AGC

European Action Plan for Air Ground Communications Safety

Edition 1.0
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"Implementation of the recommendations should commence upon receipt of this Action Plan"

ECA

era
european regions airline association

Flight Safety Foundation

IATA

IFATCA

EUROCONTROL

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1 - Statement of commitment

Clear, unambiguous, timely and uninterrupted communications are central to the efficient and safe management of air traffic. In time, controller pilot data link communications (CPDLC) will replace voice as the medium for passing a large proportion of information, intentions, requests, and instructions between pilots and controllers, but voice communications will always have a role to play in emergency situations and in tactical intervention. Not surprisingly, communications-related problems are a factor in many flight safety incidents

This Action Plan specifically addresses the subject of Air-Ground Communications Safety (AGC Safety) and is the result of the combined efforts of organisations representing all areas of airline operations – International Federation of Air Traffic Controllers' Associations, Flight Safety Foundation, European Cockpit Association, European Regions Airline Association and EUROCONTROL. European Commission (EC) supports the plan and Eurocontrol Agency will continue working with the EC for addressing this hazard, including but not restricted to the use of data from European Co-ordination Centre for Aviation Incident Reporting Systems.

Those organisations have contributed to and endorsed this Action Plan and are totally committed to enhancing flight safety by advocating the implementation of the recommendations that it contains.

The recommendations, when implemented, will assist in reducing the number of incidents, including level busts and runway incursions where communication problems are a contributory factor. This will be achieved by the consistent and harmonised application of existing ICAO provisions, increased awareness, and the adoption of best practice in air-ground communications.

2 - Introduction and background

The Air-Ground Communication (AGC) Safety Improvement Initiative was launched by the EUROCONTROL Safety Team in 2004, and is addressing communications issues identified in the Runway Incursion and Level Bust Safety Improvement Initiatives as well as other issues of concern such as call sign confusion, undetected simultaneous transmissions, radio interference, use of standard phraseology, and prolonged loss of communication.

Communication between air traffic controllers and pilots remains a vital part of air traffic control operations, and communication problems can result in hazardous situations. A first step towards reducing the incidence of communication problems is to understand why and how they happen. Separate studies commissioned by EUROCONTROL have sought to identify the causes of these communication problems. An occurrence-reporting campaign addressed to European airlines and Air Navigation Service Providers was conducted in order to collect a representative data sample on air-ground communication problems. At the same time, a survey of airline pilots and air traffic controllers in Europe was included in the framework of this study to identify lessons learnt and recommendations in the area of communication safety. Further work has examined existing practices and rules regarding similar call signs and proposed strategies for making significant reductions in the incidence of similar call signs.

This work has contributed to our understanding of the causes of communications problems and informed the development of recommendations and solutions.

Assessing the scale of the problem, the causes and the consequences

Analysis of level bust events occurring in the first half of 2005 showed that four out of the top five causal factors involved a breakdown in communications, including incorrect read-back by the correct aircraft and pilot read-back by the incorrect aircraft, which is often the result of call sign confusion.

Call-Sign confusion

Call sign confusion is the major cause for aircraft taking a clearance not intended for them. The danger of an aircraft taking and acting on a clearance intended for another is obvious. Call sign confusion can lead to runway incursions, level busts, loss of separation and CFIT. There are many factors which contribute to call sign confusion, associated with:

- the way the message is transmitted
- the quality of the communication channel
- the perception and cognitive processing of the message, influenced between the other things by the frequency workload and flight phase complexity
- inadequate mitigation.

Call sign confusion can arise because of visual or phonetic confusion associated with the sequencing of letter and number groups in a call sign.

Aircraft identification on radar screens and controllers' "strips" often use ICAO 3-letter groups plus a flight identifier number. Controllers can experience both visual and phonetic confusion with ICAO 3-letter groups and flight numbers relating to different airlines. For example, identical final letters (ABC & HBC), parallel letters and numbers (ABC & ADC, 1458 and 1478), block letters and figures (ABC & ABD, 14 and 142) and anagrams (DEC & DCE, 1524 and 1425).

The purpose of radiotelephony designators is to ensure a clear difference between two or more aircraft from different airlines at the beginning of pilot and controller communications. The use of common prefixes and especially suffixes therefore reduces their effec-

tiveness. For example, the word "AIR" is used either as prefix or suffix in more than one in five radiotelephony designators in use worldwide. Furthermore, one of its derived translations, in the Spanish language ("AERO"), represents 270 cases worldwide.

Prolonged loss of communications (PLOC)

A large proportion of communication problems have no safety consequences, but about a quarter of the reported occurrences result in a prolonged loss of communication (PLOC).

Since the events of 11 November 2001, PLOC has become a matter of security as well as a safety issue. The Joint NATO-EUROCONTROL ATM Security Coordinating Group (NEASCOG) was created in 2002 to develop activities to cope with the new security situation. In northern Europe in 2004, there were over 120 military intercepts of aircraft not responding to air traffic control. A silent aircraft is not necessarily a security threat and is not usually an immediate safety problem if the crews are flying in accordance with their flight plan or last clearance, but PLOC results in increased workload for controllers, security concerns, and additional safety concerns in the event of interception. Reports indicate a general lack of awareness of interception procedures among controllers and pilots, and failure to monitor 121.5 at all times.

Simultaneous transmission

Simultaneous transmission by two stations results in one of the two (or both) transmissions being blocked and unheard by the other stations (or being heard as a buzzing sound or as a squeal). With the steady growth of air traffic worldwide there is a corresponding increase in the incidence of blocked or simultaneous transmissions. These frequently result in dangerous situations developing, especially when they go undetected.

Radio interference caused by unauthorised transmissions or breakthrough from commercial stations can have a similar effect, causing reception difficulties or the loss of all or part of a message.

Possible dangerous outcomes include the following:

- a flight takes a clearance intended for another flight and takes action, e.g. alters heading or level, with resultant loss of separation;
- a flight misses all or part of a clearance intended for it and maintains its level and/or heading, bringing it into conflict with other flights;
- a controller assumes that a message received is from a different flight and issues inappropriate instructions;
- a controller fails to note error in read-back (including wrong call sign) and does not correct the error (hear-back error);
- unacceptable delay in establishing RTF contact or in issuing a clearance or passing a message;
- the workload of controllers and pilots is increased due to the need to resolve the confusion.

Radio discipline

Communication between pilots and air traffic controllers is a process that is vital for the safe and efficient control of air traffic. Pilots must report their situation, intentions and requests to the controller in a clear and unambiguous way; and the controller must respond by issuing instructions that are equally clear and unambiguous. Although data link communication has reached an advanced stage of development, verbal communication is likely to remain the prime means of air-ground communication for many years to come.

It is of course important that radio equipment should be reliable and easy to use, and should be capable of conveying the spoken word clearly and without distortion over long distances. However, the process of communication is equally important and must be successful even in the most difficult conditions. Good radio discipline is essential to this process.

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.

Standardised 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.

Other factors such as the format and content of the message, language and the speed and timeliness of transmissions also make important contributions to the communications process.

3 - Explanatory note – recommendations & best practice

Air Ground Communications Safety Workshop

ERA, ECA,IATA,IFATCA,FSF and the EUROCONTROL Safety Enhancement Business Division hosted an Air-Ground Communications Safety Workshop (AGCWS) at EUROCONTROL Headquarters in Brussels on 30 September 2005. Representatives from aircraft operators (commercial, cargo, and general aviation), pilot groups, regulators, airport operators, Air Navigation Service Providers (ANSPs) as well as pilot and controller associations, attended.

The Workshop represented an important phase within the Air-Ground Communications Safety Initiative, with recognised experts sharing their knowledge and views on various aspects of pilot-controller communications safety. The Workshop debated the issues and validated a set of practicable safety recommendations for the industry, which now form the foundation of this European Action Plan.

The recommendations

The recommendations are set out in Section 4. For clarity, the recommendations have been divided into specific areas for action: National authorities, Aircraft operators, ANSPs, and EUROCONTROL.

The recommendations are based on an analysis of over 500 air-ground communications safety events, suggestions put forward by over 300 experienced controllers and flight crew, and contributions from stakeholders including ECA, IFALPA, IFATCA, ERA, and EUROCONTROL. Some recommendations concern standards, technology and awareness, but the vast majority of recommendations concern best practice. Recommendations with regard to best practice for controllers and flight crews are contained in Section 5.

Best practice or standard practice?

Many experienced pilots and controllers may feel that some of the best practice highlighted in this Action Plan is basic professional knowledge that should not require reinforcement. Unfortunately, analysis of incident reports concerning air-ground communications safety suggests that what many may consider to be standard practice is not universal, and all aircraft operators and ANSPs would find it useful to examine their training and standard operating procedures to ensure that this best practice is not taken for granted.

Implementation

Whereas the national aviation safety authorities have overall responsibility for safety regulation and oversight, the importance of this issue requires that implementation commences at the earliest opportunity by all parties involved. All parties include, but are not limited to, ANSPs, aircraft operators, and national aviation safety authorities. Progress will be monitored by the EUROCONTROL Agency. Implementation of the recommendations should commence upon receipt of this Action Plan.

4 - Recommendations

4.1 Recommendations for national authorities

REF:	Issue / Category	Recommendations for national authorities	Action	Timescale	Briefing note reference
4.1.01	Call sign confusion / Best practice	Before submitting a set of ICAO 3-letter groups as well as radiotelephony designators ensure that there is no evidence of potential similarity with the existing ICAO data	National authorities	Immediate	Nil
4.1.02	All / Best practice	Consider ensuring that regular flight crew proficiency checks cover air-ground communications safety issues.	National authorities	01 Jan 2008	1/10.2
4.1.03	All / Technology	Give priority to the wider implementation of Controller to Pilot Datalink Communications (CPDLC)	National authorities	Immediate	Nil

4.2 Recommendations for aircraft operators

REF:	Issue Category	Recommendations for aircraft operators	Action	Timescale	Briefing note reference
4.2.01	Call sign confusion Best practice	Implement a call sign deconfliction programme within your airline, to review and if necessary amend call signs.	Aircraf operators	01 Jan 2008	2/6.12
4.2.02	PLOC Best practice	Ensure that company policy for the monitoring of 121.5 MHz is in accordance with ICAO SARPs and is contained in operating manuals. Do not refer to 121.5 MHz as a guard frequency; 121.5 MHz is an emergency frequency.	Aircraft operators	Immediate	3/6.2
4.2.03	PLOC Best practice	Ensure that standard procedures for copying, setting and cross-checking frequency changes are sound, and that they are followed by all pilots.	Aircraft operators	01 Jan 2007	3/6.3
4.2.04	Blocked transmission Best practice	Review radio equipment fitted to aircraft in your fleet and install anti-blocking devices if appropriate.	Aircraft operators	01 Jan 2008	3/6.5 4/5.1
4.2.05	PLOC Best practice	Ensure availability of an updated list of sector frequencies for all flight plan routes as part of SOPs (pre-flight preparation activity).	Aircraft operators	01 Jan 2007	3/6.4
4.2.06	All Best practice	Ensure that standard procedures address: ■ correct pronunciations; ■ that both pilots listen to en-route clearances; ■ the communication issues during the transfer of control between Pilot flying and Pilot not flying;	Aircraft operators	01 Jan 2007	5/8.3
4.2.07	Radio discipline Best practice	Provide resources for self-improvement of the use in the English language.	Aircraft operators	01 Jan 2007	5/8.4
4.2.08	All Awareness	Ensure that all flight crew are aware of the loss of communications issue through publicity.	Aircraft operators	Immediate	3/6.1
4.2.09	All Awareness	Facilitate and promote practices for sharing the mutual understanding of professional characteristics between flight crews and controllers, including regular meetings, visits and familiarisation flights.	Aircraft operators	01 Jan 2007	1/10.4

REF:	Issue category	Recommendations for aircraft operators	Action	Timescale	Briefing note reference
4.2.10	PLOC Best practice	Investigate communications redundancy, including establishing clear procedures for the use of commercial telephone links, in the event of PLOC.	Aircraft Operators	01 Jan 2008	3/6.6
4.2.11	All Best practice	Encourage communications best practice for Flight crews, as details in Section 5 of the European Action Plan for AGC Safety	Aircraft operators	01 Jan 2007	5/8.2

4.3 Recommendations for ANSPs

REF:	Issue Category	Recommendations for ANSPs	Action	Timescale	Briefing note reference
4.3.01	Radio Discipline Standards	Insist on adherence to standard communications procedures by all controllers.	ANSPs	Immediate	1/12.1 5/9.1
4.3.02	Radio Discipline Best practice	Include in training packages communication procedures for emergency/unusual situations for which ICAO standard phraseology does not exist or is not sufficient.	ANSPs	01 Jan 2007	5/9.3
4.3.03	PLOC Best practice	Ensure that proper procedures are promulgated for PLOC and interceptions of aircraft, and ensure that controller responsibilities in the case of interception of a civil aircraft are clearly laid down.	ANSPs	01 Jan 2007	3/8.3 3/8.4
4.3.04	All Best practice	If a controller is providing ATS for 2 or more areas, the relevant channels must be located on the controller working position being used. Preferably, channels should be cross-coupled to prevent simultaneous transmissions by aircraft.	ANSPs	01 Jan 2007	4/7.3
4.3.05	Simultaneous transmission Technology	Future systems should include technology that warns the controller in the event of a simultaneous transmission.	ANSPs	01 Jan 2008	4/7.4
4.3.06	All Best practice	Communications with aircraft should only be undertaken within the Designated Operational Coverage (DOC) for the frequency being used.	ANSPs	01 Jan 2007	3/8.2
4.3.07	Radio discipline Best practice	Provide resources for self improvement in the use of the English language.	ANSPs	01 Jan 2008	5/9.4
4.3.08	PLOC Awareness	Ensure that all controllers are aware of the loss of communications issue through publicity.	ANSPs	Immediate	3/8.1

