EUR OPS BULLETIN

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Subject: Principles and best practices in case of loss of air-ground communication

Introduction and scope

Air–ground communications is of vital importance in the safe and expeditious operation of aircraft. Flight crews and air traffic controllers are facing a significant radio communication workload when operating in complex high-density airspace of the EUR region. Loss of air-ground communication for the most part result in undesirable and sometimes unsafe situations.

The tragic events on 11 September 2001 introduced new security concerns and since then any loss of communication not recovered swiftly may also be treated as a potential security risk. State authorities may then decide, as a last resort, to intercept such aircraft for the purpose of identification.

Greater awareness of flight crews, air traffic controllers and military personnel facilitates positive trends and minimise the number of such events. Emphasis of all actors is to be put on timely action to recovery communication.

National security and defence considerations

The events on 11 September 2001 have triggered a new threat awareness and States for the first time faced the challenge to secure their respective airspace from civilian aircraft that could be utilized as a weapon. Airspace security is a matter of national sovereignty and as such a national task. Although the jurisdiction for airspace security might vary from State to State, the executive level will usually be a military responsibility.

Subsequently, plans have been put into place by States and international organisations to counter this potential danger. For example, NATO procedures to protect their Member States airspace from intruding military aircraft, identify a catalogue of actions, usually escalatory in nature, to adequately react to potential danger of a civilian aircraft being used as a weapon in a terrorist or criminal context. These actions can include fighter aircraft intercepting civilian aircraft and, depending on national law, up to and including the use of deadly force.

However, it is also very important to understand that there are a variety of measures that precede such an intercept. As far as airspace security is concerned, any prolonged loss of air-ground communication case (COMLOSS-case) could be a potential threat and will be treated as such. The threshold for the initiation of response measures may vary again from State to State, but after these criteria have been met the national air defence mechanism will be triggered. These could escalate in a timely manner through several increases of readiness status of armed fighter aircraft (Quick Reaction Alert, QRA), which are specifically designated to ensure airspace security, but could also lead to an immediate take off (scramble) and subsequent intercept.

Such initiations of military response measures may happen during any COMLOSS-case but do not necessarily have to result in an actual intercept. Often the fighter aircraft will be recalled after a scramble had been ordered

because radio contact to the previous COMLOSS-aircraft could be re-established. But at that time valuable resources have already been used (comparable to a false fire alarm that has already triggered emergency response teams). From this perspective, any unnecessary utilization of military assets need to be minimized. However, it is also necessary to emphasize the fact that a QRA may also be of assistance in case of an emergency. If for example the QRA has completed an intercept and has established that the nature of the COMLOSS-case is an inflight emergency, the military aircraft can also act as escort and assist in a safe handling of the emergency.

Loss of communication defined

The word “communicate” is descended from the Latin verb *communicare*, which means "to make known, to share, to do it together". Communication is considered successful when the sender and receiver share and use the same information. Barriers do exist which can affect the ability to get a message across or to fully comprehend the information being conveyed. These may occur at any stage of a flight and can lead to a loss of communication.

While the terms loss of communication, prolonged loss of communication, COMLOSS, communication failure and radio communication failure (RCF) may seem inter-changeable, some of these terms are used to differentiate between the various aspects of such event, see Figure 1.

