skyguide

safety bulletin

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#36 October/November/December 2011 – www.skyguide.ch/dossiers/safety management
editor:thomas.novotny@skyguide.ch - intranet:skyline/issue/safety/safety bulletin

I have the honour to write this editorial for the Safety Bulletin and share some thoughts about one of my favourite subjects: safety. I have placed safety culture as my top priority for my first year in skyguide and much of my work, and that of my team, is focussed on this topic.

I always think it is important that I reiterate at this stage that there is nothing "wrong" with skyguide and with its excellent staff, who provide our customers with such a good service; I just know that we could get better, and it is upon this idea of continuous improvement that I wish to concentrate.

There are numerous challenges in this field, not the least of which is the legal framework in the country, where an individual controller can be called for a legal inquiry for endangering public safety, even after what we would consider to be a minor incident. I think this is crazy, and it drives a certain set of very understandable behaviours in terms of reporting and investigations – which lead to a less-than-ideal environment in which to learn as much as possible to improve safety. Simon Maurer, Simone Rossier and I spent a day with lawyers from Kanton Zürich recently to explain what our issues are and how they could help us improve safety culture in skyguide. We achieved some understanding, and it is step by step in such a fashion that we will get to our desired destination (although we will not be there tomorrow!).

The main point of all the work we are doing on safety culture is about **safety improvement**: today, skyguide runs an operation that is acceptably safe, but we will need to be safer tomorrow. In a rather simplistic view of skyguide and of the aviation environment around us, I always ask myself: "how does this process/procedure/rule maintain or improve safety?" If it does not, then let us change it or remove it and simplify a system which we have allowed to become too complex – reduction in complexity where possible is usually a good way to find safety improvements (without of course reducing the concept or view of the system itself to over-simplification).

There are 9 different workstreams now being kicked off in the overall programme called "BMS" (Business Model Skyguide), which are aimed at tackling some of the more concrete issues in the next year or so. Examples include our relationship with FOCA, a review of the ATCO competency scheme, safety accountabilities and human factors. Each of the workstreams has a significant amount of work packages within it, and none of them is easy to solve, so we will be working with the Trades Union and with staff to get the best possible solutions to all of these workstream areas.

One of the questions for me in skyguide is "who is it that does safety?" It seems to me that there are one or two people who feel that it is something that happens elsewhere – it isn't, safety happens right here, wherever you are while you are reading this. You can help to improve safety, whatever your role in skyguide: there are 1400 people who "do" safety in the company, and for those who are more remote from the Ops Rooms, for example, I would ask you to spend a few minutes working out what your own personal relationship to the safety of skyguide actually is.

Good safety comes about from a good environment in which to operate, from good trust between all staff (and for example, between managers and controllers), it is underpinned by good processes, and it comes from a genuine and honest focus on safety improvement rather than just compliance.

I believe that it is my job, and our job in management, to support all our front-line staff in order to enable them to provide safety with every transmission, and every piece of equipment. I look forward to providing that support and to experiencing the improvement in safety and in safety culture that will be the result.

Alex Bristol
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The phenomena of *Undetected Simultaneous Transmission in VHF voice communication in skyguide*

One of the main technical mean for an ATCO to communicate with his partners is the VHF radio transmission. The reliability and the quality of this communication is vital for an ATCO in the daily operation. On the other side, the actual Voice Communication System has different weak spots. One of them was the main cause of the incident happened on the 18th of June 2010 on ZRH airport (BCI/THA case) where a simultaneous transmission of two radio calls was not detected. This incident triggered SR for an internal investigation and in addition to publish a report in the skyguide safety bulletin in order to increase the controllers awareness to similar situations and to inform on the current activities in the VCS domain.

Introduction

As stated above, we shouldn't forget that the technical principles of our actual Voice Communication System goes back to the beginning of the last century.
Therefore we have to live with some kind of limitations like frequency disturbances, limited quality of sound, blocked or undetected transmission, loss of communication etc.

In this article we'll have a closer look at one of this phenomena, the Undetected Simultaneous Transmissions (USiT).