REF:	Issue Category	Recommendations for Aircraft Operators	Action	Timescale	Briefing Note Reference
4.3.09	All Awareness	Facilitate and promote practices for sharing the mutual understanding of professional characteristics between flight crews and controllers, including regular meetings, visits and familiarisation flights.	ANSPs	01 Jan 2007	1/12.3
4.3.10	PLOC Best practice	Investigate communications redundancy, including establishing clear procedures for the use of commercial telephone links, in case of PLOC.	ANSPs	01 Jan 2008	3/8.5
4.3.11	All Best practice	Encourage communications best practice for controllers, as detailed in Section 5 of the European Action Plan for AGC Safety.	ANSPs	01 Jan 2007	5/9.2

4.4 Recommendations for EUROCONTROL Agency

REF:	Issue Category	Recommendations for EUROCONTROL Agency	Action	Timescale	Briefing note reference
4.4.01	Call sign confusion Technology	Investigate the feasibility of using the flight planning process for a systemic analysis, detection and de-confliction of similar call signs	EUROCONTROL Agency	01 Jan 2007	N/A
4.4.02	All Best practice	Investigate and analyse the effects of intonation and inflection on the way in which ATCOs instructions are interpreted and implement the results in training programmes.	EUROCONTROL Agency	01 Jan 2008	N/A
4.4.03	PLOC Standards	Develop, justify and propose to ICAO a change in the procedures requiring read-backs for channel changes.	EUROCONTROL Agency	01 Jan 2007	N/A
4.4.04	PLOC Awareness	Collect data on, monitor, investigate, and analyse PLOC occurrences	EUROCONTROL Agency	01 Jan 2007	N/A
4.4.05	PLOC Technology	Investigate further the possibility of using SELCAL in VHF.	EUROCONTROL Agency	01 Jan 2008	N/A

5 - Best practice for ATCOs and flight crews

5.1 Best practice - general

REF:	Issue	Best practice	Briefing note reference
5.1.01	Radio discipline	Observe ICAO SARPs, standard ICAO phraseology, and recommendations regarding language to be used, word spelling, transmission of numbers, transmitting technique, composition of messages, call signs, and exchange of communications	5/8.1-8.3, 5/9.1-9.3, 5/10.2-10.28
5.1.02	Radio discipline	Do not clip transmissions	2/7.2 2/9.2 4/8.3
5.1.03	Radio discipline	Use full RTF call sign at all times, unless call sign abbreviation has been introduced by ATC	2/7.3 5/10.13 5/10.14 5/10.15
5.1.04	Radio Discipline	Avoid heavy accents or colloquialisms	5/10.20
5.1.05	Radio discipline	Do not use terms such as "Roger" to acknowledge messages requiring a definite answer (e.g. acknowledging a pilot's statement that an altitude or speed restriction cannot be met). Doing so decreases both the pilot's and the controller's situational awareness	5/10.12 5/10.25 5/10.28

5.2 Best practice for ATCOs

REF:	Issue	Best practice	Briefing note reference
5.2.01	Call sign confusion	Monitor flight crew compliance with RTF call sign use.	2/9.4
5.2.02	Radio discipline	Take extra care when language difficulties may exist.	2/9.5
5.2.03	Radio discipline	Avoid combining numerical elements which may easily be confused in the same message, for example, flight level and heading.	5/10.18
5.2.04	Radio discipline	Stress, or repeat, any non-standard elements in a message to ensure that the pilot notes the differences from standard.	5/10.19
5.2.05	Radio discipline	Always listen carefully to the read-back of a clearance.	5/10.26
5.2.06	Radio discipline	Correct any error in read-back and insist on further read-back until certain that the clearance has been correctly copied.	5/10.27
5.2.07	Call sign confusion	Advise adjacent sectors/airports if it is felt that potential confusion may exist between aircraft likely to enter their airspace .	2/9.6
5.2.08	Call sign confusion	Warn the pilots of aircraft on the same RTF frequency having similar call signs that call sign confusion may occur. Pronounce call signs at a lower speed and more clearly. If necessary, instruct one or both aircraft to use alternative call signs while they are on the frequency.	2/9.7
5.2.09	Blocked transmission	If a blocked transmission is suspected, ensure that both aircraft retransmit their messages and confirm carefully that a clearance has not been taken by an aircraft for which it was not intended	2/9.8
5.2.10	Call sign confusion	Where an actual or potential call sign confusion incident is observed, file a report using the national mandatory incident reporting system or voluntary incident reporting system as appropriate.	2/9.9
5.2.11	Radio discipline	Do not pass RTF frequency changes as part of a multi-part clearance.	3/9.1
5.2.12	Radio discipline	Pay close attention to read-back of RTF frequency changes and correct any error.	2/9.3 3/9.3 5/10.27
5.2.13	PLOC	Do not delay passing any vital instruction until after a frequency change (e.g. heading or level change to avoid confliction).	3/9.2
5.2.14	RTF interference	On observing or being informed of radio interference, arrange for transfer of affected aircraft to another RTF frequency.	3/9.4

REF:	Issue	Best practice	Briefing note reference
5.2.15	PLOC	If loss of communication is suspected, or you believe an aircraft is operating at extreme range or in conditions of poor propagation, attempt to contact the aircraft by relay through other aircraft (who may also be prepared to attempt contact using 121.5 MHz) and through previous operating agency/RTF frequency.	3/9.8
5.2.16	PLOC	If loss of communication is suspected, attempt to establish whether the airline company is in contact with the aircraft (SELCAL, ACARS, etc.).	3/9.8
5.2.17	PLOC	When contact is not quickly established, do not delay precautionary clearance to conflicting aircraft on frequency on the assumption that contact will soon be established.	3/9.11
5.2.18	Radio discipline	Always start each transmission with the call sign of the subject flight.	5/10.13

5.3 Best practice for flight crews

REF:	Issue	Best practice	Briefing note reference
5.3.01	Call sign confusion	Advise ATC if any of the following situations are observed: ■ two or more aircraft with similar call signs are on the RTF frequency; ■ it is suspected that an aircraft has taken a clearance not intended for it; ■ it is suspected that another aircraft has misinterpreted an instruction; ■ a blocked transmission is observed.	2/7.9
5.3.02	Call sign confusion	After a flight where an actual or potential call sign confusion incident is observed, file a report using the national mandatory incident reporting system or voluntary incident reporting system as appropriate.	2/7.11
5.3.03	Radio discipline	Insist that other crewmembers on your flight also follow SOPs.	1/11.2
5.3.04	PLOC	Always use headsets during times of high RTF loading.	1/11.1 2/7.1 3/7.4
5.3.05	PLOC	Always wear a headset when members of the flight crew are involved in other tasks and may not be monitoring the RTF.	1/11.1 2/7.1 3/7.4
5.3.06	Radio discipline	Always read back ATC clearances in full.	5/10.21
5.3.07	Radio discipline	If in doubt about an ATC instruction, ask the controller to re-confirm the clearance rather than saying what you thought you heard i.e. "London, confirm the cleared flight level for BIGJET 162" not "London, confirm the cleared flight level for BIGJET 162 is FL 190". This procedure should also be followed if any doubt exists between flight crew members.	5/10.23
5.3.08	PLOC	Be alert to the possibility of loss of communication, and always follow standard procedures for copying, setting and cross-checking RTF frequencies. As soon as a loss of communication is suspected, check radio equipment settings and carry out a radio check.	3/7.1 3/7.3
5.3.09	RTF interference	If any part of a message for you is distorted, request repetition i.e. "say again…".	3/7.6
5.3.10	RTF interference	On observing any radio interference, note the nature and effect of the interference, time and position of commencement, time and position where the interference ceased, and any other factors that would help the authorities to identify the source.	3/7.8
5.3.11	RTF interference	If in your opinion safe aircraft operation is affected, request a frequency change. If the interference prevents satisfactory communication with your assigned ATC unit, request instructions using another listed frequency.	3/7.11

REF:	Issue	Best practice	Briefing note reference
5.3.12	PLOC	If the squelch control is adjusted to reduce the effect of interference, take care to ensure that transmissions from ATC or other aircraft are not cut out.	3/7.9
5.3.13	PLOC	If unable to establish contact on a new frequency, check all equipment settings (including volume) and return to previous frequency if contact is not quickly established.	3/7.13
5.3.14	PLOC	Make use of other aircraft to relay messages when operating at extreme range or when poor propagation is suspected.	3/7.14
5.3.15	PLOC	Inform cabin crew of any suspected "sleeping receiver" occurrence and ask for any relevant information (e.g. recent use of cabin address, or portable electronic equipment).	3/7.15
5.3.16	PLOC	Follow company procedures for the monitoring of 121.5 MHz. If loss of communications is suspected, select 121.5 MHz and listen out for any transmission from intercepting aircraft.	3/7.16
5.3.17	PLOC	Do not switch immediately to the next sector frequency following read back of controller's instruction. Ensure confirmation of your read back is received.	3/7.2 5/10.22
5.3.18	PLOC	Check the audio panel settings after any use of the passenger address system.	3/7.5

6 - Follow-up actions

Some of the actions contained in this plan are already under way as a result of complimentary safety initiatives whilst others are specific to the AGC Safety issue. Progress of all the actions, new data, and further study into the causes of AGC Safety events will be monitored and all stakeholders will be advised of progress.

6.1 Communication

The Action Plan will be distributed in hard copy to national authorities, ANSPs, and aircraft operators and be made available online via the EUROCONTROL website. Publication of the Action Plan will be a precursor to circulation of the AGC Safety Toolkit. The target date for publication of the AGC Safety Toolkit is July 2007.

6.2 Monitoring

The EUROCONTROL Safety Improvement Sub Group (SISG) will monitor the distribution, use, and effectiveness of the Action Plan and toolkit

The EUROCONTROL European Convergence and Implementation Plan (ECIP) mechanism will be used to monitor the implementation of the Action Plan.

The AGC Safety risk will be monitored collaboratively by all partners, including the arrangements of EUROCONTROL Safety Regulation Commission Safety Measurement and Improvement Programme and SISG.

7 - AGC safety toolkit

A toolkit, modelled on the successful Level Bust Toolkit, will be developed and distributed in 2007 and will contain computer-based training material for controllers and flight crews, along with awareness and briefing material including video.

Appendices - AGC Safety briefing notes

AGC 1: General

AGC 2: Call sign confusion

AGC 3: Loss of communications

AGC 4: Blocked transmission

AGC 5: Radio discipline

Air-Ground Communications Briefing Note
1- General

1. Introduction

1.1. Until datalink communication comes into widespread use, air traffic control (ATC) will depend primarily upon voice communications, which are affected by various factors. Communications problems can result in hazardous situations and have been significant direct or indirect factors in a number of aircraft accidents and incidents.

1.2. Aircraft operators and Air Navigation Service Providers (ANSPs) cooperate closely to achieve high productivity (e.g. optimising traffic flow through an airport or airspace); like pilots and air traffic controllers (ATCOs), they also share a common interest in maintaining a high level of safety.

1.3. A first step in reducing the incidence of communications problems is to understand why and how they happen. In the past, a number of studies of the causes of communication breakdown have been conducted in Europe and in North America. This briefing note refers to the findings of the most recent study, carried out in 2005 for EUROCONTROL by the Dutch National Aerospace Laboratory (NLR)[1].

1.4. This briefing note is the first of a series of five[2] which address the main factors affecting pilot-controller voice communications. It provides an overview of these factors and makes some general recommendations. There is also a short section dealing with emergency communications.

1.5. These five briefing notes are intended to be used by airline and air traffic management (ATM) training and safety managers in preparing awareness and training material. They will also be useful for private study by individual pilots and ATCOs.

1.6. One way of using safety information of this sort is to relate the information to local examples. Using the briefing notes in this way to highlight situations which are well known within the organisation has proved a highly effective alternative to treating them as isolated study packages.

2. Statistical background

2.1. The NLR report referred to above examined 535 occurrences of communication problems in European airspace reported during the period from 1 March 2004 to 1 April 2005. Undoubtedly, many more communications problems occurred during this period, but were either not reported or were not available to NLR. Also, many reports lacked important details which would have enabled a more complete study of cause and effect.

2.2. More than one quarter of reported problems involved loss of communication. Other main problem types included read-back/hear-back error and communication equipment problems.

2.3. The main reported consequences of the communication problems were prolonged loss of communication (PLOC), altitude deviation, loss of separation, wrong aircraft accepting clearance, instruction issued to wrong aircraft, heading deviation and runway transgression (including runway incursion).

2.4. The most common contributory factors identified were similar call sign, frequency change, radio equipment malfunction (air), radio interference, content of message inaccurate or incomplete, radio equipment malfunction (ground), frequency congestion, sleeping vhf receivers and pilot distraction.

1- Air-Ground Communication Safety Study: Causes and Recommendations
2- See Section 14

3. Pilot-controller communication loop

3.1. Communications between controllers and pilots can be improved by the mutual understanding of each other's operating environment and of the communication process itself.

3.2. The responsibilities of the pilot and controller overlap in many areas and provide backup.

3.3. The pilot-controller confirmation/correction process is a "loop" that ensures effective communication (Figure 1[3]).