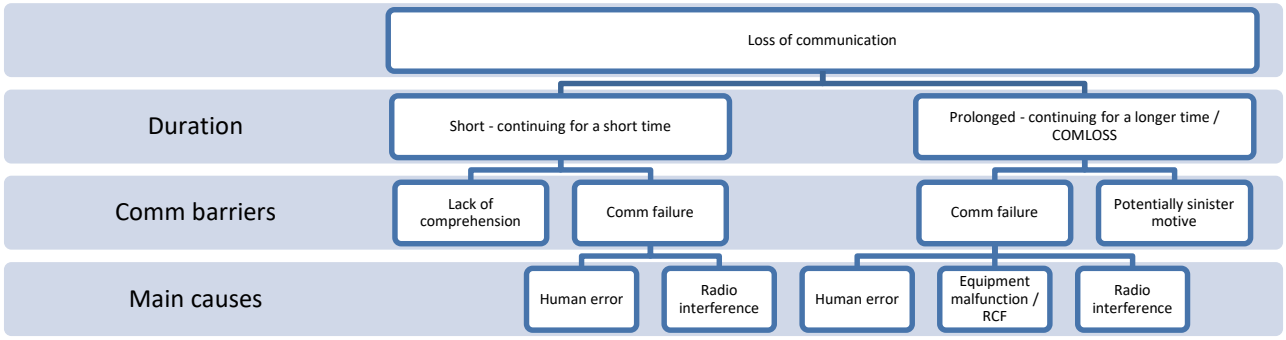

Figure 1

A prolonged loss of communication, also called “COMLOSS” is unilaterally declared on the ground, when no voice communication has been received from the aircraft within a specified period[1] after a communication should have been received, or from the time an unsuccessful attempt to establish communication with such aircraft was first made, whichever is the earlier, except when no doubt exists as to the safety of the aircraft. Many States use COMLOSS to trigger air defence activities.

Observing a loss of communication is insufficient to diagnose the motive because similar behaviours may represent different motives. Getting a clear picture of the situation is paramount and every effort should be made to minimise the uncertainty period i.e., the time interval between noticing the loss of communication and either re-establishment of communication or the ascertainment of a failure. Emphasis needs to be put on timely action to recovery communication.

Two exemplary events with excessively long uncertainty periods are shown in Figure 2. For around 45 minutes various ATC units along the flight paths were unable to contact those aircraft either on assigned or emergency channels. Communications were only re-established after interception. Due to an unclear situation, one aircraft was accompanied by the interceptor till landing. Flight crews were not aware that communication was lost with safety and security affected.

[1] The specific time period is prescribed by the appropriate national authority.

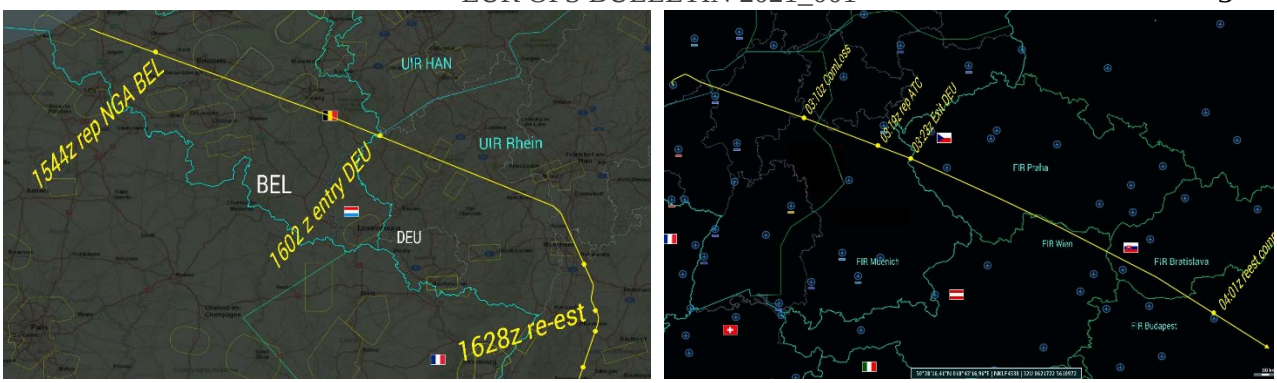

Figure 2

After communication is lost a series of actions need to happen in parallel on aircraft and on ground before a communication failure can be ascertained. A long uncertainty period is illustrated in Figure 3. In this particular example the ATC unit notices the loss of communication before the flight crew itself.

