpus of calls is transcribed and described in detail in an unpublished degree thesis by Daniela Amatulli. I am grateful to the Italian authorities for granting permission to use the recordings for research purposes. Recordings are entirely anonymous and all references to flight numbers have been removed.

telephone calls involving an *opening sequence*, in which speakers greet and confirm identities, followed by a *reason-for-call* sequence, in which the operation to be carried out is negotiated between the callers, followed by a *closing sequence*. The analysis will concentrate on the *reason-for-call* sequence, which is where operational problems tend to arise.

Opening sequences resemble other kinds of service telephone call in as much as they squeeze a considerable number of functions into a very small number of turns. The following is a typical example:

call 1	R = receiver; C = caller	
1)	*flash*	summons
2)	R: hallo	open channel + greeting
3)	C: hallo,	open channel + greeting
	approval request xxx	request type + flight no.
	to xxx, level three zero	instruction

After the summons (the flash on the screen in turn 1), the receiver's initial *hallo* in turn 2 acts as both a greeting and as a signal to C that the channel of communication is open. Turn 3 supplies the reason-for-call. This sequence is usually organised through a *standard topicalisation procedure*: the type of request is specified first ("approval request") and this is followed by a statement of the request, giving the flight number and the level for which approval is being requested. The use of a formula such as "approval request" in first position establishes immediately a) that this is a request and b) the type of request.

As callers move into the *reason-for-call*, sequencing becomes less predictable since the number of ways in which a call can progress depends on the nature of the request and the state of knowledge of the receiver. The analysis below will concentrate on calls which indicate procedural or linguistic atypicality.

2.1. Procedural atypicality

This section will illustrate parts of calls in which standard procedures seem not to have been followed, as in the following example:

call 2   R = receiver; C = caller
1)   *flash*
2)   C: hallo, Roma speaking. **Abesi estimate**
3)   R: yes?
4)   C: xxx123 ((background noise)) (1.0)
5)   R: eh going to Xxxx?
6)   C: that is correct

The term *estimate* refers to a message with flight data and a predicted time at which a plane will be flying over a specific point. Standard phraseology would require the controller to state the request first ("estimate") followed by the flyover point ("over Abesi"). In this case, however, the controller has stated the flyover point in first position and the request-type at the end omitting the word *over*. This *inversion of the standard request formula* is fully understood by R and the operation is completed successfully. It should be noted that the inversion makes the permission request even more economical than it already is in the standard procedure.

In this second example *a standard request formula is replaced* by an informal one:

call 3   R = receiver; C = caller
4)   C: yes please reference the xxx123
5)   R: yes
6)   C: **will be three six zero over Osmar, ok**?

The operation being carried out in call 2 is identical to call 1 - the caller is asking for approval of a flight level. In this case, however, C does not use the standard formula "request approval" and simply says *please reference*. There is thus no immediate indication that he is asking for approval of a flight. The only indication that we have that a request is being made is the use of *ok?* in end position. The framing of the request is thus highly atypical.

C's specification of the flight level is also atypical. R's *yes* in turn 5, acknowledging that R is paying attention to the flight, leads C to proceed to give the flight level and request approval. The standard formula for this kind of operation would be "request approval over Osmar". Instead, C omits the topicalisation formula "flight level" and merely gives the numbers *three six zero*. Presumably in this case

C is relying on the receiver to infer from the numbers that he is referring to a flight level. Within the same call, then, the caller has omitted to specify two types of request and relies on the receiver to infer them from the rest of the information that he is being given.

An example of *omission of the topicalisation procedure* is shown in this simple request for a flight to proceed to a destination:

call 4   R = receiver; C = caller
3)   C: [yeah] **the xxx123 direct to Papa November
             Zulu**, (0.5)
4)   R: ok, <Ponza>

The caller is asking permission for a flight to proceed to Ponza. The standard phraseology that would be required for this kind of request would be "request xxx123 to proceed direct to Papa November Zulu". In turn 3, however, C omits the standard topicalization form "request" as well as the verb "to proceed". R's reply (*ok*) in turn 4 shows that the request has been understood.

