

# The Analysis of the Errors in Standardised Phraseology of Student Pilots and ATC

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## Abstract

The paper deals with the analysis of the pilot and ATC students' errors when learning standard phraseology which reduces the risk that a message will be misunderstood. The first part describes the requirements for knowledge of the phrases and continues with the grammar description of some of problematic ones. The basic part an article focuses on the error analysis in grammar, vocabulary and word order. The final part discusses the importance of the read-back/hear-back process so that any error is quickly detected, and the role of aviation communication in human factors.

**KEY WORDS:** *aviation, communication, errors, students, human factor*

## 1. Introduction

The standard for aeronautical operations was laid down by International Civil Aviation Organization (ICAO) in its 1944 Chicago convention. Most of the standards for communication (equipment, standards and procedures) are laid down in Annex 10 Vol. 2 to the convention. By convention, messages are agreed standardizes phrases, placed into categories.

The use of correct and precise standard phraseology in communication between pilots and ground personnel is vitally important. Incidents and accidents have occurred in which a contributing factor has been the misunderstanding caused by the use of non- standard phraseology. Therefore, we have to ensure that we use the correct technique, phonetic sounds for letters and numbers, format for time, phraseology and call signs.

We have focused on some problems in training of students studying to be pilots and air traffic controllers. The task was to find out and analyze the most frequent errors which make the standardized phraseology unclear, not precise or even change the meaning. It is important to know in English language training to avoid the miscommunication in simulator training and later practical flights [1-5].

## 2. Communication Errors

Communication error is the biggest causal factor in both level busts and runway incursions in Europe. This document aims to provide Commercial Air Transport (CAT) pilots and other pilots flying IFR within controlled airspace with a quick reference guide to commonly used radiotelephony (RTF) phrases that may be encountered during a routine CAT flight in European Airspace. It also explains some of the rationale behind the use of certain words and phrases to aid understanding and reinforce the need for compliance with standard phraseology.

### 2.1. Safety

The aim is to improve safety by raising RTF standards.

The need for clear and unambiguous communication between pilots and Air Traffic Control (ATC) is vital in assisting the safe and expeditious operation of aircraft. It is important, therefore, that due regard is given to the use of standard words and phrases and that all involved ensure that they maintain the highest professional standards when using RTF. This is especially important when operating within busy sectors with congested frequencies where any time wasted with verbosity and non - standard, ambiguous phrases could lead to flight safety incidents.

Phraseology has evolved over time and has been carefully developed to provide maximum clarity and brevity in communications while ensuring that phrases are unambiguous. However, while standard phraseology is available to cover most routine situations, not every conceivable scenario will be catered for and RTF users should be prepared to use plain language when necessary following the principle of keeping phrases clear and concise.

### 2.2. Non – Standard Phraseology

Where non-standard phraseology is introduced after careful consideration to address a particular problem, it can make a positive contribution to flight safety; however, this must be balanced with the possibility of confusion for pilots

or ATCOs not familiar with the phraseology used. This phraseology is not in accordance with ICAO but is based on careful study of the breakdown of pilot/controller communications. Some other European countries have also adopted similar non-standard phraseology.

### 2.3. Phraseology as a Contributing Factor

B737, Gran Canaria Spain, 2016 (On 7 January 2016, a Boeing 737-700 was inadvertently cleared by ATC to take off on a closed runway. The take-off was commenced with a vehicle visible ahead at the runway edge. When ATC realised the situation, a 'stop' instruction was issued and the aircraft did so after travelling approximately 740 metres. Investigation attributed the controller error to "lost situational awareness". It also noted prior pilot and controller awareness that the runway used was closed and that the pilots had, on the basis of the take-off clearance crossed a lit red stop bar to enter the runway without explicit permission.)

## 3. Research and Analysis of Frequent Errors

The research was attended by 18 students studying at the Aeronautical Faculty in the Pilot Study Program and Air Traffic Controller, and during two semesters they were tested and verbally examined during the semester and at the end of the semester. The students completed 42 lessons of standardized aviation phrases, were analysing the pronunciation, grammar, and made short dialogues. Testing was focused on the accuracy of phrases, vocabulary, grammar, word order and writing, which could change the meaning of the phrase. In the analysis, we mainly noted uncertainty about the phrase or certain words and the use of another but not the correct word. The correctness of the word order and the incorrect grammatical form played an important role in the analysis, as they interfered with the meaning of the phrase.

### 3.1. Vocabulary

The first prerequisite for correctness of standardized phraseology is knowledge of vocabulary. Compared to the general English vocabulary, standard verbs, nouns and prepositions that cannot be confused are used in standardized phrases.