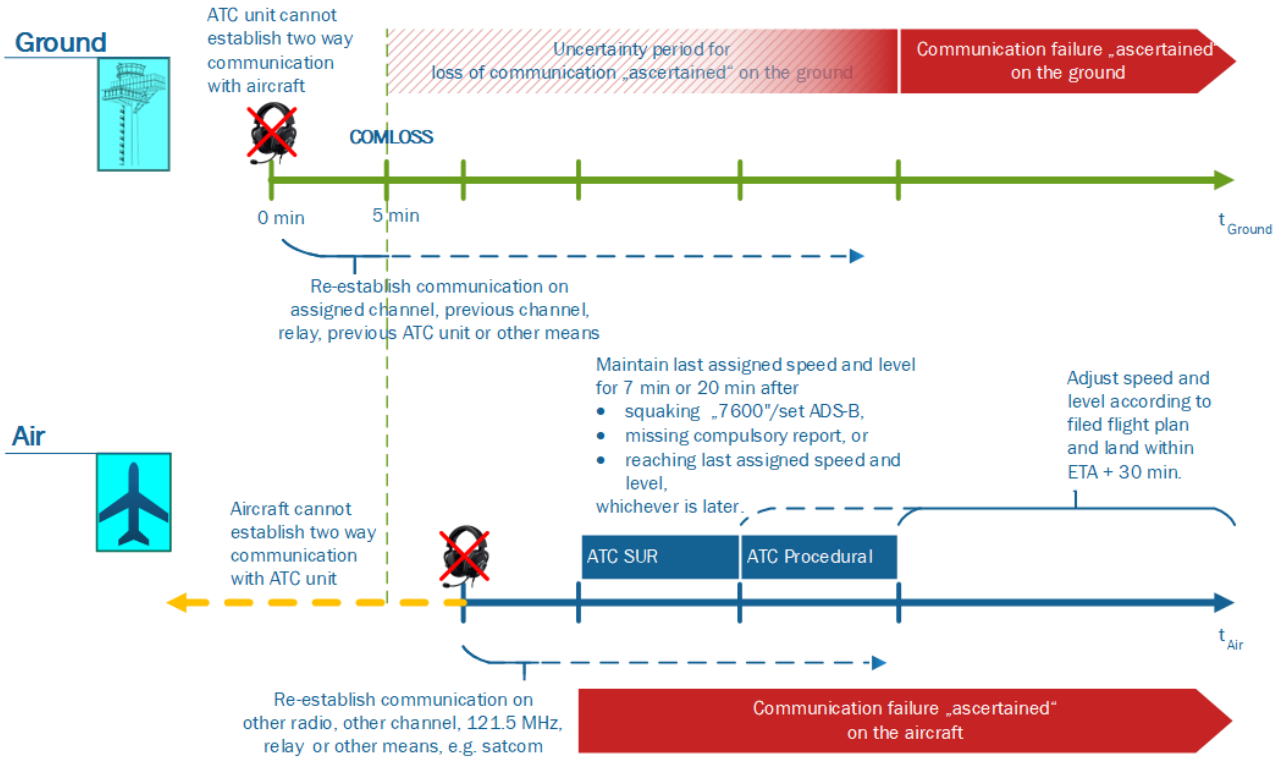

Figure 3

Causes for loss of communication

Barriers, one or several, that can block a meaningful flow of air-ground communication include human errors associated for example with handling of equipment including inadvertent changing of correctly set radio controls, changing frequencies, distraction due to workload, call sign similarities, language problem, as well as radio interference. Malfunction of communication equipment, if routinely maintained, as a barrier is usually secondary.

Loss of communication occurs predominantly in complex airspace with high-density of air traffic, where many frequency changes are required as the aircraft is passed from one controller to another within or adjacent ATC units. Such occurrences are often of short duration but may have a serious safety impact if communication cannot be re-established quickly.

Radio frequency interference is another contributing factor which is closely linked to the increasing demand for radio spectrum access, including data communication. The shortage of frequencies requires a reuse at locations being sufficiently geographically separated. Cases where communication with aircraft takes place outside the frequency protected service volume or designated operational coverage of involved ground stations may result in harmful interference.