As well as omission of a standard procedure, R also *substitutes a standard procedure with a non-standard one*. After hearing a request of this kind, receivers are usually required to do a readback of the request and repeat the phrase "Papa November Zulu" to indicate to the caller that it has been understood correctly. Instead R opts for a further non-standard strategy and translates the destination directly (*Ponza*). This non-standard (translation) format is accepted by C, suggesting that in this context it fulfils the same function as readback,[5] i.e. "letting the caller know that you have understood the destination".

An example of *omission of readback* is shown in call 5:

call 5   R = receiver; C = caller
11)   R: do you want him level three:(0.8) >stand
             by< **three <nine> zero** is better
12)   C: is ok? ok [ciao]
13)   R: **[>three] nine zero<** ciao ciao

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[5] Readback is the procedural requirement of a caller to repeat the details of operations that have been requested back to the receiver. It is complemented by "hearback" which enables the receiver to acknowledge or correct the information that has been transmitted in readback.

In this call, C and R are negotiating the level of a flight. In turn 11, R asks which level R would prefer and then signals to C that she is taking a pause, using the standard terminology *stand by*. R then suggests that level 390, a non-standard level, would be better. At this point, since a non-standard level is involved, ATC procedure dictates that C should carry out a readback such as "three nine zero approved". Instead, C offers a more generic approval (*is ok? ok*), followed by closure (*ciao*). However, R does not immediately close at turn 13. Instead she quickly repeats the numbers *three nine zero* in partial overlap. The fact that R does the readback herself, in self-repetition, suggests that she has interpreted the lack of the expected repetition/readback from C as significant and has supplied it herself, as if she is confirming approval on R's behalf.

2.2. Linguistic atypicality

This section will concentrate on examples of linguistic atypicality. Linguistic atypicality means a use of language which deviates from IPAO linguistic guidelines for specific operations or language which deviates from the linguistic norm used by operators in the corpus:

call 6   R = receiver; C = caller
1)   C: yeah and then I need the yyy456 but
          it's actually the lower Kilo sector in
          case I have to coordinate with the Delta
          sector
2)   R: **what's** (eh) **to do,°say again°**
3)   C: eeh yes ehm xxx123 destination xxxx,
          I have climb flight level three four
          zero, do you accept?

This call is a conversation between controllers in which C is changing the level of a flight[6] and is asking R if the operation is acceptable.

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[6] The altitudes which aircraft have to maintain between national airspaces are fixed by bilateral agreements. In this operation C is asking for a higher altitude than normal for a flight but R does not have the flight plan information available. The negotiation involves supplying the correct information needed to approve the request.

In turn 1, C makes a request (*I need the ….).* In turn 2 R asks C
to repeat his turn 5 request. In doing this, R mixes a non-standard
informal register *what's to do* with a standard professional formula
used to ask someone to repeat - *say again.*

Another interesting deviation from the textbook norm shown
in this call is the *use of atypical grammatical forms*, i.e. forms which
are not typically used by the ELF speakers in this corpus. In order
to describe the operation, C gives the flight number and destination
and uses the expression *I have climb.* The phrase *I have climb* could
be interpreted by the non-expert as "I have (on my screen) a flight
which is climbing to level …" with "have" as the main verb and
"climb" functioning as a noun referring to a climbing flight. In
fact the expert interpretation of the expression would be "<u>I have
asked the flight</u> to climb to level x and it is still at that level". C
has thus abbreviated the more orthodox "I have asked x to climb"
formula to *I have climb*, suggesting that *climb* is a shortened form
of the past participle *climbed.* The point of interest here is not the
omission of the standard –ed form of the past participle but the
creativity of the grammaticalisation process that is being used. This
kind of "transitivisation", (e.g. "I have *climbed the flight* to ….") is
anecdotally confirmed as commonplace in ATC communication[7].
The call continues as follows:

4)   R: eh where is it now?
5)   C: mh?
6)   R: eh where is it now, I don't have anything
         about the [( )]
7)   C: [yeah] I know
8)   R: ok, [xxx?]
9)   C: [xxx]123,squawk 1234: <just:> before
         Nosta now (2.0)
10)   R: (.) 1234, it's climbing at flight level
         three four zero?