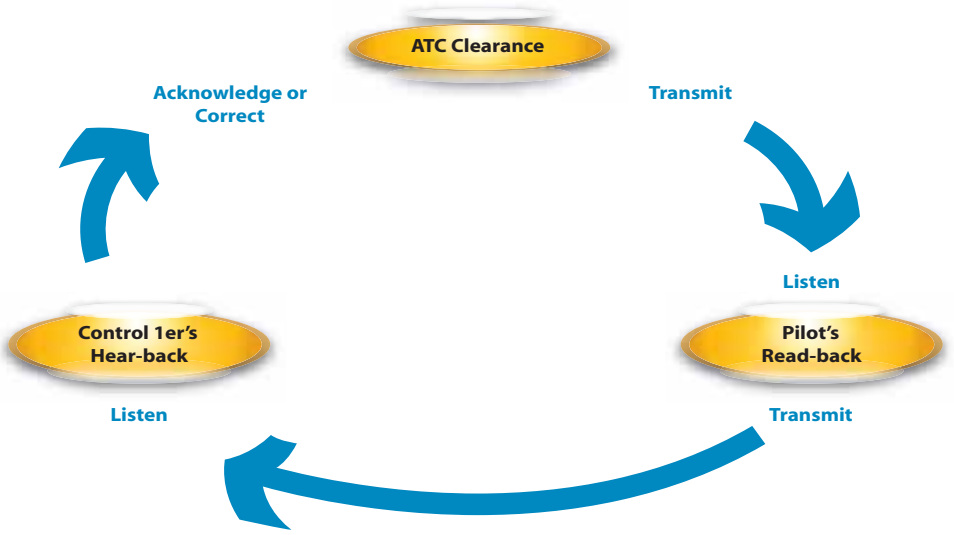

Figure 1 - The pilot / controller communication loop

3.4. During normal situations, but especially when adverse factors are likely to affect communication, the confirmation/correction process is a line of defence against communication errors.

4. Use of aircraft equipment

4.1. The ICAO Standard (Annex 6, Part 1, paragraph 6.20) requires the use of boom or throat microphones below transition altitude. JAR-OPS 1 contains a requirement for carriage of headset and boom microphone (JAR-OPS 1.652(s) for IFR operations, and JAR-OPS 1.650(p) for VFR), but there is no requirement for their use.

4.2. The JAA Operational Procedures Study Group consider that, for the purposes of:

- reliable two-way radio communication,
- ensuring that hands are kept free for other tasks, and
- good-quality voice recording,

the headset should be worn at all times below transition altitude or 10,000 feet, where the workload and number of radio exchanges are high.

3- Figure 1 and much of the subsequent information relating to Human Factors is based on information contained in Airbus Industrie Approach and Landing Briefing Note 2.3 - Effective Pilot/Controller Communications.

4.3. A recent Notice of Proposed Amendment (NPA) to JAR-OPS 1 introduces a new requirement to address this anomaly:

"Each flight crew member required to be on flight deck duty shall wear the headset with boom microphone required by JAR-OPS 1.650(p) and/or 1.652(s) on the ground and in flight below transition altitude or 10,000 feet, which ever is higher, and whenever deemed necessary by the commander, in order to have it available for use for all voice communications with Air Traffic Services."

5. Cross-checking on the flight deck

5.1. The first line of defence is the cross-checking process that exists on the flight deck between the pilot flying (PF) and the pilot not flying (PNF) (pilot monitoring).

5.2. Most airlines employ standard procedures for setting and cross-checking vital pieces of information, for example change of flight level or altitude. The following procedure, typical of many airlines, shows how this is done in the case of setting cleared altitude:

(a) when the autopilot is engaged, the PF sets the cleared altitude;
(b) when the autopilot is not engaged, the PNF sets the cleared altitude.

Each altitude setting triggers a cross-check:
(c) the PF calls out the altitude set;
(d) the PNF checks what has been set and announces the value of the altitude.

5.3. This procedure allows any discrepancy in what was heard by the pilots or in the setting made to be resolved without delay. Similar procedures are prescribed for other operations, for example, change of heading, altimeter setting or RTF frequency.

5.4. The procedure in use within an airline must be standardised, clearly stated in the operations manual, reinforced during training and adhered to by all pilots.

4 - NPA-OPS 49 (JAR-OPS 1) Use of Headset dated 1 November 2005

6. Effective communications

6.1. Pilots and controllers are involved equally in the air traffic management (ATM) system.

6.2. Achieving effective radio communications involves many factors that should not be considered in isolation. Many factors are interrelated and more than one factor is usually involved in a breakdown of the communication loop[5].

Human factors

6.3. Effective communication is achieved when the message transmitted by one party is correctly interpreted and understood by the other party.

6.4. Crew resource management (CRM) (for flight crew) and team resource management (TRM) (for controllers) highlight the relevance of the context and expectation in communication. Nevertheless, expectations may introduce a bias in the effectiveness of the communication.

6.5. High workload, fatigue, distractions, interruptions and conflicts are among the factors that may adversely affect pilot-controller communications and result in:

(a) incomplete communication;
(b) omission of call sign or use of an incorrect call sign;
(c) use of non-standard phraseology;
(d) failure to hear or to respond; and,
(e) failure to implement effectively a confirmation or correction.

Language and communication

6.6. People do not always pronance their own language in the same way as each other and this is equally true for second languages. Standard phraseology is intended to overcome these basic shortcomings.

6.7. The first priority of any communication is to establish an operational context that defines the following elements:

(a) Purpose – clearance, instruction, statement or proposal, question or request, confirmation;
(b) When – immediately, anticipate, expect;
(c) What and How – altitude (climb, descend, maintain), heading (left, right), airspeed; and,
(d) Where – (at […] waypoint).

6.8. The construction of the initial and subsequent message(s) should support this operational context by:

(a) following the chronological order of the actions;
(b) grouping instructions and numbers related to each action; and,
(c) limiting the number of instructions in the transmission.

6.9. The intonation, the speed of speaking and the placement and duration of pauses may affect the understanding of a communication.

5 - Refer to Briefing Note AGC 5 – Radio discipline

Mastering the language

6.10. CRM studies show that language differences on the flight deck are a greater obstacle to safety than cultural differences.

6.11. Because English has become a shared language in aviation, an effort has been initiated to improve the English-language skills of pilots and controllers worldwide. Nevertheless, even pilots and controllers for whom English is the native language may not understand all words spoken in English, because of regional accents or dialects.

6.12. In many regions of the world language differences generate other communication difficulties. For example, controllers using both English (for communication with international flights) and the country's official language (for communication with domestic flights) hinder some flight crews from achieving the desired level of situational awareness (loss of "party-line communications").

Non-standard phraseology

6.13. Non-standard phraseology is a major obstacle to effective communications.

6.14. Standard phraseology in pilot-controller communication is intended to be universally understood.

6.15. Standard phraseology helps lessen the ambiguities of spoken language and thus facilitates a common understanding among speakers:

(a) of different native languages; or,
(b) of the same native language, but who use, pronounce or understand words differently.

6.16. Non-standard phraseology or the omission of key words may completely change the meaning of the intended message, resulting in potential conflicts.

6.17. For example, any message containing a number should indicate what the number refers to (e.g. a flight level, a heading or an airspeed). Including key words prevents erroneous interpretation and allows an effective read-back/hear-back.

6.18. Particular care is necessary when certain levels are referred to because of the high incidence of confusion between, for example, FL100 and FL110.

6.19. Non-standard phraseology is sometimes adopted unilaterally by national or local air traffic services, or is used by pilots or controllers in an attempt to alleviate these problems; however, standard phraseology minimises the potential for misunderstanding.

Building situational awareness

6.20. Radio communications should contribute to the pilot's and the controller's situational awareness, which may be enhanced if they provide each other with advance information.

Frequency congestion

6.21. Frequency congestion significantly affects the flow of communications, especially during approach and landing phases at high-density airports, and demands enhanced vigilance by pilots and by controllers.

Omission of call sign

6.22. Omitting the call sign or using an incorrect call sign jeopardises effective read-back/hear-back.

Omission of read-back or inadequate read-back

6.23. ICAO Annex 11[6] requires that the safety-related part(s) of any clearance or instruction be read back to the air traffic controller.

6.24. The pilot's read-back must be complete and clear to ensure a complete and correct understanding by the controller.

6.25. The action of reading back a clearance gives the controller an opportunity to confirm that the message has been correctly received, and if necessary, to correct any errors.

6.26. Full read-back should never be replaced by the use of a term such as "Roger" or "Copied".

6.27. Similarly, a controller should not use terms such as "Roger" to acknowledge a message requiring a definite answer (e.g. acknowledging a pilot's statement that an altitude or speed restriction cannot be met).

Failure to correct faulty read-back

6.28. The absence of an acknowledgement or a correction following a clearance read-back is perceived by most flight crews as an implicit confirmation of the read-back.

6.29. The absence of acknowledgement by the controller is usually the result of frequency congestion and the need for the controller to issue clearances to several aircraft in succession.

6.30. An uncorrected erroneous read-back (known as a hear-back error) may lead to a deviation from the intended clearance and may not be detected until the controller observes the deviation on his/her radar display.

6.31. Less than required vertical or horizontal separation (and an AIRPROX) is often the result of hear-back errors.

Expectations

6.32. Bias in understanding a communication can affect pilots and controllers.

6.33. The bias of expectation can lead to:

(a) transposing the numbers contained in a clearance (e.g. a flight level) to what was expected, based on experience or routine; and,

(b) shifting a clearance or instruction from one parameter to another (e.g. perceiving a clearance to maintain a 280° heading as a clearance to climb/descend and maintain flight level 280).

6 - Refer to ICAO Annex 11 Chapter 3 Section 3.7.3.

Failure to request confirmation or clarification

6.34. Misunderstandings may include half-heard words or guessed-at numbers.

6.35. The potential for misunderstanding numbers increases when an ATC clearance contains more than two instructions.

6.36. Reluctance to seek confirmation may cause pilots to:
(a) Accept an inadequate instruction (over-reliance on ATC); or,
(b) Determine for themselves the most probable interpretation.

6.37. Failing to request clarification may cause flight crew to believe erroneously that they have received an expected clearance (e.g. clearance to climb to a requested level).

Failure to question instructions

6.38. Failing to question an instruction can cause a crew to accept an altitude clearance below the minimum safe altitude (MSA) or a heading that places the aircraft on collision course with another.

If there is any doubt as to the content of a clearance, or its meaning is not clearly understood, pilots must obtain clarification or confirmation.

Taking another aircraft's clearance or instruction

6.39. Problems often occur because a pilot accidentally takes a clearance intended for another aircraft.

6.40. This usually occurs when two aircraft with similar-sounding call signs are on the same RTF frequency[7] and are likely to receive similar instructions, or the call sign is blocked by another transmission.

6.41. When pilots of aircraft with similar-sounding call signs omit the call sign on read-back, or when simultaneous read-backs are made by both pilots, the error may go unnoticed by the pilots and the controller.

Filtering communications

6.42. Because of other flight deck duties, pilots tend to filter communications, hearing primarily communications that begin with their aircraft call sign and not hearing most other communications.

6.43. For workload reasons, controllers may also filter communications (e.g. not hearing or responding to a pilot read-back preparing to issue clearances/instructions to other aircraft, or ensuring internal coordination).

6.44. To maintain situational awareness, this filtering process should be adapted, according to the flight phase, for more effective listening. For example:

(a) whenever on an active runway (e.g. while back-tracking or when lining up in preparation for takeoff) or when conducting a final approach to an assigned runway, pilot's should listen and give attention to all communications related to this runway; and
(b) when operating in congested airspace the pilots should listen and give attention to all communications related to clearances to climb or descend to, or through, their flight level.

7 - Refer to briefing note AGC 2 – Call sign confusion.

Timeliness of communications

6.45. Deviation from an ATC clearance may be required for operational reasons (e.g. TCAS manoeuvres, a heading deviation or altitude deviation for weather avoidance, or an inability to meet a restriction).

6.46. Controllers need time to accommodate these deviations; therefore ATC should be notified as early as possible.

Blocked or simultaneous transmissions

6.47. Blocked or simultaneous transmissions are a common cause of communication breakdown.[8]

6.48. Blocked transmissions are often the result of not immediately releasing the push-to-talk switch after a communication.

6.49. Simultaneous transmission by two stations (two aircraft or one aircraft and ATC) results in one of the two (or both) transmissions being blocked and going unheard by the other stations (or being heard as a buzzing sound or a squeal).

6.50. Radio interference can have a similar effect to that of blocked or simultaneous transmissions in preventing a message from being heard.

6.51. The absence of a read-back from the pilot should be treated as a blocked transmission and prompt a request to the pilot to repeat or confirm the message.

6.52. In practice, most pilots are unlikely to treat the absence of a hear-back acknowledgement from the controller as evidence of a blocked transmission, and only question the controller if they are uncertain that the read-back was correct or have other reasons to suspect a blocked transmission.

6.53. Although not an official procedure, some pilots make a practice of alerting controllers and other pilots to an apparent blocked or garbled transmission by saying "Blocked" immediately afterwards.

Loss of communication

6.54. Clearly, loss of communication is a dangerous occurrence.[9] Since 11 September 2001 it has assumed a new significance, as controllers are unable to distinguish between communication failure and potentially sinister causes. Loss of communication can result from a number of causes, for example:

(a) wrong frequency assigned by ATC;
(b) pilot misheard frequency assignment;
(c) pilot mis-set radio controls;
(d) radio failure;
(e) radio interference.

6.55. In recent years, an increasing number of incidents have been reported which cannot be ascribed to any of the above causes. These occurrences are usually referred to as "sleeping receivers".