More effective communication

ANTICIPATE – RECOGNISE – RECOVER - SAFE FLIGHT has been introduced in threat and error management (TEM) strategies like "defensive flying" which will assist flight crews to build a robust mitigation strategy to prevent loss of communication events.

Air traffic controllers (ATCOs) should keep in mind that communication may be lost at any moment with special attention on cases when clearing two aircraft at the same level, vector them towards restricted airspace or areas with higher minimum vectoring altitudes. In general, loss of communication with one aircraft indicates an onboard equipment failure, whereas with all aircraft on the same frequency may point to ground equipment failure or a blocked/interfered radio channel.

The following table provides guidance for all involved stakeholders on actions to prevent or minimise the occurrence of communication failure events:

Aircraft operators should	**ATC units should**
• Raise awareness amongst flight and cabin crews as well as aircraft dispatchers / flight operations officers and maintenance personnel • Training of radio communicating skills	• Raise awareness amongst controllers and other involved personnel • Training of radio communicating skills
• Make available information on aircraft interception procedures	• Make available information on aircraft interception procedures • Ensure that controller and military personnel are aware of their responsibilities during an interception and associated coordination procedures.
• Ensure that flight crew is aware of State's procedures on first contact when entering their airspace or prior to leaving their airspace and loss of communication by referring to the relevant instructions (e.g., AIP) before undertaking international flights. • Provide updated information on frequencies for the planned route • Establish a "Flight Crew Frequency Change" procedure for receiving, setting and cross-checking frequency information • Include ICAO provisions on monitoring 121.5 MHz in their operating manuals	• Ensure that detailed loss of communication procedures are published in AIP for relevant aerodromes considering national rules, local particularities including available NAVAIDS, airspace restrictions, etc. • Ensure that communication with aircraft takes place within the frequency protected service volume or designated operational coverage of the involved ground stations • Monitor frequency use and initiate enforcement action where radio interference is caused due to unauthorized frequency use
• Assist in re-establishing contact with their aircraft. • Ensure accurate information published in the "Airlines directory"[2] for use by ATC.	• Make available "Airlines directory" information to support re-establishment of contact via aircraft operator.
• To the extent possible, make alternative air-ground communications means available	• To the extent possible, make alternative ground-air communications means available

Flight crews should:	**Air traffic controllers should:**
• Communicate effectively • Do regular "Radio Checks" • Know frequencies using charts • Highlight FIR boundaries (operational flight plan or flight management computer) and challenge ATC if no transfer happened • Continuously monitor 121.5 MHz on VHF radio#2 • Avoid unnecessary communication (company, VOLMET, ground handling etc.) or private	• Communicate effectively • Make sure to deliver the correct frequency in the handovers, particularly in the vicinity of the FIR boundaries. • Avoid RTF frequency changes as part of a multi-part clearance or leave the frequency change for the final part of the message. • Listen carefully to read-back of RTF frequency changes and immediately correct any error.

[2] Full title is "Airlines directory for use during prolonged loss of communication". To request access, see contact details in section "Additional guidance and further reading". Some restrictions may apply.

Flight crews should:	Air traffic controllers should:
talking in critical phases of flight. Adopt a "sterile cockpit". • Make maximum use of headsets and limit background noise	
• Adhere to "Flight Crew Frequency Change" procedure for Pilot Flying and Pilot Monitoring (for example in en-route flight: PF is pre-selecting the new frequency on STDBY whilst the PM is responding to ATC, checks the pre-selection and activates frequency whilst all actions are monitored by the PF). • If one pilot leaves the active frequency, the other pilot shall take over that responsibility . • If one pilots leaves the cockpit, established procedures should be used to maximise attention of the remaining pilot (e.g., headset use plus loudspeaker ON, prevent distraction from other persons in the cockpit etc.).	
• While flying en-route, make use of CPDLC to the maximum extent possible.	• Make use of CPDLC to the maximum extent possible. • Follow published data link procedures for frequency changes, if applicable
• Be prepared to follow the lost communication flight procedures and have the necessary source of information readily available on the flight deck.	
• Report any radio interference through the appropriate reporting channels	• On observing or being informed of radio interference, arrange for transfer of affected aircraft to another RTF frequency. • Report any radio interference through the appropriate reporting channels.
• Prevent damage to radio equipment (e.g., do not allow items placed on top of radio equipment, limit liquids/spillage in cockpit by use of proper containers)	