Table 1

Words which caused problem to remember

Correct word	confirm	check	disregard	out, over, roger	request	verify	cleared
% of incorrect answers	6%	4%	17%	3%	8%	5%	8%

In the table there are the correct terms instead of which students used the synonyms of these words as e.g. ask instead of request, control instead of check, or the meaning of the words verify and confirm, also out, over, roger, interchange with each other. The most difficult to remember was a word disregard, to which up to 17% did not write correctly (Table 1).

Table 2

Incorrect phrases because of incorrect word

Correct phrase	Problematic word	% of failure
One orbit left	orbit	13%
Resume own navigation	resume	6%
Expedite climb	expedite	12%
Unable to comply	comply	21%
Revert to flight plan call sign	revert	18%
Traffic in sight	in	12%
Caution work in progress	caution	8%
Runway damp	damp	5%
Ruts and ridges	ruts, ridges	10%
Cruise climb between (levels)	cruise	7%
Commence approach	commence	15%
Start up at own discretion	discretion	20%
Request time check	check	3%

The reason for not following the exactness of the phrase is again the use of words that students know from general English knowledge, or complete skipping. In particular, words such as commence, comply, revert, orbit, expedite, and discretion are the most common mistake (Table 2).

### 3.2. Grammar

We cannot deny the importance of the grammatical form of the word in English professional aviation terminology for a correct understanding and safety. Rather than ignorance of grammar, students, especially in oral communication, in speed training and readiness to use phrases, are unaware of the difference of some verbal forms, and they change the word or omit the preposition (Table 3).

Table 3

Incorrect grammar forms of the word

Correct phrase	Incorrect phrase	% of errors
Report starting acceleration	Reporting start acceleration	2%
Expedite climb	Expedite climbing	16%
Resume position reporting	Resume report position	12%
Advise if able to cross	Advise to cross	5%
Revised expected approach	Revised expecting approach	21%
Make short approach	Making short approach	3%
Transmit for identification	Transmit identification	23%

The forms of words with the suffixes -ed and -ing students often confused or add in words where they are not needed. From the point of view of grammar, the simple phrase Transmit for identification requires attention in training due to the use of a preposition for. The student must be aware of the difference between the individual grammar patterns and the mistakes they make in the training to understand the correctness of the used phrase especially in the fast communication. Student pilots and ATC in the simulator and real training should no longer make mistakes of this kind.

### 3.3. Pronunciation

The similarity of the pronunciation of some words causes oral misunderstanding and unnecessary requests to repeat a phrase or explain it. It is a delay that can cause a serious incident in real communication. It is in the training where it is necessary to pay attention to the accuracy of pronunciation and to prevent any mispronunciation, miscommunication in the future (Table 4).

Table 4

Mispronounced words

Correct word	Pronounced like...	% of errors
beacon	bacon	5%
bearing	boring	3%
heading	heating	17%
lighting	lightning	12%

The similarity of pronunciation of words like lightning, heading and heating, and the difference in importance, students have to train through frequent repetitions and training. These pronunciation errors are often repeated in the oral examination.

### 3.4. Word Order

Errors in words appear mainly in longer phrases. Often they do not make a fundamental change of meaning, but they disrupt the accuracy of the standardized phrases, and in some cases they can also cause a change of meaning and misunderstanding.

Table 5

Incorrect word order of the phrase

Correct word order	Incorrect word order	% of errors
Traffic right 2 o'clock same level converging	Traffic right 2 o'clock converging same level	6%
Frequency change approved	Approved frequency change	32%
Secondary power supply not available	Not available secondary power supply	4%
Request detailed taxi instruction	Detailed taxi instruction request	2%
Cleared to land runway B	Runway B cleared to land	8%
Execute instructions immediately upon receipt	Immediately execute instructions according to advise	28%

Increased attention in training requires longer phrases not only from the point of view of vocabulary, but also

from the use of the correct expression. The biggest problem for students was the phrase "Execute instructions immediately upon receipt, where we recorded up to 28% of errors (Table 5).

#### 4. Conclusions

Of the many factors involved in the process of communication, phraseology is perhaps the most important, because it enables us to communicate quickly and effectively despite differences in language and reduces the opportunity for misunderstanding.

Standard phraseology reduces the risk that a message will be misunderstood and aids the read-back/hear-back process so that any error is quickly detected. Ambiguous or non-standard phraseology is a frequent causal or contributory factor in aircraft accidents and incidents. Failure to use standard phraseology can lead to misunderstanding, breakdown of the communication process and eventually to loss of separation.

For oral and written testing, standardized phrases were used, which pilots and ATCs must operate accurately, reliably, readily, quickly, with the correct pronunciation and agreed standardized phrases. Students come from secondary schools where General English is taught, and Aviation English classes at university are their first encounter with standardized aviation phrases. From the studies of the students, we have found out that mistakes appear in all language skills. It is therefore important for students to master thoroughly vocabulary, structure, grammar, vocabulary and phrases in the professional English lessons, and to avoid sometimes serious mistakes that are long-term fixed in memory and could interfere with safety of air traffic.

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