Investigation into loss of communications

Loss of communication between controllers and pilots is a key issue for aviation safety. This article reports on the main causes currently identified, what EUROCONTROL and its stakeholders are doing to investigate how to resolve the problem and what the next steps might be.

'PLOC' and 'COMLOSS' are nowadays used interchangeably to define those air-ground communications incidents whose duration affects the normal ATC processes

Definition

Two acronyms can be used when describing loss of communications. The military prefer "COMLOSS", standing for communications loss, while the civil sector tends to prefer "PLOC" for prolonged loss of communications.

Loss of communications between aircraft and air traffic control (ATC) may actually occur for a variety of reasons, some technical, others relating to the human-machine interface. The length of the loss of communications can vary considerably. However, it is those that impact day-to-day ATC functions that have drawn the most attention and have instigated studies aimed at resolving the problem.

A BRIEF HISTORY

One communication loss problem was known as the "sleeping receiver".

Radios went silent, only to be reactivated when the pilot pressed his transmit key. Initially, back in 1998, these events were flagged, investigated and reported by just a few airlines, such as British Airways (BA) and KLM. It is unclear whether this kind of event started prior to, or in parallel with, the introduction of 8.33 kHz radios. However, some events had already been observed by then, but without drawing too much attention. The number of reported events increased and in the UK the majority of incidents reported occurred over the London Terminal Area either in the stack or during the descent and approach phase. BA then started its own internal investigation into the subject. It could not, however, identify any common explanation or isolate any specific technical failure.

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In May 2002, BA, NATS and the UK-Safety Regulatory Group (SRG) organised a forum to bring communication loss events to the wider attention of various European aviation safety stakeholders, including the EUROCONTROL Agency. From 11 September 2001, silence from any aircraft lasting more than a few minutes became clearly unacceptable since it represents a security risk. The UK SRG invited EUROCONTROL through its Safety Regulatory Unit and Communications Division (COM) to support the wider investigations and expand them to European level. More recently, a complementary Safety Improvement Initiative was launched by the EUROCONTROL Safety Team. This addressed operations-related safety issues like call-sign confusion, blocked transmissions, radio interference, standard phraseology and prolonged loss of communications.

EUROCONTROL CONTRIBUTION

Common PLOC database and reporting

Since 2002, the EUROCONTROL Communications Domain has taken over the investigative task from UK SRG. Their database of incidents was transferred to the EUROCONTROL Agency and extended to enable the logging of any prolonged loss of communications events reported by civil or military controllers and by aircrews. The reporting forms have been standardised and enhanced in conjunction with stakeholders' suggestions. The purpose of the database is to quantify PLOC phenomenon across Europe and to scrutinise the reports in search for common elements in order to progressively identify new profiles of communications loss incidents.

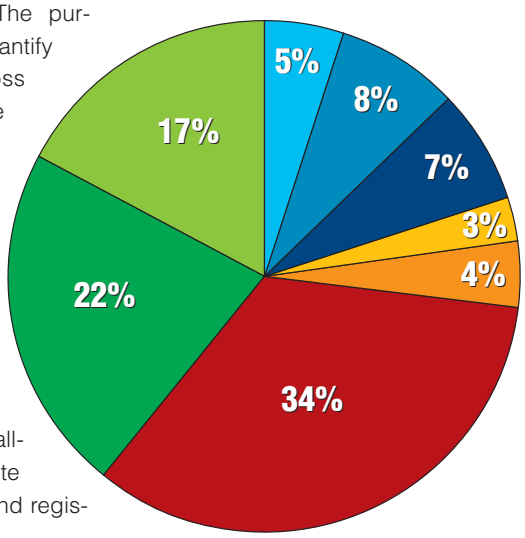
Information in the database includes:

- Flight details, e.g. airline, call-sign, flight number and route
- Aircraft details, e.g. type and registration number
- Incident details, e.g. time and date of incident, location, phase of flight, speed and altitude of aircraft when PLOC occurred
- ATC information, e.g. frequency, ATC sector, whether air-to-air relay was attempted and successfully re-established communication.
- Information about the loss of communications, e.g. duration, possible observed silence on the channel, remedial actions.
- Details of the aircraft equipment in use during the PLOC, e.g. headset, VHF transceiver and audio management unit.

The database contains over 1,050 events recorded since 1999. Most of them are concentrated in the last years due to the initial lack of awareness and reporting; 191 events in 2002, 121 in 2003, 307 in 2004, and already 355 for 2005 (position on 1 September 2005).

Identification of recurrent incident profiles

Based on the reported symptoms and with the support of IATA for interrogating airlines shortly after each PLOC, about 32% of the reported PLOC (for the years 2004 and 2005) can be allocated to one of the identified PLOC profiles (see pie chart).



The importance of each profile in this database is of course influenced by the profiles of a few major contributors. As COMLOSS awareness and reporting are expanding, the relative importance of each PLOC profile is expected to evolve.

Unfortunately some 68% of the reported events still do not contain enough detail to be explained and categorised. Recurrent profiles emerging from the report database include:

- Airborne radio failure (with identified repair action required).
- Human factors related profiles – e.g. human errors where the pilot tuned to an incorrect frequency, inadvertently changed radio selector or set the radio volume too low. On the ATC side, there are incorrect frequencies assigned by ATC or errors in voice readback/hearback; ATC forgetting to call and hand over aircraft, etc. Call-sign confusions or overload of pilots or controllers are of course other possible operational factors contributing to the human errors described here.
- Communications technical causes, e.g. PLOC Type A (the sleeping receiver) and multicarrier/squelch related issues.