Table 1

In the event where the communication is lost

In case air-ground voice communication cannot be established and maintained, the pilot and controller shall follow the voice communication failure procedures of ICAO Annex 2, 10, Volume II and PANS ATM (Doc 4444) and PANS OPS (Doc 8168). In addition, when the aircraft is forming part of the aerodrome traffic at a controlled aerodrome, the flight crew shall keep a watch for instructions which may be issued by visual signals from the control tower.

The following table provides guidance on actions to re-establish communication. Pilots and Air Traffic Controllers will use their individual judgment to determine the action most appropriate to any given situation:

Pilots should:	Air traffic controllers should:
• Voice/Radio: o Check frequency selection, headset connections, stuck mike and volume control. o Continuously monitor 121.5 MHz on VHF radio#2	• Attempt to contact the aircraft by other means, including: o select ground transmitting and receiving sites located closest to the aircraft; o ask previous sector/ATC unit to transfer the aircraft to your frequency; if done already, ask to call instruct the aircraft again; in case

Pilots should:	Air traffic controllers should:
○ If no reply received with frequency and volume are correctly set, revert to previous frequency. ○ Perform a "Radio Check" call and request assistance from other aircraft on the frequency. ○ Attempt communications on other channels/frequencies appropriate to the route flown (e.g. call the flight information centre) ○ If still unable to establish communications, attempt to establish communication on 121.5 MHz. ○ Use VHF radios#2 or #3 as alternatives to re-establish voice communication. • Datalink: ○ While flying en-route, make use of CPDLC to the maximum extent possible or consider alternative datalink means. For approach and landing, aircraft shall comply with voice communication failure procedures of Annex 10 Volume II. ○ Check correct CPDLC log-on info. Flight information region and air traffic control centre location indicators may differ. • Use all means available for communication as published in AIP of the State including emergency frequency, mobile phone, monitoring NAVAIDs voice channels.	the aircraft has changed to wrong frequency, the pilot will come back to previous frequency and request clarification; ○ use the emergency frequency 121.5 MHz; ○ relay through other nearby aircraft; ○ relay through other aircraft of the same operator; ○ use CPDLC, if available; ○ apply the appropriate procedures to contact the operator, who may be able to contact the aircraft by other means, e.g. HF SELCAL, ACARS or SATCOM (see flight plan field 18 and "Airlines directory"). • Inform the appropriate military authorities in accordance with national procedures and thereafter keep them informed of any action taken by the ATS unit as well as any further intended action. • Do not delay issuing precautionary clearances to potentially conflicting aircraft because of an assumption that contact will soon be re-established. • Use all available communication channels including emergency frequency, NAVAIDs that are equipped with voice channel capabilities, relay via other aircraft.
• If you can't/don't establish communications and communicate with the ground, you should follow closely all the steps described to re-establish communications while ascertaining the cause of the problem. • Be aware that after a specified period of time of not being able to communicate with the ATC, security measures may be initiated. Make all possible efforts to re-establish communications. • If the result of ascertaining the problem indicates a failure of the onboard VHF equipment, squawk A7600 and set the ADS-B on RCF. If communications are established eventually using other means, you could coordinate with ATC the best set of actions to be taken with regards the continuation of the flight. • Squawk A7600 and in absence of success on the attempts to establish communications using other means, follow strictly the provisions in Annex 2, para 3.6.5, and continue attempts to re-establish communications.	• Determine the extent of the failure by instructing the pilot to make a turn, SQUAWK IDENT or to change code. If it is determined that the aircraft receiver is functioning, further control of the aircraft will be continued using code changes or IDENT transmission to acknowledge receipt of clearances. • Provide safe separation by clearing the airspace along the expected flightpath of the aircraft with communication failure