8 - Refer to briefing note AGC 4 – Blocked transmission.
9 - Refer to briefing note AGC 3 – Loss of communication.

7. Emergency communication

7.1. When flight crew are confronted with an abnormal situation whilst in flight, they normally prioritise their immediate actions in the following order.

- **A**viate;
- **N**avigate;
- **C**ommunicate.

Aviate

7.2. The pilot's immediate priority is to ensure the safe flight path and condition of the aircraft. This not only includes the flying of the aircraft but also the completion of checklist drills. The safe flight path may even include the initiation of a controlled rapid descent.

7.3. In order to maintain the correct balance of workload, the flight crew normally distribute the responsibilities between the available crew members. For a modern two-crew flight deck, one flight crew member takes responsibility for the flight path of the aircraft and all radio communications while the other flight crew member carries out any checklist actions.

7.4. When there is a problem, the workload during the first moments is high and the flight crew may elect to inform air traffic control immediately by the most direct means. This normally entails the use of an initial call incorporating the word "standby" (e.g. "Houston, (call sign), we've got a problem – standby".)

Navigate

7.5. The flight crew will decide on whether to continue the flight to destination, initiate a diversion or just place the aircraft in a safe flying position. The decision to divert may be immediate but normally it will require coordination with air traffic control and other parties.

Communicate

7.6. Pilots believing themselves to be facing an emergency situation should declare an emergency as soon as possible and cancel it later if the situation allows.

7.7. The correct method of communicating this information to ATC is by using the prefix "MAYDAY, MAYDAY, MAYDAY" or "PAN PAN, PAN PAN, PAN PAN" as appropriate. This procedure, which is an international standard, is the single most effective means of alerting the controller to the need to give priority to the message that will follow.

Controller response to emergency situation

7.8. Controllers should recognise that, when faced with an emergency situation, the flight crew's most important needs are:

- **T**ime;
- **A**irspace; and,
- **S**ilence.

7.9. The controller's response to the emergency situation could be patterned after a memory aid such as ASSIST[10]:

- **A**cknowledge the call.
- **S**eparate the aircraft from other traffic. Give it room to manoeuvre.
- **S**ilence – on the frequency. Where possible, change the frequency for other traffic, or provide a separate frequency – this prevents unnecessary clutter for the pilots.
- **I**nform those who need to know and those who can help; inform others as appropriate.
- **S**upport the pilots in any way possible – start to think of alternative routings, etc.
- **T**ime - Give the pilots time to collect their thoughts, don't harass them for information. Time produces good decisions.

7.10 EUROCONTROL has produced guidelines for controller training in handling unusual or emergency situations which contain much useful information and advice, including sample checklists for various types of emergency.

8. Training programme

8.1. Training programmes on pilot-controller communications should strive to involve both flight crew and ATC personnel in joint meetings to discuss operational issues, and in joint flight/ATC simulator sessions, to promote a mutual understanding of each other's working environment.

8.2. Training sessions should include the following:

(a) modern flight decks (e.g. flight management system reprogramming) and ATC equipment (e.g. absence of primary returns, such as weather, on modern radar displays);
(b) operational flying requirements (e.g. aircraft climb, descent and deceleration characteristics, performance, limitations) and ATC requirements (e.g. optimum use of airspace and runways, traffic deconfliction, etc.);
(c) standard procedures used by pilots and controllers.

8.3. Special emphasis should be placed on pilot-controller communications and task management during emergency situations.

8.4. Ideally, pilots and controllers would participate in each other's resource training (CRM and TRM).

8.5. Operators and ANSPs should provide resources for self-improvement in the use of the English language.

9. Safety reporting

9.1. Investigation and analysis of safety occurrences is essential for the development of measures to prevent recurrence. Risk analysis allows resources to be targeted in the most effective way.

9.2. To be fully effective, detailed reporting of all safety occurrences is necessary, whether or not this is required by national regulations. This is most likely to occur where the national and company safety culture encourages open reporting and protects the confidentiality of the reporter.

10 - The ASSIST concept was first employed by ATC at Amsterdam Schiphol Airport.
11 - Guidelines for Controller Training in the Handling of Unusual/Emergency Situations.

9.3. Analysis of trends revealed by safety reports allows safety managers to decide whether specific measures have been effective. Trend analysis also allows safety managers to detect new areas of concern as soon as they arise. Important safety information uncovered as a result may be shared with other operators and ANSPs.

9.4. A detailed discussion of the issues involved may be found in the relevant EUROCONTROL Level Bust Toolkit Briefing Notes[12].

10. Recommendations for aircraft operators

10.1. Maintain a continuous review of standard operating procedures (SOPs). Encourage discussion within the airline (including criticism and suggestions) to ensure that SOPs are practicable and effectve and that pilots understand the dangers of violation.

10.2. Ensure that training emphasises the need for pilots to observe sound and standard communications procedures in accordance with ICAO and national regulation, following the recommendations contained in these briefing notes.

10.3. Ensure that all flight crew observe SOPs.

10.4. Facilitate and promote practices for sharing the mutual understanding of professional characteristics between flight crews and controllers, including regular meetings, visits and familiarisation flights.

10.5. Work to encourage a positive, open safety culture within your airline. Encourage flight crew to report safety occurrences and inform flight crew of action taken following their reports.

10.6. In encouraging incident reporting, an anonymous reporting system is very effective. However, a confidential system leads to a more straightforward and satisfactory investigations because it allows the investigator to make contact with the reporter in order to clarify any points and to go deeper into the investigation.

10.7. Foster a sense of trust within the team that reports made in confidence will not be divulged except where required in accordance with national law. Team members may be reluctant to admit mistakes if they fear punishment or loss of status in the eyes of their colleagues.

10.8. In conducting an investigation into an incident, bear in mind the stricture contained in ICAO Annex 13 that "The sole objective of the investigation of an accident or incident shall be the prevention of accidents and incidents. It is not the purpose of this activity to apportion blame or liability."

10.9. The results of the investigation should be issued in a report describing the relevant facts that led to the incident and suggesting recommendations in order to avoid similar occurrences. Feedback should be provided to those who were involved in the incident but also to people who were not involved and who can learn from the incident.

12 - EUROCONTROL Level Bust Briefing Note Ops 7 – Safety Reporting: Operators and ATM3 – Safety Reporting: Air Traffic Management

11. Recommendations for flight crew

11.1. Always use headsets during times of high RTF loading. Always wear a headset when members of the flight crew are involved in other tasks and may not be monitoring the RTF.

11.2. Always observe company SOPs, including standard communications procedures. Insist that other crew members on your flight also follow SOPs.

11.3. Inform managers immediately if SOPs appear to be inefficient or inappropriate in certain situations.

11.4. Whenever a hazardous situation arises, consider informing air traffic control using the standard keywords "MAYDAY" or "PAN PAN" as appropriate.

11.5. Do not delay declaring an emergency; it can always be cancelled later if the situation does not to warrant it.

11.6. Always report safety occurrences whether or not they directly involve you, using the local mandatory or voluntary reporting system as appropriate.

11.7. Cooperate in the analysis of incidents. In this way you can make a positive contribution to safety.

12. Recommendations for air navigation service providers

12.1. Insist on adherence to standard communications procedures by all controllers.

12.2. Ensure that training for managers and staff is effective in explaining and promoting safe working practices.

12.3. Facilitate and promote practices for sharing the mutual understanding of professional characteristics between flight crews and controllers, including regular meetings, visits and familiarisation flights.

12.4. In encouraging incident reporting, an anonymous reporting system is very effective. However, a confidential system leads to a more straightforward and satisfactory investigation because it allows the investigator to make contact with the reporter in order to clarify any points and to go deeper into the investigation.

12.5. Foster a sense of trust within the team that reports made in confidence will not be divulged except where required in accordance with national law. Team members may be reluctant to admit mistakes if they fear punishment or loss of status in the eyes of their colleagues.

12.6. In conducting an investigation into an incident, bear in mind the stricture contained in ICAO Annex 13 that "The sole objective of the investigation of an accident or incident shall be the prevention of accidents and incidents. It is not the purpose of this activity to apportion blame or liability."

12.7. The results of the investigation should be issued in a report describing the relevant facts that led to the incident and suggesting recommendations in order to avoid similar occurrences. Feedback should be provided to those who were involved in the incident but also to people who were not involved and who can learn from the incident.

13. Recommendations for controllers

13.1. Always follow standard procedures, including standard communications procedures.

13.2. When under pressure to get the job done (e.g. to increase the number of aircraft movements at your airport), resist the temptation to cut corners (e.g. reduce separation). Such practices reduce the safety margins for aircraft and so increase the likelihood of an incident.

13.3. Notify your supervisor or manager of any element of a procedure that makes it difficult to implement safely or efficiently.

13.4. Be prepared for dealing with an aircraft emergency using a checklist or mnemonic such as ASSIST[13].

13.5. Always report safety occurrences whether or not they directly involve you, using the local mandatory or voluntary reporting system as appropriate.

13.6. Cooperate in the analysis of incidents. In this way you can make a positive contribution to safety.

14. Resources

Other Air-Ground Communication (AGC) Briefing Notes

14.1. There are five AGC Briefing Notes in this series, of equal applicability to Flight Operations and Air Traffic Management:

- No 1: General;
- No 2: Call sign confusion;
- No 3: Loss of communication;
- No 4: Blocked transmissions; and,
- No 5: Radio discipline.

Access to resources

14.2. Most of the resources listed may be accessed free of charge from the Internet. Exceptions are:

- ICAO documents, which may be purchased direct from ICAO;
- Certain Flight Safety Foundation (FSF) documents, which may be purchased direct from FSF;
- Certain documents produced by the Joint Aviation Authorities, which may be purchased from JAA.

Regulatory resources

14.3. Documents produced by regulatory authorities such as ICAO, JAA and national aviation authorities are subject to amendment. Reference should be made to the current version of the document to establish the effect of any subsequent amendment.

- ICAO Annex 10 – Aeronautical Telecommunications, Volume II – Communication Procedures including those with PANS status;
- ICAO Annex 11 – Air Traffic Services;
- ICAO Doc 4444 – Procedures for Air Navigation Services – Air Traffic Management (PANS-ATM);

12 - EUROCONTROL Level Bust Briefing Note Ops 7 – Safety Reporting: Operators and ATM3 – Safety Reporting: Air Traffic Management

- ICAO Doc 8168 – Procedures for Air Navigation Services – Aircraft Operations (PANS-OPS), Volume I – Flight Procedures;
- ICAO Doc 8585 – Designators for Aircraft Operating Agencies, Aeronautical Authorities and Services;
- ICAO Doc 9432 – Manual of Radiotelephony;
- JAR-OPS 1 – Commercial Air Transport (Aeroplanes).

Emergency communications

- EUROCONTROL – Guidelines for Controller Training in the Handling of Unusual/Emergency Situations;
- EUROCONTROL – Best practice draft: Runway Sterilisation;
- UK CAA – CAP 745: Aircraft Emergencies – Considerations for Air Traffic Controllers;
- UK CAA – AIC 51/99: VHF Radio Telephony Emergency Communications;
- UK NATS – Aircraft Emergencies: Considerations for Controllers.

Other resources

- EUROCONTROL – Air-Ground Communication Safety Study: An Analysis of Pilot-Controller Communications;
- EUROCONTROL – Air-Ground Communication Safety Study: Causes and Recommendations;
- FAA Report – An Analysis of Ground Controller-Pilot Voice Communications;
- FSF Accident Prevention Volume 47 No 6 – My Own Mouth shall Condemn Me;
- UK CAA Aeronautical Information Circular (AIC) 107/2000 – Call sign Confusion;
- UK CAA Safety Sense – RT Discipline (for Pilots & ATC);
- UK CAA – Flight Operations Department Communication 11/2000 – Understanding and Interpreting Phraseology and Procedures used by Air Traffic Services Providers;
- UK CAA CAP 704 – Aircraft Call Sign Confusion Evaluation Safety Study (ACCESS);
- UK CAA CAP710 – On the Level.

Air-Ground Communications Briefing Note
2- Call sign confusion

1. Introduction

1.1. The use of similar call signs by aircraft operating in the same area on the same RTF frequency often gives rise to potential and actual flight safety incidents. This hazard is usually referred to as "call sign confusion".

1.2. The danger of an aircraft taking and acting on a clearance intended for another is obvious. The following are some of the potential outcomes of such a situation:

(a) the aircraft takes up a heading or routing intended for another;
(b) the aircraft commences a climb or descent to a level to which it has not been cleared;
(c) the aircraft leaves the appropriate RTF frequency;
(d) in responding to a message, the aircraft blocks a transmission from the intended recipient;
(e) the intended recipient does not receive the clearance, and fails to take up the desired heading or routing, or fails to climb or descent to the cleared level;
(f) the controller misunderstands the intentions of aircraft under his/her control;
(g) the controller issues a clearance to the wrong aircraft, and/or fails to issue a clearance to the intended aircraft;
(h) the workload of controllers and pilots is increased because of the necessity to resolve the confusion.

1.3. Any of the above situations could result in a loss of separation, a level bust, an AIRPROX, or a mid-air collision.

1.4. The purpose of this briefing note is to recommend the best courses of action in order to minimise the risk of call sign confusion.

1.5. This briefing note draws heavily on the studies referred to in Section 2 below.

2. Statistical data

UK CAA

2.1. The UK CAA reported[1] that, out of a total of 5,625 safety occurrences notified to them during 1997, 175 involved call sign confusion.