More technical or operational profiles could be identified in the future through improved reporting and refined analysis.

- **Airborne radio failure**
- **Frequency tuned incorrectly**
- **Inadvertently changed radio selector**
- **Radio volume too low or off**
- **Suspected MultiCarrier - related issue**
- **Suspected PLOC Type A (silent channel; if relay attempted, no success)**
- **ATC forgot to hand over, or Wrong Freq assigned by ATC, or Readback/Hearback error**
- **Radio selection error by aircrew (e.g.: still on previous sector)**

Communication loss is affecting all aviation segments:

The phenomenon is not restricted to a few airlines or radio types. In the thousand reported events that have affected air traffic control since 1999, more than 300 airlines, 12 radio types, 180 sectors and 90 channel frequencies are represented.

A typical example of PLOC Type A

A pilot reported:
"During our usual arrival preparation, we realised that our VHF1 radio, which was assigned to the Paris control frequency, had been silent for several minutes. When we managed by a brief radio check to establish contact with London FIR, we were told that several calls had been left unanswered; air-air relay attempted by ATC hadn't work either. Then we were transferred to the appropriate sector frequency and the flight continued normally.

During that period, the flight was on its assigned route and level, but we got a call from a French Mirage fighter closing our left wing on 121.5MHz. We explained to him that we were back in contact with London and that everything was OK with our radio, and then we continued our flight and approach in the usual manner."

According to the current procedures, when a certain time of communication loss has elapsed, the military units are alerted. Every time the fighters are scrambled, other air traffic is affected and has to be moved aside; the cost of a fighter launch is about € 6,000 each time.

Remedies found for two technical PLOC profiles

PLOC Type A:
Thanks to BA's sustained efforts over the years in keeping their aircrews aware and accurately reporting events, a Service Bulletin for retrofitting their VHF[1] receivers has finally been delivered to BA by the radio manufacturer concerned.

Since January 2005, BA has recorded a clear decrease in the number of PLOC type A occurrences, as the Service Bulletin deployment has progressed throughout the fleet.

It is now anticipated that the PLOC type A will progressively be cleared from the whole BA fleet and the few other affected airlines; it has now become a question of time.

Multi-carrier related PLOCs
Recent laboratory and flight trials confirmed that the squelch operation of some receivers may be disturbed in a multi-carrier environment. According to the current MOPS (Minimum Operational Performance Specification), receiver sensitivity in multi-carrier operation must not be worse than –85 dBm.

One type of analogue radio retrofitted for 8.33 kHz operations was identified during these trials as not being compliant with the MOPS requirement.

A PLOC might be experienced by this type of radio when flying in multi-carrier equisignal areas (same signal strength originating from different offset ground transmitters). Work is currently in progress to include a test for multi-carrier operation sensitivity in the relevant airborne transceiver standards in order to prevent aircraft radios with limited squelch performance being installed. Awareness of avionics manufactures of this issue is considered essential. Recently, multi-carrier operation in 8.33 kHz channel spacing was proven to be feasible and standardisation activities have been initiated.

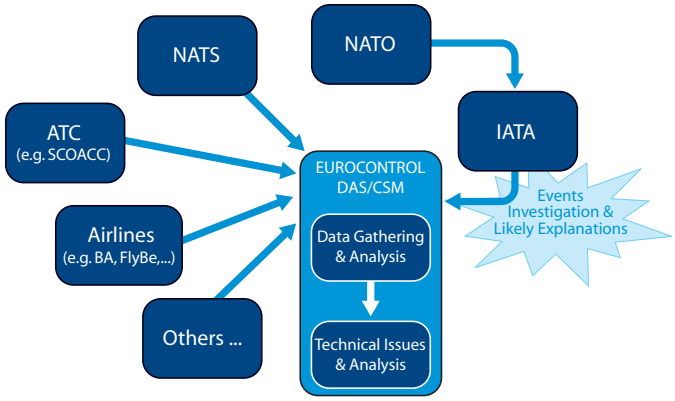
Raising awareness

Since its involvement, EUROCONTROL has steadily worked towards increasing PLOC awareness among airlines, the avionic and aircraft industry as well as within civil and military ATC organisations.

Progress reports are presented in workshops and working groups such as EATM SISG (Safety Improvement Sub-Group), CMIC (Civil Military Interface Standing Committee), and NEASCOG (NATO/EUROCONTROL ATM Security Coordinating Group).

The diagram below depicts the current flow of PLOC incidents reports involving EUROCONTROL

To ensure that PLOC resolution is made more efficient, all the stakeholders involved need to share commonly updated information and their actions. To this end, the NEASCOG group is currently working to establish a definition of loss-of-communications common to both civil and military control centres, based on operational aspects.



Furthermore, EUROCONTROL has suggested sharing its reporting forms and procedures with IATA and NATO. It will also share the existing PLOC database, and especially work to identify causes and develop more remedies for all PLOC profiles, whether the causes are technical, operational or both.

Once that has been established, the EUROCONTROL Communications Domain will exploit its expertise, focusing more on technical profiles of PLOC and their resolution across Europe. For its part, the Agency Safety Team will continue to manage the Air-Ground Communication Safety Initiative, aiming to deliver an industrial Action Plan in 2006 jointly with IFATCA[2], IFALPA[3], ERA[4] and the Flight Safety Foundation. ■

1 - Very High Frequency

2 - International Federation of Air Traffic Controllers' Association

3 - International Federation of Airline Pilots Association

4 - European Regional Airlines Organisation