Table 2

*It is of utmost importance that any Loss of Communication event is **reported** within the respective organization through the established reporting mechanisms/channels!*

States must drive a positive reporting culture which is founded on mutual trust, characterised by shared perceptions of the importance of safety and security, as well as by confidence in the efficiency of preventive measures. Making sure individuals are comfortable flagging up risks, problems and concerns is extremely important as it helps in the creation of constructive solutions to such events, rather than being reactionary. This will enable that valuable lessons can be learned from these events and minimize the chance of reoccurrence.

The following figure provides a typical set of actions an ATCO may undertake when communication with an aircraft cannot be established after a frequency change. However, the tasks and actions as well as their sequence may vary depending on the given circumstances.

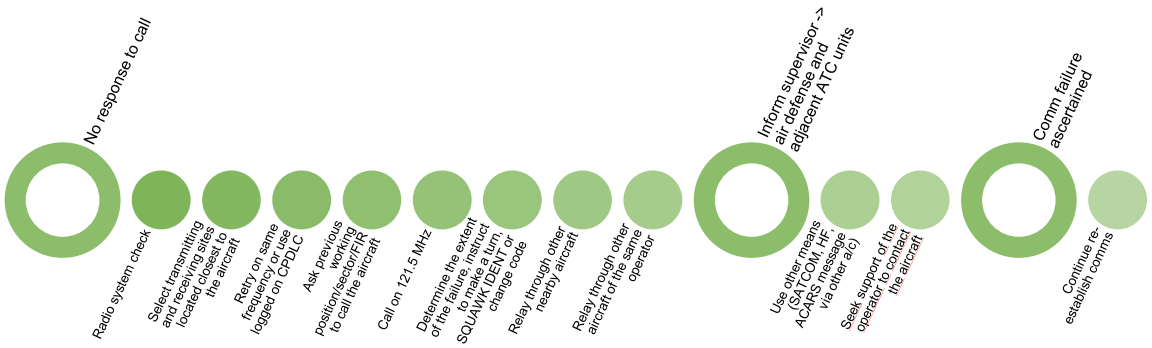

Figure 4

The next figure provides a typical set of actions a flight crew may undertake when communication with an ATC unit cannot be established after a frequency change. The tasks and actions as well as their sequence may also vary depending on the given circumstances.

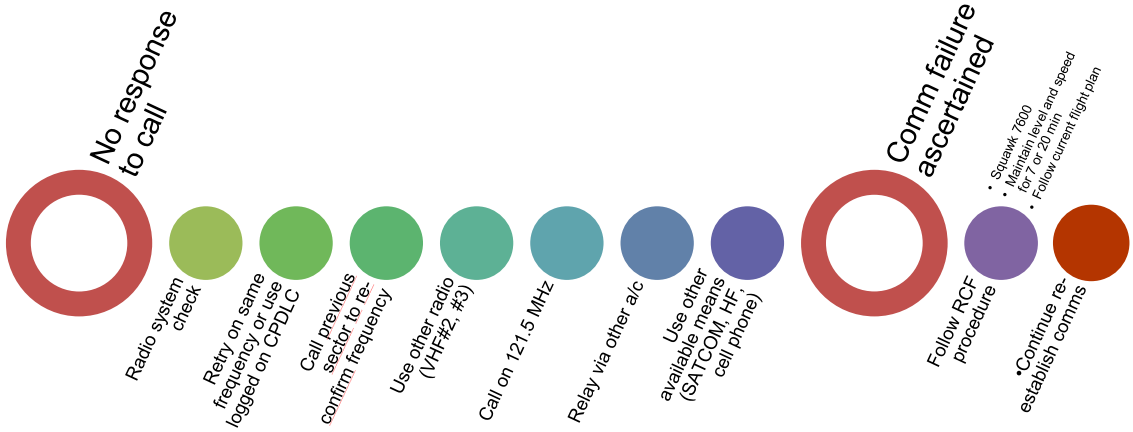

Figure 5

As soon as it is known that the two-way communication cannot be re-established and a communication system failure is ascertained, the aircraft shall comply with the communication failure procedures as contained in the ICAO provisions