2.2. In the same year, the ACCESS[2] initiative collected a total of 482 reports of call sign similarity filed by pilots and air traffic controllers in UK. 217 of these involved actual confusion, including 99 where ATC were actually confused. 353 involved increased controller workload by reducing controllers' thinking time, and increasing RTF usage time.

French ATM services

2.3. During 2003, about 800 safety occurrence reports concerning similar call signs were collected by air traffic management (ATM) Services in France. These included 100 or so incidents having a direct impact on air traffic safety and leading to very unsafe situations (AIRPROX, Short-Term Conflict Alert (STCA) alerts, level busts and clearance misunderstandings).

EUROCONTROL/NLR

2.4. In cooperation with the Dutch National Research Laboratory (NLR), EUROCONTROL studied 444 occurrences in which there were problems with communication between controller and pilot. All these occurrences were classified as "incidents[4]".

2.5. The above occurrences were classified according to their consequences. 70 were classified as "wrong aircraft accepting clearance", 92 as "altitude deviation[5]", 30 as "loss of separation", 25 as "runway transgression", 20 as "heading or track deviation" and 5 as "instruction issued to wrong aircraft". Contributory factors in these incidents included "similar call sign" (87 cases), "incorrect read-back" (44) and "non-standard controller phraseology" (32).

2.6. A second, wider study[6] also conducted by NLR found that the contributory factors most often cited in communication problems involving similar call signs were related to human factors:
(a) controller accent (34%);
(b) controller speech rate (28%);
(c) pilot distraction (25%);
(d) pilot expectation (22%);
(e) pilot fatigue (20%).

2.7. Two factors which are also common are frequency congestion (28%) and blocked transmissions (30%).

3. Aircraft call signs

3.1. Before proceeding with an examination of the call sign confusion problem the rules governing the use of aircraft call signs will be reviewed. These rules are laid down in ICAO Annex 10[7]. The relevant paragraphs are summarised below.

3.2. Three different types of aircraft call sign may be encountered, as follows:

Type (a) The characters corresponding to the registration marking of the aircraft (e.g. ABCDE). The name of the aircraft manufacturer or model may be used as a prefix (e.g. AIRBUS ABCDE);

Type (b) The telephony designator[8] of the aircraft operating agency, followed by the last four characters of the registration marking of the aircraft (e.g. RUSHAIR BCDE);

Type (c) The telephony designator of the aircraft operating agency, followed by the flight identification (e.g. RUSHAIR 1234).

3.3. The full call sign must be used when establishing communications.

3.4. After satisfactory communication has been established, abbreviated call signs may be used provided that no confusion is likely to arise; however, an aircraft must use its full call sign until the abbreviated call sign has been used by the ground station.

1- CAP 701 – Aviation Safety Review 1990-1999
2 - CAP 704 – Aircraft Call Sign Confusion Evaluation Safety Study. A summary of this report may be found in UK CAA Aircraft Information Circular (AIC) 107/2000
3 - Air-Ground Communication Safety Study: An Analysis of Pilot-Controller Communications
4 - An incident is defined in ICAO Annex 13 as an occurrence, other than an accident, associated with the operation of an aircraft which affects or could affect the safety of operation
5 - In this study, an altitude deviation was defined as a departure from, or failure to attain, an altitude assigned by ATC
6 - Air-Ground Communication Safety Study: Causes and Recommendations
7 - ICAO Annex 10, Volume II, Section 5.2.1.7
8 - The telephony designators referred to in (b) and (c) are contained in ICAO Doc 8585 — Designators for Aircraft Operating Agencies, Aeronautical Authorities and Services

3.5. Call signs may be abbreviated only in the manner shown below. Examples of full and abbreviated call signs are shown on Table 1 below.

Table 1 – Examples of full call signs and abbreviated call signs

	Type (a)		Type (b)	Type (c)
Full call sign	ABCDE	AIRBUS ABCDE	RUSHAIR ABCDE	RUSHAIR 1234
Abbreviated call sign	ADE or ACDE	AIRBUS DE or AIRBUS CDE	RUSHAIR DE or RUSHAIR CDE	No abbreviated form.

Type (a) The first character of the registration and at least the last two characters of the full call sign (the name of the aircraft manufacturer or model may be used in place of the first character);

Type (b) The telephony designator of the aircraft operating agency, followed by at least the last two characters of the call sign;

Type (c) No abbreviated form.

3.6. Most airline call signs belong to type (c) for which there is no abbreviation. Therefore, abbreviations such as "RUSHAIR 34" are not permissible.

3.7. An aircraft is not permitted to change its call sign during flight, except temporarily on the instruction of an air traffic control unit in the interests of safety.

3.8. In order to avoid any possible confusion, when issuing ATC clearances and reading back such clearances, controllers and pilots must always add the call sign of the aircraft to which the clearance applies.

4. Numeric v. alphanumeric call signs

4.1. Many airlines continue to use their IATA commercial flight numbers as call sign suffixes. However, because they tend to be allocated in batches of sequential and very similar numbers, call sign confusion occurs.

4.2. Several airlines have switched to alphanumeric call signs reasonably successfully in recent years. However, if every operator adopts alphanumeric call signs, the limited choices available within the maximum of 4 elements allowed within a call sign suffix means that call sign confusion, similar to the existing numeric system, is likely to result.

4.3. Before changing to an effective all-alphanumeric call sign system, which involves a significant amount of work, it is recommended that operators review their existing numeric call sign system to deconflict any similar numeric call signs. Where there is no solution to those call signs that have a potential for numeric confusion, alphanumeric call signs can be adopted.

5. Selection of call signs

5.1. The best defence against call sign confusion consists in eliminating, or reducing to an absolute minimum, the chance of having two (or more) aircraft with phonetically similar call signs on the same RTF frequency at the same time.

5.2. To be effective, such a strategy requires action on a regional and international basis. Call sign suffixes must be allocated according to a deliberate, coordinated policy that prevents a confliction arising in the first place.

5.3. Until such a strategy is in place, aircraft operators should attempt to assign call signs in such a way that confliction with their own and other scheduled traffic does not arise.

5.4. Where commercial flight numbers are not used, operators should ensure that airport information systems can cope with the conversion of RTF call signs (for ATC use) to commercial flight numbers (for passenger and airport use).

5.5. Practical experience, reinforced by the reports referred to in Section 2 above, suggests that certain formats are especially likely to lead to confusion. Examples are: number sequences beginning with a low number; long number sequences (four or more); repeated digits; and letter sequences which correspond with the last two letters of the destination ICAO location indicator. Examples are given in recommendations 6.3-6.7 below.

6. Recommendations for aircraft operators

6.1. Avoid the use of similar numeric call signs within the company. Effectively, this means, do not use commercial flight numbers as call signs.

6.2. Coordinate with other operators to reduce to a minimum any similar numeric and alphanumeric elements of call signs.

6.3. Start flight number element sequences with a higher number (e.g. 6).

6.4. Do not repeatedly use call signs involving four digits and, wherever possible, use no more than three digits.

6.5. Do not use the same digit repeated (e.g. RUSHAIR 555).

6.6. If alphanumeric suffixes are to be used, coordinate letter combinations with other airspace and airport users.

6.7. Do not use alphanumeric call signs which correspond to the last two letters of the destination's ICAO location indicator (e.g. RUSHAIR 25LL for a flight inbound to London Heathrow).

6.8. Use some numeric and some alphanumeric call signs (rather than all numeric or all alphanumeric).

6.9. If similarly numbered call signs are inevitable, allow a significant time and/or geographical split between aircraft using similar call signs.

6.10. When useful capacity in the allocation of call signs has been reached, apply for and use a second company call sign designator.

6.11. Do not use similar/reversed digits/letters in alphanumeric call signs (e.g. RUSHAIR 87MB and RUSHAIR 78BM).

6.12. Implement a call sign deconfliction programme within your airline, to review and if necessary amend call signs.

7. Recommendations for flight crew

7.1. Always use headsets during times of high RTF loading. Always wear a headset when members of the flight crew are involved in other tasks and may not be monitoring the RTF.

7.2. Do not clip transmissions.

7.3. Use full RTF call signs at all times, unless call sign abbreviation has been introduced by ATC.

7.4. Use correct RTF procedures and discipline at all times.

7.5. If in doubt about an ATC instruction, do not use readback for confirmation. Instead, positively confirm instructions with ATC. This procedure should also be followed if any doubt about a clearance exists between flight crew members.

7.6. Question unexpected instructions for any stage of flight.

7.7. Take extra care when members of the flight crew are involved in other tasks and may not be monitoring the RTF.

7.8. At critical stages of flight actively monitor ATC instructions and compliance with them.

7.9. Advise ATC if any of the following situations is observed:
(a) two or more aircraft with similar call signs are on the RTF frequency;
(b) it is suspected that an aircraft has taken a clearance not intended for it;
(c) it is suspected that another aircraft has misinterpreted an instruction;
(d) a blocked transmission is observed.

7.10. Although not an official procedure, many pilots hearing that two transmissions block each other call out "Blocked", after which all transmitting parties try once more to pass their messages.

7.11. After a flight where an actual or potential call sign confusion incident is observed, file a report using the national mandatory incident reporting system or voluntary incident reporting system as appropriate.

8. Recommendations for air navigation service providers

8.1. Ensure that aircraft operators are made aware of any actual or potential call sign confusion reported by air traffic controllers.

9. Recommendations for air traffic controllers

9.1. Use correct RTF phraseology, procedures and discipline at all times.

9.2. Do not clip transmissions.

9.3. Ensure clearances are read back correctly. Do not use read-back time to execute other tasks.

9.4. Monitor flight crew compliance with RTF call sign use.

9.5. Take extra care when language difficulties may exist.

9.6. Advise adjacent sectors/airports if it is felt that potential confusion may exist between aircraft likely to enter their airspace.

9.7. Warn the pilots of aircraft on the same RTF frequency having similar call signs that call sign confusion may occur. If necessary, instruct one or both aircraft to use alternative call signs while they are on the frequency.

9.8. A transmission could be blocked when two or more aircraft are responding to the same clearance. Typically the controller would hear a partial or garbled readback. If a blocked transmission is suspected, ensure that both aircraft retransmit their messages and confirm carefully that a clearance has not been taken by an aircraft for which it was not intended.

9.9. Where an actual or potential call sign confusion incident is observed, file a report using the national mandatory incident reporting system or voluntary incident reporting system as appropriate.

10. Resources

Other Air-Ground Communication (AGC) Briefing Notes

10.1. There are five AGC Briefing Notes in this series, of equal applicability to flight operations and air traffic management:

- No 1: General;
- No 2: Call sign confusion;
- No 3: Loss of communication;
- No 4: Blocked transmissions; and,
- No 5: Radio discipline

Access to resources

10.2. Most of the resources listed may be accessed free of charge from the Internet. Exceptions are:

- ICAO documents, which may be purchased direct from ICAO;
- Certain Flight Safety Foundation (FSF) Documents, which may be purchased direct from FSF;
- Certain documents produced by the Joint Aviation Authorities, which may be purchased from JAA. Regulatory Resources

10.3. Documents produced by regulatory authorities such as ICAO, JAA and national aviation authorities are subject to amendment. Reference should be made to the current version of the document to establish the effect of any subsequent amendment.

- ICAO – Annex 10 – Aeronautical Telecommunications, Volume II – Communication Procedures including those with PANS status, Chapter 5 – Aeronautical Mobile Service Voice Communications, Section 5.2.1.7;
- ICAO Doc 8585 – Designators for Aircraft Operating Agencies, Aeronautical Authorities and Services;
- ICAO Doc 9432 – Manual of Radiotelephony.

Training material and incident reports

- FSF ALAR Toolkit – Briefing Note 2.3 – Effective Pilot/Controller Communications.

Other resources

- EUROCONTROL – Air-Ground Communication Safety Study: An Analysis of Pilot-Controller Communications;
- EUROCONTROL – Air-Ground Communication Safety Study: Causes and Recommendations;
- FAA Report – An Analysis of Ground Controller-Pilot Voice Communications;
- FSF Accident Prevention Volume 47 No 6 – My Own Mouth shall Condemn Me;
- UK CAA Aeronautical Information Circular (AIC) 107/2000 – Call sign Confusion;
- UK CAA Safety Sense – RT Discipline (for Pilots & ATC);
- UK CAA CAP 701 Aviation Safety review 1990-1991;
- UK CAA CAP 704 – Aircraft Call Sign Confusion Evaluation Safety Study (ACCESS).

Air-Ground Communications Briefing Note
3- Loss of communication

1. Introduction

1.1. Loss of communication incidents usually result from one of three main causes:
(a) radio interference;
(b) frequency change; or,
(c) communication equipment problems.

1.2. Pilot workload, frequency congestion, similar call sign and language problems are also factors in some cases.

1.3. Loss of communication may be brief (e.g. when the pilot de-selects the radio to make a PA call, not realising that the other pilot is not monitoring the frequency), or prolonged (e.g. in the case of "sleeping receiver").

1.4. Prolonged loss of communication (PLOC) has not yet been officially defined. Typically, PLOC involves loss of communication measured in minutes. The term COMLOSS is used by the military to refer to PLOC.

1.5. Whether brief or prolonged, loss of communication has obvious flight safety significance; possible dangerous outcomes include the following:
(a) failure to receive (and therefore to follow) a new clearance, leading to loss of separation and perhaps an AIRPROX;
(b) inability to pass important information to ATC;
(c) the workload of controllers and pilots is increased because of the necessity to resolve the confusion.