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[7] I am grateful to Daniela Amatulli for pointing this out. The comprehensibility
of this creative form of grammaticalisation in ELF is helped by the fact that C is
NS French and R is NS Italian. In French and Italian the transitivisation of the
intransitive verb (*to climb the plane* = far salire l'aereo) would not be standard and
this may be why it is easy for the speakers to give it the unorthodox interpretation.

11)   C: yeah, destination is <xx[xxx>]
12)   R: [xxx]ok [four]zero
13)   C: [it's ok?]
14)   R: ok.

In turn 4, R asks for the flight's position and repeats the request
in turn 6, explaining that he does not have the information on the
screen. In turn 9, C supplies the flight information and position.
In turn 10 R confirms receipt of the information and requests
confirmation of the altitude. In turn 11, C confirms the altitude and
adds the destination and in turn 12, R approves the request. Overall,
this sequence shows very clearly how each controller orients towards
the other's state of knowledge during the reason-for-call and uses
extremely economical multifunctional turns at talk to confirm
existing information and request further information.

   One of the factors guaranteeing economy in ATC exchange is
ellipsis of grammatical forms not regarded as necessary for achieving
transactional goals. Call 9 below provides a number of examples:

call 7   R = receiver; C = caller
7.   C: eh <yyy456> **as you no have it yet,** he'll
         exit over Ginox, I have to call the Delta
         sector, confirm? **or is always you**?
8.   R: (2.5) yes.

The first use of non standard forms occurs in turn 6 with R's
what's (eh) to do. Here R's hesitation (*eh*) indicates a difficulty in
complying with the request. While reformulating the request in
turn 7, C confirms that he has understood that R does not have
the required information (*as you no have it yet*), replacing the more
frequently used "do not" with *no* and informs R that the flight will
exit over Ginox. R uses another non-standard abbreviation in the
second half of turn 7, which is a request to R to confirm whether
Delta or R is in charge of the Ginox area; more specifically, C wants
to know whether he has to call the Delta sector (*I have to call the
Delta sector, confirm?*) or whether he has to continue talking to R (*or
is always you?*). Here the expression *is always you* is a non-standard
abbreviation of a more extended request "are you the person I have
to contact?" following the Italian syntactic form ("sei sempre tu?").

Finally, there is evidence in one of the calls of a miscommunication which is not resolved by either the caller or the receiver. This was not expected, given that ATC control communication requires operators to clarify immediately any doubts or potential ambiguities regarding a particular operation.

call 8   R = receiver; C = caller
12.   C: it is **state flight**, obviously. an U2
13.   R: ok eh and then he is eh well- he is eh on **civil flight**?
14.   C: **yeah he is**:: he is eeh make ehh >**state flight yeah**< and at the moment he is going direct to Ajaccio at flight level six zero zero

In this call the controllers are discussing the flight path of a U2 military flight[8] – an unusual occurrence in ATC transaction. However, in turn 12 (*it is **state flight**, obviously. an U2*), C does not use the standard terminology "military traffic not operative" to refer to military aircraft, but instead uses the expression *state flight*, thus failing to specify whether this is an operative military flight or part of General Air Traffic (GAT)[9]. Even though this is clearly a military flight, C's lack of specification causes R to make a further enquiry in turn 13 about the status of the flight, asking if it is a *civil flight*. However, R's expression *civil flight* is not part of standard phraseology and C in turn 14 wrongly interprets it as referring to GAT traffic - *yeah he is* - but then corrects himself later with *state flight yeah*. R is therefore still left with the same misconception as before, i.e. that this is a GAT flight rather than a military one. However, the fact that C continues with his description of the flight path and R does not press to clarify the doubt suggests that it clearly does not need to be clarified for present operational purposes.

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[8] This particular flight is flying in the stratosphere (20,000 m). This altitude is beyond the range of civil radar and the pilot has probably contacted ATC as a courtesy. A military aircraft not carrying out a military operation is part of GAT - see footnote 8.
[9] GAT Traffic refers to civil aircraft engaged in state-sponsored activities such as fire services, first aid, transporting Heads of State and so on.