ICAO provisions

Procedures to be followed by pilots and controllers in a loss of communication event are contained in Annex 2 and Annex 10 Volume II to the ICAO Convention, as well as in Procedures for Air Navigation Services — Air Traffic Management (PANS-ATM, Doc 4444) and — Aircraft Operations (PANS-OPS, Doc 8168, Volume III). The principles to be observed during an interception of a civil aircraft are contained in ICAO Annex 2.

In addition, the MID/ASIA, NAT and PAC Regions have published Regional Supplementary Procedures on air-ground communication failure in ICAO Doc 7030. For the North Atlantic a dedicated operations and airspace manual (ICAO NAT Doc 007) has been published by the EUR/NAT Office.

Additional guidance and further reading

EUROCONTROL

- Skybrary
  - https://www.skybrary.aero/index.php/Loss_of_Communication
  - https://www.skybrary.aero/index.php/The_Human_Factors_"Dirty_Dozen
- NEASCOG Leaflet https://www.eurocontrol.int/update/tackling-risks-comloss-community-effort
- Access to the “Airlines directory for use during prolonged loss of communication” can be requested using the generic EVAIR (EUROCONTROL Voluntary ATM Incident Reporting) address: evair@eurocontrol.int

IFALPA
https://www.ifalpa.org/publications/library/loss-of-communication-with-atc--3501

Erik Hollnagel: The ETTO Principle: Efficiency-Throroughness Trade-Off. Why Things That Go Right Sometimes Go Wrong. Farnham (Surrey), Ashgate: 2009

Gordon Dupont, twelve elements (“the dirty dozen”) influence human behaviour as preconditions for accidents or incidents. They are also called “The Human Factors” and this theory is accepted throughout the industry.

James Reason: Human Error. Cambridge University Press: 1990
James Reason: Managing the Risks of Organizational Accidents. Ashgate: Aldershot 1997 (Reprinted 2008)

Examples for good loss of communication procedures are published for:

- Moscow aerodrome Sheremetjevo, Russia AIP RUSSIA AD 2.1 Para 5. Communication Failure (15 Jul 2021) UUEE-13.6, 13.7, 13.8. The publication contains detailed description of flight procedures in case the communication is lost in Moscow TMA, including:
  - means to re-establish communication;
  - departure procedure with lost communication;
  - arrival and approach, missed approach;
  - diverting to alternate aerodrome within Moscow TMA;
  - diverting to alternate aerodrome outside Moscow TMA.

- St. Petersburg aerodrome Pulkovo, Russia AIP RUSSIA AD 2.1 para 7.2 Communication Failure (21 Feb 2021) ULLI-13.11, 13.12, 13.13 – detailed description

- Helsinki aerodrome Vantaa, Finland EFHK AD 2.1 – 33 para 2.22.2.12 Radio communication failure – short but informative description

- Stockholm aerodrome Arlanda, Sweden AD 2 ESSA 1-22 3.2 Communication failure (21 May 2020) – detailed description of approach procedures with lost communication, including word description of navaids to be used, altitudes and tracks to follow for approach.

Notice

The purpose of the European Operations Bulletin **2021_001** is to promulgate principles and best practices in case of loss of air-ground communication. It aims to raise awareness amongst aircraft operators, flight crews, air traffic controllers and military stakeholders with a special emphasis on the recovery of communication as well as the required timely actions by all involved entities.

This Bulletin is incorporating the results from the EASPG Project Team for the development of a new EUR OPS Bulletin on loss of communication between the aircraft and the air traffic control unit. It was presented and endorsed at the 3rd Meeting of the European Aviation System Planning Group in December 2021.

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