1.6. Since 11 September 2001 PLOC events have assumed greater security significance, because controllers are unable to distinguish between communications failure and a loss of communication due to potentially sinister causes. On several occasions, military aircraft have been scrambled to intercept aircraft which are experiencing PLOC.

1.7. A recent EUROCONTROL report[1] based on a study carried out by the Dutch National Research Laboratory (NLR) found that 40% of all "loss of communication" occurrences resulted in PLOC, while the frequency of PLOC occurrences approximately reflected the amount of time spent in each phase of flight.

1.8. Reports following interception by military aircraft suggest that civil pilots do not routinely monitor the international emergency frequency (121.5 MHz), since the military pilots involved were unable to contact the civil pilots on that frequency.

1.9. If for any reason communications on the designated frequency are lost, pilots should be able to refer to a list of alternative frequencies in use on their sector.

2. Radio interference

2.1. "Radio interference" is the term used to describe a range of different situations in which transmissions other than those from authorised users of an RTF frequency interfere with radio reception. Full discussion of this subject is included in Briefing Note 4 – Blocked transmissions.

1 - Air-ground Communication Safety Study – An analysis of pilot-controller occurrences

3. Frequency change

3.1. The process of changing frequency offers many possibilities for error, for example:
(a) controller assigns incorrect frequency;
(b) pilot mis-hears frequency assignment (perhaps due to radio interference);
(c) pilot hears frequency correctly but makes an error when setting it;
(d) pilot sets frequency correctly but fails to select radio;
(e) pilot mis-sets volume or squelch control;
(f) pilot anticipates next frequency and selects it on the panel, but ATC assigns another frequency.

3.2. Frequency change occurrences are often of short duration because the pilot realises on checking in that he/she is on the wrong frequency: either the frequency is silent, in which case the pilot returns to the previous frequency, or it is active, in which case the controller directs the pilot to the correct frequency.

3.3. Frequency change incidents can have serious consequences if the pilot is unable to re-establish contact quickly. This might occur if the previous frequency is very busy, or if the aircraft is out of range of the previous controlling station.

3.4. Frequency change occurrences are most likely to occur in areas of high density air traffic, especially during climb and descent, where many frequency changes are required as the aircraft is passed from one agency to another. Since these occasions coincide with periods of high pilot work-load, there is an enhanced likelihood that an error in copying the frequency or in setting it correctly will go undetected.

4. Communication equipment problems

4.1. The EUROCONTROL report[1] already refers to found that the most common factors contributing to communication equipment problems were:
(a) sleeping VHF receivers (53%)
(b) radio equipment malfunction – air (17%);
(c) radio equipment malfunction – ground (15%); and
(d) stuck microphones (6%).

Sleeping receivers

4.2. "Sleeping receiver" is the term used to describe incidents when the radio apparently goes dead so that no incoming calls are heard, either those directed to the flight or those between ATC and other flights. Usually, the situation continues until the aircraft transmitter is keyed – often because the pilots have noticed the silence and wish to check their receiver; thereafter, radio operation is normal.

4.3. At first, the rate of occurrences was low – around one or two per month – and concentrated in Terminal Control Area (TMA) airspace. From about the summer of 2001, the rate of reported loss of communications began to increase and this rate now appears to be constant. Additionally, it has become apparent that the geographical extent of these incidents is not confined to UK airspace and involves other areas.

4.4. It seems probable that many cases of "sleeping receiver" go unreported, possibly because those involved suspect that communication was lost through some other cause (e.g. poor radio propagation, their own

inattentiveness, or equipment mishandling). When the first incidents were reported in the late 1990's there was widespread scepticism that the phenomenon actually existed; it may be that similar scepticism still exists in parts of Europe.

4.5. The sleeping receiver phenomenon has been the subject of much research in recent years. Possible causes under investigation include interference sources from inside or outside the aircraft from various spectrum bands (e.g. from mobile telephones or paging systems), receiver design, receiver software, etc. To date, these investigations have been inconclusive.

Radio equipment malfunction

4.6. Radio equipment malfunction can include inadvertent changing of correctly set radio controls, especially in a cramped cockpit.

5. General recommendation

5.1. In order to increase the knowledge base and so aid the identification and understanding of the causes of PLOC, operators and air navigation service providers (ANSPs) should give wide publicity to the issue. This publicity should be extended to ground engineers and cabin crew.

6. Recommendations for operators

6.1. Ensure that flight crews, cabin crews and ground engineers are aware of the loss of communications issue through publicity.

6.2. Ensure that company policy for the monitoring of 121.5 MHz is in accordance with ICAO recommendations and is contained in operating manuals. Do not refer to 121.5 MHz as a Guard frequency: 121.5 MHz is an Emergency frequency.

6.3. Ensure that standard operating procedures (SOPs) for copying, setting and cross-checking frequency changes are practical and effective, and that they are followed by all pilots.

6.4. Ensure availability of an updated list of sector frequencies for all flight plan routes as part of SOPs (pre-flight preparation activity).

6.5. Review radio equipment fitted to aircraft in your fleet and install anti-blocking devices if appropriate.

6.6. Investigate communications redundancy, including establishing clear procedures for the use of commercial telephone links in the event of PLOC.

7. Recommendations for pilots

7.1. Be alert to the possibility of loss of communication.

7.2. Do not switch immediately to the next sector frequency following read-back of the controller's instruction. Ensure confirmation of your read-back is received.

7.3. Always follow standard procedures for copying, setting and cross-checking RTF frequencies. As soon as a loss of communication is suspected, check radio equipment settings and carry out a radio check.

7.4. Always use headsets during times of high RTF loading. Always wear a headset when members of the flight crew are involved in other tasks and may not be monitoring the RTF.

7.5. Check the audio panel settings after any use of the passenger address system.

7.6. If any part of a message for you is garbled or unclear, request confirmation or clarification (i.e. "say again…").

7.7. If in doubt about an ATC instruction, do not use read back for confirmation. Instead, positively confirm instructions with ATC. This procedure should also be followed if any doubt about a clearance exists between flight crew members.

7.8. On observing any radio interference, note the nature and effect of the interference, time and position of commencement, time and position where the interference ceased, and any other factors that would help the authorities to identify the source.

7.9. If the squelch control is adjusted to reduce the effect of interference, take care to ensure that transmissions from ATC or other aircraft are not cut out.

7.10. Always report any radio interference experienced whether or not it affected safe operation.

7.11. If in your opinion interference affects safe aircraft operation, request a frequency change. If the interference prevents satisfactory communication with your assigned ATC unit, request instructions using another listed frequency.

7.12. When conditions permit pass full information concerning interference to the ATC unit affected. Additionally, report the incident to your national authority using the mandatory occurrence reporting scheme.

7.13. If unable to establish contact on a new frequency, check all equipment settings (including volume) and return to previous frequency if contact is not quickly established.

7.14. Make use of other aircraft to relay messages when operating at extreme range or when poor propagation is suspected.

7.15. Inform cabin crew of any suspected "sleeping receiver" occurrence and ask for any relevant information (e.g. recent use of cabin address, or portable electronic equipment).

7.16. Follow company procedures for the monitoring of 121.5 MHz. If PLOC is suspected, select 121.5 MHz and listen out for any transmission from intercepting aircraft.

8. Recommendations for air navigation service providers

8.1. Ensure that all controllers are aware of the loss of communications issue through publicity.

8.2. Ensure that communications with aircraft are only undertaken within the Designated Operational Coverage (DOC) for the frequency being used.

8.3. Ensure that proper procedures are promulgated for PLOC and interceptions of aircraft.

8.4. Ensure that controller responsibilities in the case of an interception of a civil aircraft are clearly laid down.

8.5. Investigate communications redundancy, including establishing clear procedures for the use of commercial telephone links in case of PLOC.

9. Recommendations for controllers

9.1. Do not pass on RTF frequency changes as part of a multi-part clearance.

9.2. Do not delay passing on any vital instruction until after a frequency change (e.g. heading or level change to avoid confliction).

9.3. Pay close attention to read-back of RTF frequency changes and correct any error.

9.4. On observing or being informed of radio interference, arrange for transfer of affected aircraft to another RTF frequency.

9.5. When conditions permit, request full details of the incident, including the nature and effect of the interference, time and position of commencement and time and position where the interference ceased.

9.6. Report any radio interference to the appropriate national authorities, which in the case of malicious interference should be the police.

9.7. Also report any radio interference incidents using your national mandatory incident reporting scheme.

9.8. If loss of communication is suspected, attempt to contact the aircraft by other means, including relay through other aircraft (which may also be prepared to attempt contact using 121.5 MHz), through the previous operating agency/RTF frequency and through the operator, who may be able to contact the aircraft by other means, e.g. SELCAL or ACARS.

9.9. Make use of other aircraft to relay messages when you believe aircraft is operating at extreme range or in conditions of poor propagation.

9.10. If attempts to restore two-way communications with the aircraft are unsuccessful, inform the appropriate military authorities. Keep the military authorities informed of action taken by the ATS unit as well as any further action intended.

9.11. When contact is not quickly established, do not delay precautionary clearance to conflicting aircraft on frequency on the assumption that contact will soon be established.

10. Resources

Other Air-Ground Communication (AGC) Briefing Notes

10.1. There are five AGC Briefing Notes in this series, of equal applicability to flight operations and air traffic management:

- No 1: General;
- No 2: Call sign confusion;
- No 3: Loss of communication;
- No 4: Blocked transmissions; and,
- No 5: Radio discipline.

Access to resources

10.2. Most of the resources listed may be accessed free of charge from the Internet. Exceptions are:

- ICAO documents, which may be purchased direct from ICAO;
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- Certain documents produced by the Joint Aviation Authorities, which may be purchased from JAA.

Regulatory resources

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- ICAO – Annex 10 – Aeronautical Telecommunications, Volume II – Communication Procedures including those with PANS status, Chapter 5 – Aeronautical Mobile Service Voice Communications, Section 5.2.1.7;
- ICAO Doc 9432 – Manual of Radiotelephony.

Training material and incident reports

- FSF ALAR Toolkit – Briefing Note 2.3 – Effective Pilot/Controller Communications.

Other resources

- EUROCONTROL – Air-Ground Communication Safety Study: An Analysis of Pilot-Controller Communications;
- Eurocontrol – Air-Ground Communication Safety Study: Causes and Recommendations;
- Findings of the COMLOSS/PLOC database – EUROCONTROL, November 2004;
- FAA Report – An Analysis of Ground Controller-Pilot Voice Communications;
- FSF Accident Prevention Volume 47 No 6 – My Own Mouth shall Condemn Me;
- UK CAA Flight Operations Department Communication FODCOM 16/2002
- UK CAA Safety Sense – RT Discipline (for Pilots & ATC)

Air-Ground Communications Briefing Note
4- Blocked transmissions

1. Introduction

1.1. With the steady growth of air traffic worldwide there is a corresponding increase in the incidence of blocked or simultaneous transmissions. These frequently result in dangerous situations developing, especially when they go undetected.

1.2. Simultaneous transmission by two stations results in one of the two (or both) transmissions being blocked and unheard by the other stations (or being heard as a buzzing sound or as a squeal).

1.3. Radio interference caused by unauthorised transmissions or breakthrough from commercial stations can have a similar effect, causing reception difficulties or the loss of all or part of a message.

1.4. Possible dangerous outcomes include the following:

(a) a flight takes a clearance intended for another flight and takes action, e.g. alters heading or level, with resultant loss of separation;

(b) a flight misses all or part of a clearance intended for it and maintains its level and/or heading, bringing it into conflict with other flights;

(c) a controller assumes that a message received is from a different flight and issues inappropriate instructions;

(d) a controller fails to note error in read back (including wrong call sign) and does not correct the error (hear back error);

(e) unacceptable delay in establishing RTF contact or in issuing a clearance or passing a message;

(f) the workload of controllers and pilots is increased due to the necessity to resolve the confusion.

1.5. The high volume of air traffic has made necessary various ATC procedures and technical activities which may increase the probability of simultaneous transmission.

2. Simultaneous transmission

2.1. The operation of large numbers of aircraft in the same airspace increases the likelihood of simultaneous transmission, especially when the volume of traffic approaches the maximum handling capacity of the controller.

2.2. Where an RTF frequency is congested, pilots feel obliged to transmit as soon as they believe a previous transmission is complete in order to get their message across. This often leads to simultaneous transmissions.

2.3. The use of multiple RTF frequencies by the same controller can increase the chance of simultaneous transmission if pilots on different RTF frequencies are unaware of each other's transmissions.

2.4. Band-boxing of sectors has a similar effect to the use of multiple RTF frequencies (paragraph 2.3) because the different sectors are normally controlled on different RTF frequencies.

2.5. Cross-coupling of RTF frequencies is often employed to improve pilot and controller situational awareness: transmissions on one frequency are simultaneously retransmitted on the second. However cross-coupling can give rise to enhanced probability of simultaneous transmission due to the increased number of audible transmissions.

2.6. Best Signal Selection (BSS) is sometimes employed within air traffic control units to prevent two simultaneous transmissions from corrupting each other so that neither is intelligible. BSS compares the strength of simultaneous transmissions and automatically suppresses the weaker. Because the controller does not hear the weaker transmission it is likely that the simultaneous transmission will go undetected.

2.7. Where similar call signs are in use, there is an increased probability of the wrong aircraft taking a clearance, especially if the call sign is blocked or garbled. Similarly, a controller may not detect a read-back error if the transmission is partially blocked. The use of similar call signs greatly increases the probability that a call taken by the wrong aircraft will go undetected.