3. Discussion

The above description sheds some light on the status of ATC communication as a form of talk. In the first place, ATC communication is prototypical ELF discourse because it is most frequently conducted in exchanges involving at least one English NNS. This makes ATC an ideal site for investigating an ELF discourse community.

The description also shows that contextual features are treated by speakers as highly relevant to their understanding of the talk. ATC communication is thus a unique working practice with a particularly high level of context-reliance and in this respect, it seems to have many affinities with Business ELF: "English in today's global business environment is 'just work' and its use is highly contextual" (Kankaanranta and Louhiala-Salminen 2010: 214). Both business ELF and ATC communication are neutral, shared codes which involve problem-solving interaction requiring the appropriate use of linguistic resources to carry out specific operations in specific ways.

A main issue emerging from the data involves atypicality. Although all the calls examined were successfully negotiated, the question of the levels and types of atypicality needs to be viewed within the context of potential miscommunication and air safety. Our data suggest that it is procedural rather than linguistic atypicality which is relevant in this respect. Procedural omissions in calls 1 to 4 required the hearer to carry out extra inferencing in order to interpret a message and call 5 required a caller to supply an extra readback which had been omitted by a receiver. This extra work did not prevent a successful conclusion of the calls, but it may be part of the "sloppiness" concerning the "referent or the sense of the action requested" which Arminen et al identify as contributing to "sequential coordination failure".

How can these atypicality problems be avoided by the "guys in the tower"? The lack of accuracy by NS ATC's in the data of Kim and Elder (2009) is mainly linguistic (e.g. inappropriate word choice), whereas the substitution, inversion or omission by NNS speakers in our data is procedural. The latter may be a consequence of the flexible pragmatics of ELF speakers, who are more oriented to the successful outcome of a call than to its procedural regularity. Perhaps both NS and NNS ATCs need to be directed towards greater procedural accuracy *by being trained out of their natural*

pragmatic predisposition – in the case of the NS, being excessively colloquial; in that of the NNS, being excessively accommodating.

A further question involves misunderstanding, which in ELF discourse is usually corrected by topic change or negotiation using rephrasing and repetition (Seidlhofer 2004: 218). In ATC communication, however, the standard ELF resources for carrying out repair are not available, since speakers have to stay "on topic" and rephrasing and repetition are constrained by time pressure to complete the operation. In the one example of misunderstanding shown in our data (call 8), the fact that neither controller sought to clarify the status of the "state flight" is perhaps evidence of the "let-it-pass" principle (Firth 1996) in action. It is possible that within ATC communication, this particular principle conflicts with the need to carry out immediate repair of what has not been understood.

4. Conclusions and future research

A number of implications and suggestions relating to ELF concerns can be drawn from this study. Alderson (2009) has stressed that in order to analyse incidents in which miscommunication is a contributory factor, there is a need for an oral corpus of ATC data which reflects how operators interact under stressful conditions in real time. This is clearly an ELF research agenda. It needs to be stressed that, since the ATC code is essentially an ELF code, such oral research should not be analysed by judging the ELF talk against NS norms but as a lingua franca. Such future ELF research needs to look carefully at areas of "trouble" in ATC communication using conversation analysis to dissect problems through qualitative analysis of individual calls.

This study has highlighted examples of atypical procedural features of talk between air traffic controllers. The characteristically fluid pragmatics of ELF speakers may contribute to callers' use of atypical procedures. Given the importance of accurate communication for air safety, this is an area where further ELF research is needed.

ELF research in *pronunciation* and *intercultural pragmatics* can also make a significant contribution to an understanding of miscommunication. Aviation research has shown that the problem of understanding different accents of English is a major factor in

miscommunciation, as is misalignment brought about by conflicts between culture-specific communicative strategies (Ragan 2007). ELF research on cross-cultural comprehensibility and pragmatic strategy can contribute a great deal to clarifying these kinds of problem.

With regard to *testing*, one might stress the requirement by Alderson (2009) that "native speakers should not automatically be granted level 6 (maximum proficiency), but be tested in the same way and under the same conditions as non-native speakers" (p. 181). Miscommunication in ATC is not a consequence of nativeness or non-nativeness *per se* but of a lack of linguistic, interactional and operational proficiency while using specific working practices in a pressurised environment.

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