2.8. Blocked transmissions may also result if the push-to-talk switch is not immediately released after a communication.

2.9. An excessive pause in a message (i.e. holding the push-to-talk switch while preparing the next item of the transmission) may lead others to believe that the transmission is complete; this may result in the response or part of another message being blocked.

2.10. The absence of a read-back from the pilot should be treated as a blocked transmission and prompt a request to repeat or confirm the message.

2.11. In practice, most pilots are unlikely to treat the absence of a hear back acknowledgement from the controller as evidence of a blocked transmission, and only question the controller if they are uncertain that the read-back was correct or have other reasons to suspect a blocked transmission.

2.12. Although not official procedure, some pilots make a practice of alerting controllers and other pilots to an apparent blocked or garbled transmission by saying "Blocked" immediately afterwards. This practice should be encouraged.

3. Radio interference

3.1. "Radio interference" is the term used to describe a range of different situations in which transmissions other than those from authorised users of an RTF frequency interfere with radio reception.

3.2. Radio interference often comes from commercial stations on the ground. These occurrences, which are very annoying to pilots, can make communication with controllers difficult or even impossible. This form of interference may result when an unauthorised transmitter is established on a frequency close to the aeronautical frequency, or on one of its sub-harmonic frequencies.

3.3. Radio interference can also result from a variety of legal but unintended sources, ranging from the familiar static generated in thunderstorm clouds to break-through from ground-based two-way radio systems.

3.4. In unusual propagation conditions, transmissions from authorised aeronautical transmitters may interfere with transmissions from stations which are well beyond its protected range.

3.5. Finally, there have been rare occasions when an unauthorised station has made malicious transmissions on an aeronautical frequency, presumably with the intention of misleading pilots. This form of interference is usually fairly obvious because the transmissions lack credibility due to their non-standard timing, content

or form; however, such transmissions made at critical stages, e.g. during the take-off run, can have potentially very dangerous consequences.

3.6. In many cases, ATC receivers are not affected by radio interference, because their antennas are close to the ground and are screened from the source of the interference.

3.7. In most cases of radio interference the short-term remedy is to change frequency. On notification that a frequency is unusable, ATC will assign a new frequency. However, in extreme cases, aircraft may not be able to hear the assigned frequency. In this case, aircraft should request instructions on another listed frequency for the facility in use.

3.8. Careful adjustment of the radio squelch control may reduce the effect of interference.

3.9. All cases of radio interference should be reported using the national mandatory occurrence reporting scheme.

3.10. Cases of malicious interference should be investigated by the police, with the objective of identifying and prosecuting the culprit.

3.11. Interference from other sources should also be reported to ATC, who should pass the information on to the appropriate national authorities so that the source of interference can be detected and arrangements made to prevent recurrence.

4. General recommendations

4.1. Whenever there is a busy frequency or there are aircraft with similar call sign on the same frequency, both pilots and controllers should be aware of blocked transmissions. A stuck microphone can lead to blocked transmissions and can be prevented by the use of anti-blocking devices.

4.2. Until technological solutions are identified and introduced, strict observance of standard RTF procedures and phraseology, including rigorous application of the read-back – hear-back process, will remain the best defence against simultaneous transmissions and will also aid the correct interpretation of messages in conditions of radio interference.

4.3. ANSPs should review the RTF communication equipment and operating procedures in use in their units to identify any shortcomings which may increase the risk of simultaneous transmission.

4.4. Air traffic controllers must be familiar with the characteristics and limitations of the RTF equipment they operate. In particular, they must have detailed information on RTF cross-coupling and BSS functionality if used, including the process itself, how it should be used and the problems inherent in the system.

5. Recommendations for aircraft operators

5.1. Review radio equipment fitted to aircraft in your fleet and install anti-blocking devices if appropriate.

5.2. Insist on high standards of RTF discipline by flight crew.

5.3. Ensure that flight crew training programmes stress the causes and dangers of blocked and simultaneous transmissions.

6. Recommendations for flight crew

Blocked and Simultaneous Transmissions

6.1. Always use headsets during times of high RTF loading.

6.2. Use correct RTF phraseology[1], procedures and discipline at all times.

6.3. Do not clip transmissions.

6.4. Use full RTF call sign at all times.

6.5. Release press-to-transmit switch between elements of a message.

6.6. Listen carefully before you transmit to ensure that you do not block another transmission.

6.7. If any part of a message for you is garbled or unclear, request confirmation or clarification.

6.8. If in doubt about an ATC instruction, do not use read-back for confirmation. Instead, positively confirm instructions with ATC. This procedure should also be followed if any doubt exists between flight crew members.

6.9. Question unexpected instructions for any stage of flight.

6.10. Take extra care when members of the flight crew are involved in other tasks and may not be monitoring the RTF.

6.11. Take care to ensure that you do not take a message intended for another aircraft. Listen carefully to the call sign and if it is unclear, request confirmation.

6.12. If you hear an apparently blocked or garbled transmissions, call "Blocked" immediately afterwards to warn the pilots and controller involved.

6.13. After a flight where a blocked or simultaneous transmission is observed, file a report using the national mandatory incident reporting system or voluntary incident reporting system as appropriate.

1- Refer to AGC Briefing Note 5: Radio discipline

Radio interference

6.14. On observing any radio interference, note the nature and effect of the interference, time and position of commencement, time and position where the interference ceased, and any other factors that would help the authorities to identify the source.

6.15. If the squelch control is adjusted to reduce the effect of interference, take care to ensure that transmissions from ATC or other aircraft are not cut out.

6.16. Always report any radio interference experienced whether or not it affected safe operation.

6.17. If in your opinion interference affects safe aircraft operation, request a frequency change. If the interference prevents satisfactory communication with your assigned ATC unit, request instructions using another listed frequency.

6.18. When conditions permit, pass on full information concerning interference to the ATC unit affected. Additionally, report the incident to your national authority using the mandatory occurrence reporting scheme.

7. Recommendations for air navigation service providers

7.1. Review the RTF communication equipment and operating procedures in use in your units to ensure that the correct balance between the benefits and shortcomings of systems such as cross-coupling and BSS is maintained.

7.2. In the case of coupling multiple RTF channels, priority should be given to duplex (allowing audible simultaneous transmission) against simplex coupling.

7.3. If a controller is providing ATS for two or more areas, the relevant channels must be located on the controller working position being used. Preferably, channels should be cross-coupled to prevent simultaneous transmissions by aircraft.

7.4. Future systems should include technology that warns the controller in the event of a simultaneous transmission.

7.5. Ensure high standards of RTF discipline by air traffic controllers.

8. Recommendations for air traffic controllers

Blocked and simultaneous transmissions

8.1. Ensure that you are familiar with the characteristics and limitations of the RTF equipment you operate. In particular, you should have detailed information on RTF cross-coupling and BSS functionality if used, including the process itself, how it should be used and the problems inherent in the system.

8.2. Use correct RTF phraseology[2], procedures and discipline at all times.

8.3. Do not clip transmissions.

8.4. Ensure clearances are read back correctly. Do not use read-back time to execute other tasks.

8.5. Monitor flight crew compliance with RTF call sign use.

8.6. Take extra care when language difficulties may exist.

8.7. When collapsing or de-collapsing sectors, communicate the frequency plan to the adjacent centres/positions and monitor the closed frequencies for the transitional period.

8.8. If a blocked transmission is suspected, ensure that both aircraft retransmit their messages and confirm carefully that a clearance has not been taken by an aircraft for which it was not intended.

8.9. Where a blocked or simultaneous transmission is observed, file a report using the national mandatory incident reporting system or voluntary incident reporting system as appropriate.

8.10. When collapsing or de-collapsing sectors, the frequency plan should be communicated to the adjacent centres/positions and the closed frequencies should be monitored for the transitional period;

Radio interference

8.11. On observing or being informed of radio interference, arrange for transfer of affected aircraft to another RTF frequency.

8.12. When conditions permit, request full details of the incident, including the nature and effect of the interference, time and position of commencement and time and position where the interference ceased.

8.13. Report any radio interference to the appropriate national authorities, which in the case of malicious interference should be the police.

8.14. Also report any radio interference incidents using your national mandatory incident reporting scheme.

2 - Refer to AGC Briefing Note 5: Radio Discipline

9. Resources

Other Air-Ground Communication (AGC) Briefing Notes

9.1. There are six AGC Briefing Notes in this series, of equal applicability to flight operations and air traffic management:

- No 1: General;
- No 2: Call sign confusion;
- No 3: Loss of communication;
- No 4: Blocked transmissions; and,
- No 5: Radio discipline.

Access to resources

9.2. Most of the resources listed may be accessed free of charge from the Internet. Exceptions are:

- ICAO documents, which may be purchased direct from ICAO;
- Certain Flight Safety Foundation (FSF) Documents, which may be purchased direct from FSF;
- Certain documents produced by the Joint Aviation Authorities, which may be purchased from JAA.

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9.3. Documents produced by regulatory authorities such as ICAO, JAA and national aviation authorities are subject to amendment. Reference should be made to the current version of the document to establish the effect of any subsequent amendment.

- ICAO – Annex 10 – Aeronautical Telecommunications, Volume II – Communication Procedures including those with PANS status, Chapter 5 – Aeronautical Mobile Service Voice Communications, Section 5.2.1.7;
- ICAO Doc 9432 – Manual of Radiotelephony.

Training material and incident reports

- FSF ALAR Toolkit – Briefing Note 2.3 – Effective Pilot/Controller Communications.

Other resources

- EUROCONTROL – Air-Ground Communication Safety Study: An Analysis of Pilot-Controller Occurrences;
- EUROCONTROL – Air-Ground Communication Safety Study: Causes and Recommendations;
- FAA Report – An Analysis of Ground Controller-Pilot Voice Communications;
- FSF Accident Prevention Volume 47 No 6 – My Own Mouth shall Condemn Me;
- UK CAA Aeronautical Information Circular (AIC) 107/2000 – Call sign confusion;
- UK CAA Safety Sense – RT Discipline (for Pilots & ATC)

Air-Ground Communications Briefing Note
5- Radio discipline

1. Introduction

1.1. Communication between pilots and air traffic controllers is a process that is vital to the safe and efficient control of air traffic. Pilots must report their situation, intentions and requests to the controller in a clear and unambiguous way; and the controller must respond by issuing instructions that are equally clear and unambiguous. Although data link communication has reached an advanced stage of development, verbal communication is likely to remain the prime means of air-ground communication for many years.

1.2. It is of course important that radio equipment should be reliable and easy to use, and should be capable of conveying the spoken word clearly and without distortion over long distances. However, the process of communication is equally important and must be successful even in the most difficult conditions. Good radio discipline is essential to this process.

1.3. 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.

1.4. Standardised 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.

1.5. Other factors such as the format and content of the message, language and the speed and timeliness of transmissions also make important contributions to the communications process.

1.6. Finally, the read-back/hear-back process ensures that the transmitted message has been received and correctly understood.

1.7. A recent study[1] carried out for EUROCONTROL by the Dutch National Aerospace Laboratory (NLR) makes many recommendations based on an analysis of a large number of incidents reported in the European area.

2. Standard phraseology

2.1. International standards of phraseology are laid down by ICAO[2]. The most important of these are repeated in Section 3 below.

2.2. Many national authorities also publish radiotelephony manuals which amplify ICAO provisions, and in some cases modify them to suit local conditions (see paragraph 2.9).

2.3. This briefing note is not intended to replace ICAO or national documentation, but to supplement it.

2.4. Standard phraseology in pilot-controller communication is intended to be universally understood.

1 - Air-Ground Communication Safety Study: Causes and Recommendations;
2 - ICAO Annex 10 Volume II Chapter 5 and in ICAO Doc 9432 – Manual of Radiotelephony

2.5. Standard phraseology helps lessen the ambiguities of spoken language and thus facilitates a common understanding among speakers:
(a) of different native languages; or,
(b) of the same native language, but who use, pronounce or understand words differently.

2.6. While the importance of standard phraseology is generally accepted, non-standard phraseology is a major obstacle to effective communications.

2.7. Non-standard phraseology or the omission of key words may completely change the meaning of the intended message, resulting in potential traffic conflicts. For example, any message containing a number should indicate what the number refers to (e.g. a flight level, a heading or an airspeed). Inclusion of key words prevents erroneous interpretation and allows for effective read-back/hear-back.

2.8. Particular care is necessary when certain levels are referred to because of the high incidence of confusion between, for example, FL100 and FL110.

2.9. Non-standard phraseology is sometimes adopted unilaterally by national or local air traffic services, or is used by pilots or controllers in an attempt to alleviate problems; however, standard phraseology minimises the potential for misunderstanding. Sections 9&10 list examples of phraseology which have been adopted for use by certain countries, but which are contrary to ICAO phraseology.

3. Message format and content

3.1. The text of the message should be as short as practicable to contain the necessary information.

3.2. The capacity of short-term memory is fairly limited: the maximum number of unrelated items that can be maintained is about seven. This has important implications for the amount of information that should be included in any single RTF message. Once this limit is exceeded, one or more items are likely to be lost or transposed.

4. Language

4.1. Language is potentially the greatest barrier to good communication. Because English has become a shared language in aviation, an effort has been initiated to improve the English-language skills of pilots and controllers worldwide. Nevertheless, even pilots and controllers for whom English is the native language may not understand all words spoken in English, because of regional accents or dialects.

4.2. In many regions of the world language differences generate other communication difficulties. For example, controllers using both English (for communication with international flights) and the country's official language (for communication with domestic flights) hinder some flight crews from achieving the desired level of situational awareness (loss of "party-line communications")[3].

3 - See Air-Ground Communication Safety Study: Causes and Recommendations

5. Speed of transmission

5.1. ICAO recommends that the speech transmitting technique should be such that the highest possible intelligibility is incorporated in each transmission. Speech rate should be adjusted to allow clearances etc. to be written down if necessary.

6. Timeliness of communication

General

6.1. Deviation from an ATC clearance may be required for operational reasons (e.g. a heading deviation or altitude deviation for weather avoidance, or an inability to meet a restriction).

6.2. Both the pilot and the controller need time to accommodate this deviation; therefore ATC should be notified as early as possible.

Pilot workload

6.3. Pilots have many tasks to perform; these are normally shared between the pilot flying (PF) and the pilot not flying (PNF) (pilot monitoring). At all times, one pilot is responsible for operation of the radios, although both pilots normally listen to calls directed to them when other duties permit.

6.4. In addition to operational messages from air traffic control (ATC), the pilots have to make administrative calls to handling agents, airline operations, etc., and listen to voice weather broadcasts and the automated terminal information service (ATIS).

6.5. Periods of very high workload include:
(a) engine start, taxi, take-off and initial climb, standard instrument departure (SID);
(b) descent, approach and landing;
(c) abnormal situations such as equipment malfunction or extreme weather; and,
(d) emergency situations.

6.6. Multiple frequency changes are often given during high workload periods following take-off and during the SID. This can cause confusion and distraction from important monitoring tasks.

6.7. Controllers may not be able to avoid passing or revising clearances during periods of high workload. However, by understanding when these occur, by passing on clearances as early as possible and by carefully monitoring readback, they can reduce the possibility of error. Further improvements may be possible by taking account of likely flight-deck workload when designing or revising ATC procedures.

7. Read-back/Hear-back

7.1. ICAO Annex 11[4] requires that the safety-related part(s) of any clearance or instruction must be read back to the air traffic controller. Controllers must insist on an accurate read-back of clearances, both after initial issue and after any correction.

4 - Refer to ICAO Annex 11 Chapter 3 Section 3.7.3.

7.2. The action of reading back a clearance gives the controller an opportunity to confirm that the message has been correctly received, and if necessary, to correct any errors.

7.3. The pilot's read-back must be complete and clear to ensure a complete and correct understanding by the controller.

7.4. The absence of an acknowledgement or a correction following a clearance readback is perceived by most flight crews as an implicit confirmation of the read-back.

7.5. The absence of acknowledgement by the controller is usually the result of frequency congestion and the need for the controller to issue clearances to several aircraft in succession.

7.6. An uncorrected erroneous readback (known as a hear-back error) may lead to a deviation from the cleared altitude or non-compliance with an altitude restriction or with a radar vector.

7.7. A deviation from an intended clearance may not be detected until the controller observes the deviation on his/her radar display.

Short-term record

7.8. Some air traffic control centres provide controllers with a short-term recorder operated from the communications panel. Activation of the equipment plays back recorded messages in reverse chronological order, so that the last received message is played back first. When a controller is unsure of the correctness of a read-back, for example because the pilot has a heavy accent and is difficult to understand, use of this facility obviates the needed for repeated read-backs. In busy situations, this task can be delegated to the planner.

7.9. Short-term record is also a valuable tool for training, allowing the trainees to play back all their instructions, to correct their phraseology, intonation of the voice, etc. Additionally, it allows controllers to play back unusual situations which have occurred recently, providing an accurate picture of the event which can form the basis of informal discussion.

8. Recommendations for operators

8.1. Insist on adherence to standard communications procedures by all flight crews.

8.2. Encourage communications best practice for flight crews.

8.3. Ensure that company standard operating procedures (SOPs) address all aspects of communications procedures, including:
(a) adherence to ICAO standards and recommended practices (SARPs);
(b) correct pronunciation;
(c) procedures for monitoring communications (both pilots should listen to en-route clearances);
(d) communication issues involved in the transfer of control between pilot flying (PF) and pilot not flying (PNF).

8.4. Provide resources for self-improvement in the use of the English language.

9. Recommendations for air navigation service providers

9.1. Insist on adherence to standard communications procedures by all controllers.

9.2. Encourage communications best practice for controllers.

9.3. Include in training packages communication procedures for emergency/unusual situations for which ICAO standard phraseology does not exist or is not sufficient.

9.4. Provide resources for self-improvement in the use of the English language.

9.5. Consider installing a short-term recorder to enable controllers to play back recent communications (see paragraphs 7.8 and 7.9 above).

10. Recommendations for pilots and controllers

10.1. Many recommendations apply equally to all transmissions. To avoid duplication, separate listings of recommendations for pilots and controllers are not given.

Phraseology

10.2. Communications should be concise and unambiguous. Use standard phraseology whenever available.

10.3. When it is necessary to spell out a word, use the standard ICAO spelling alphabet.

10.4. Convert ICAO abbreviations into the unabbreviated words or phrases (except for those which, in accordance with ICAO, should be transmitted as spoken words or as individual letters in non-phonetic form (e.g. CAVOK, ILS, QNH, RVR, etc.)).

10.5. Except as stated in the next paragraph, all numbers should be transmitted by pronouncing each digit separately. In the English language, pronunciation should follow the standard ICAO recommendations to avoid the confusion of digits (in particular, the spoken words "two" and "three" are often confused as are the spoken words "five" and "nine").

10.6. Numbers used in the transmission of altitude, cloud height, visibility and runway visual range (RVR) information, which contain whole hundreds and whole thousands, should be transmitted by pronouncing each digit in the number of hundreds or thousands followed by the word HUNDRED or THOUSAND as appropriate.

10.7. The word DECIMAL should be pronounced when appropriate, e.g. when passing an RTF frequency.

10.8. Table 1 overleaf gives examples of ICAO standard phraseology involving numbers, based on the provisions of ICAO Annex 10 Volume II. Note that Amendment List No 80 to ICAO Annex 10, dated 24 November 2005, provides a full explanation of the correct identification of VHF RTF frequencies depending on whether six digit (8.33kHz separation) or five digit (25kHz separation) is in use.

10.9. Messages should be transmitted in plain language or approved phrases. A complete listing of ICAO standard words and phrases is contained in ICAO Annex 10[5].

5 - ICAO Annex 10 Volume II Chapter 5 paragraph 5.2.1.5.8

10.10. Do not use the phrase "Go ahead" when it could be construed to mean that an aircraft is authorised to proceed.

10.11. Avoid the use of a word in an instruction which could be misinterpreted as a digit (e.g. the word "to" could be confused with the digit "2", or the word "for" with the digit "4").

10.12. Do not use the term "Roger" when a message requires a read-back or a positive or negative response. Message Format and Content.

10.13. Place the aircraft call sign at the beginning of a message. This allows pilots to identify messages intended for them quickly and reduces the chance of a message being acted on by the wrong pilot.

10.14. Use the full aircraft call sign when establishing communications. After satisfactory communication has been established, abbreviated call signs may be used provided that no confusion is likely to arise; however, an aircraft must use its full call sign until the abbreviated call sign has been used by the ground station.

10.15. Call signs may only be abbreviated in accordance with ICAO standard procedures, relevant portions of which are reproduced in Table 2. Note that most airline call signs belong to type (c) for which there is no abbreviation; therefore, abbreviations such as "RUSHAIR 34" are not permissible.

Message text

10.16. Limit the number of elements in a message to two to reduce the chance of an element being missed or misheard.

10.17. The elements of an RTF frequency are treated by a pilot as individual digits; therefore, do not combine a frequency change with another instruction.

10.18. Avoid combining numerical elements which may easily be confused in the same message, for example, flight level and heading.

10.19. Stress or repeat any non-standard elements in a message to ensure the pilot notes the differences from standard.

10.20. Avoid heavy accents or colloquialisms.

Read-back/Hear-back: Pilots

10.21. Always read back ATC clearances in full.

10.22. Do not switch immediately to the next sector frequency following read-back of controller's instruction. Ensure confirmation of your read-back is received.

10.23. If in doubt about an ATC instruction, ask the controller to re-confirm the clearance rather than saying what you thought you heard, (e.g. "London, confirm the cleared flight level for BIGJET 162" not "London, confirm the cleared flight level for BIGJET 162 is FL 190".) This procedure should also be followed if any doubt exists between flight crew members.

Table 1 – Examples of ICAO standard phraseology involving numbers

Aircraft call sign OAL 242	*transmitted as* Olympic **two four two** [no abbreviation permitted]
flight levels Descend to FL 180 Maintain FL 100	*transmitted as* Descend to flight level **one eight zero** Maintain flight level **one zero zero**
altitudes 800 ft Climb to 3,400 ft 12,000 ft	*transmitted as* **eight hundred** feet climb to **three thousand four hundred** feet **one two thousand** feet
cloud height 2,500 ft	*transmitted as* **two thousand** five hundred feet
headings 100 degrees 080 degrees	*transmitted as* heading **one zero zero** heading **zero eight zero**
wind direction and speed 200 degrees 70 knots 160 degrees 18 knots gusting 30 knots	*transmitted as* wind **two zero zero** degrees **seven zero** knots wind **one six zero** degrees **one eight** knots gusting **three zero** knots
visibility 1,000 metres	*transmitted as* visibility **one thousand**
runway visual range (RVR) 600	*transmitted as* RVR **six hundred**
transponder codes 2400	*transmitted as* squawk **two four zero zero**
runway 27 30 R	*transmitted as* runway **two seven** runway **three zero right**
altimeter setting QNH 1010 QFE 990	*transmitted as* QNH **one zero one zero** QFE **nine nine zero**
RTF frequency 118.000 118.025 (25 kHz spacing) 118.025 (8.33 kHz spacing)	*transmitted as* **one one eight decimal zero** **one one eight decimal zero two** **one one eight decimal zero two five**
time 0920 1445	*pronounced as* **too ze-ro** or **ze-ro nin-er too ze-ro** **fow-er fife** or **wun fow-er fow-er fife**

Table 2 – Examples of full call signs and abbreviated call signs

	Type (a)		Type (b)	Type (c)
Full call sign	ABCDE	AIRBUS ABCDE	RUSHAIR ABCDE	RUSHAIR 1234
Abbreviated call sign	ADE or ACDE	AIRBUS DE or AIRBUS CDE	RUSHAIR DE or RUSHAIR CDE	No abbreviated form.

10.24. Question unexpected instructions for any stage of flight.

10.25. Full read-back should never be replaced by the use of a term such as "Roger" or "Copied".

Read-back/Hear-back: Controllers

10.26. Always listen carefully to the read-back of a clearance.

10.27. Correct any error in the read-back and insist on further read-back until certain that the clearance has been correctly copied.

10.28. Do not use terms such as "Roger" to acknowledge messages requiring a definite answer (e.g. acknowledging a pilot's statement that an altitude or speed restriction cannot be met). Doing so decreases both the pilot's and the controller's situational awareness.

11. Non-standard phraseology in Europe

11.1. The UK CAA has adopted certain non-standard phraseology designed to reduce the chance of mishearing or misunderstanding RTF communications. 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.

11.2. The following paragraphs taken from the UK Manual of Radiotelephony[6] summarise the main differences.

(a) The word 'to' is to be omitted from messages relating to FLIGHT LEVELS.

(b) All messages relating to an aircraft's climb or descent to a HEIGHT or ALTITUDE employ the word 'to' followed immediately by the word HEIGHT or ALTITUDE. Furthermore, the initial message in any such RTF exchange will also include the appropriate QFE or QNH.

(c) When transmitting messages containing flight levels each digit shall be transmitted separately. However, in an endeavour to reduce 'level busts' caused by the confusion between some levels (100/110, 200/220 etc.), levels which are whole hundreds e.g. FL 100, 200, 300 shall be spoken as "Flight level (number) HUNDRED". The word hundred must not be used for headings.

6 - UK CAA CAP 413 Radiotelephony Manual. See also UK CAA CAP 493 Manual of Air Traffic Services Part 1 and UK CAA Air Traffic Services Information Notice 8/2002 – Phraseology Associated With Clearances Involving Flight Level 100, 200, 300 and 400

11.3. Examples of the above are:
(a) "RUSHAIR G-BC climb flight level wun too zero."
(b) "RUSHAIR G-BC descend to altitude tree tousand feet QNH 1014."
(c) "RUSHAIR G-BC climb flight level wun hundred."
(d) "RUSHAIR G-BC turn right heading wun wun zero."

12. Non-standard North American phraseology

12.1. A particular example of non-standard phraseology which is in regular use in North America is the instruction "taxi into position and hold", (which has the same meaning as the ICAO standard phrase "line up and wait"). This can be confused with the old ICAO phraseology "taxi to holding position" (which means taxi to, and hold at, a point clear of the runway).

12.2. Use of this non-ICAO standard phraseology is fail-safe in North America, but in Europe can lead to an aircraft taxiing onto the runway when not cleared to do so.

12.3. To overcome this problem ICAO has amended its phraseology to "taxi to holding POINT".[7]

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- ICAO Doc 4444 – Procedures for Air Navigation Services (PANS-ATM)
- ICAO Doc 9432 – Manual of Radiotelephony.

7 - See amendment 4 to the Procedures for Air Navigation Services - Air Traffic Management (PANS-ATM, doc. 4444). Applicable 24 November 2005.

Other resources

- EUROCONTROL – Air-Ground Communication Safety Study: An Analysis of Pilot-Controller Communications;
- EUROCONTROL – Air-Ground Communication Safety Study: Causes and Recommendations;
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This publication has been prepared by the Safety Improvement Sub-Group (SISG) of EUROCONTROL. The authors acknowledge the assistance given by many sources in the preparation of this publication.

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