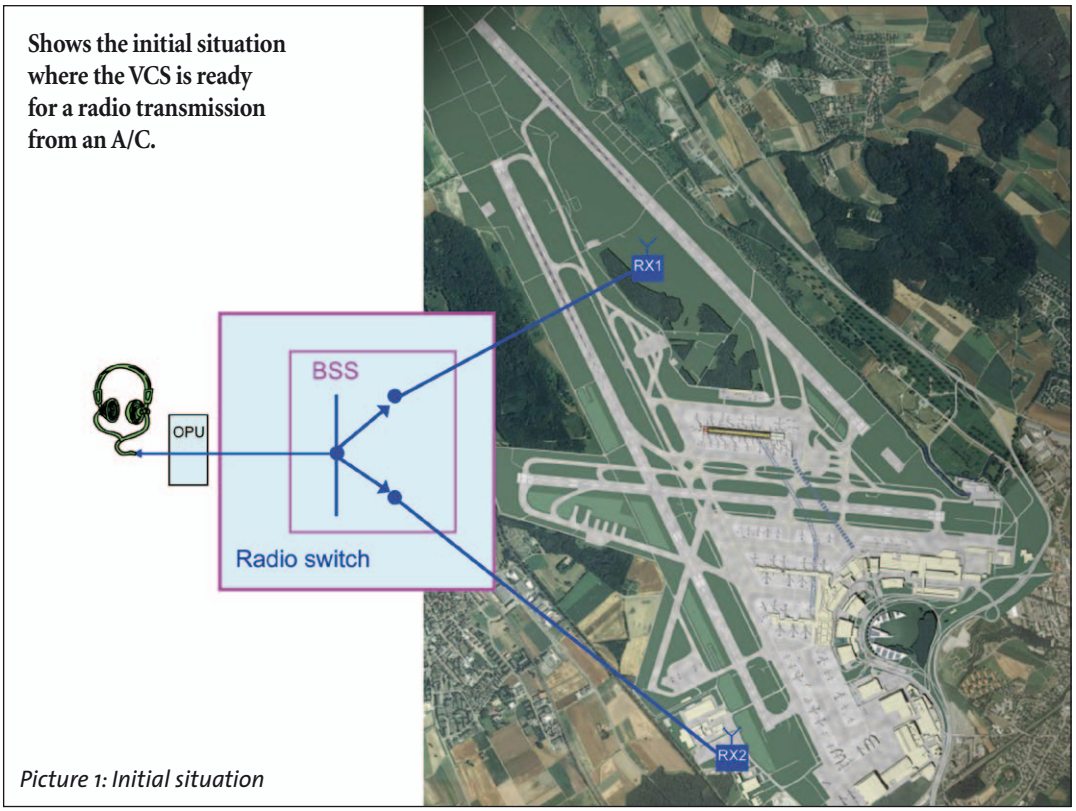
What is an USiT?

Situations arise when two or more radio transmissions occur, simultaneously, on the same frequency. In this context "simultaneous" is defined as two or more transmissions that overlap in such a way that the controller is not aware that more than one transmission has occurred. This effectively very rare shortcoming means that it is possible that calls from a pilot doesn't reach the ATCO or vice versa.
There are different circumstances which can lead to an USiT so we'll focus on a most critical situation where we have a complete overlapping of two calls as illustrated in the following pictures.

Example of a USiT situation on ZRH airport

Two receivers (RX1 and RX2) are placed on different locations on the ground to guarantee a good

Shows the initial situation where the VCS is ready for a radio transmission from an A/C.



Picture 1: Initial situation

The phenomena of Undetected Simultaneous Transmission in VHF voice communication in skyguide

coverage of radio transmissions from aircrafts (picture 1).
In order to switch the best available signal to the controller, the VCS system uses a **BSS** (**B**est **S**ignal **S**election) equipment. The BSS analyses the incoming signals from RX1 and RX2, determines the signal with the best quality (on the base of the **S**ignal to **N**oise-**R**atio and other factors) and presents this to the controller.

The picture 2 illustrates how an USiT situation can occur:

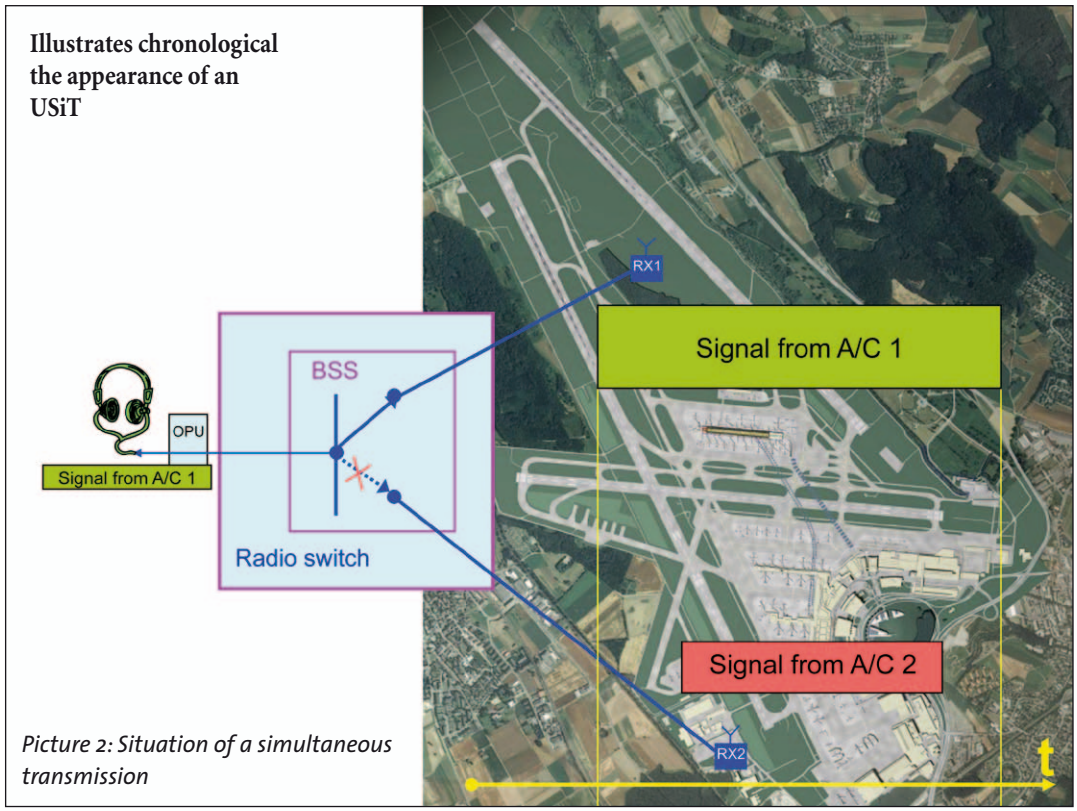
- A/C 1 calls first on the frequency.
- The BSS checks the signals on both RX and selects RX1, which gets the best signal quality.
- The BSS switches RX1 to the ATCO
- The signal from RX2 is muted during this transmission period.
- If the transmission of A/C 2 is not recognized by RX1 (too weak signal), the controller won't be able to detect the call from A/C2, especially if it ends before A/C1's transmission.

→ In this situation, an aircraft call may be lost, that means it is a typical USiT situation

Why such a transmission can't be heard by the controller?

A few years ago, more analogical transceivers with lower performances were in use in aircrafts. Therefore, in case of a simultaneous transmission the controller could more often hear a remarkable tone (due to the interference of the two signals in our receivers) indicating that during a transmission of an a/c another call was launched simultaneously. This allowed the controller to react and to clarify the situation.
With the installation of modern transceivers in aircrafts the transmitted frequency is much more accurate than before and the interference in such a situation leads to less situations where a recognizable tone can be detected by the controller.
It can be summarized, that due to the use of an improved technology with advantages in quality and maintainability the ATCO lost kind of a safety net to recognize simultaneous transmissions.

Illustrates chronological the appearance of an USiT



Picture 2: Situation of a simultaneous transmission

What's the risk (probability) of such an incident

Research and statistics elaborated by different ANSPs in Europe show, that real undetected transmissions are in reality rare (3-4% of incidents (separation infringements and incursions) were related to USiTs).
The risk for an USiT raises with the number of coupled frequencies. As more users are participating to the same information

The phenomena of Undetected Simultaneous Transmission in VHF voice communication in skyguide

channel (coupled frequencies) the probability of overlapping calls increases.
As a consequence of that higher risk, which is increasing with frequencies who are often congested, the coupling of the TWR ZRH ADC frequency is forbidden since years.
Another increased risk for simultaneous transmissions are situations with similar call signs on the same frequency or DEP on crossing runways (see below).

How do ATCOs deal with this situation?

According to the previous paragraph, an ATCO doesn't need to expect beyond every radio transmission a hidden call from another a/c!
But the knowledge of these facts and the latent awareness for such situations will probably reduce the "surprise-factor" if such a situation should appear.
There are also methods to reduce the risk of a simultaneous call in following situations:
similar call signs: warn pilots by saying: "*caution similar C/S on frequency*" and/or to specially accentuate the call signs concerned.
Especially with DEP on crossing runways: inform pilots on the sequence, for ex: "SWRxxx you're number 2 for departure".

What's going on to improve the situation on technical side?

First of all, the problematic of USiT is not a skyguide specific issue.
A working group chaired by **Eurocontrol** is permanently discussing the actual development in this domain.
Also a new standard (ED-136) sets guidelines and requirements like:

- Proposals for technical solutions for future ATC receivers to detect and warn about simultaneous transmissions.
- Future VCS should be able to process BSS by including signals from simultaneous transmissions

On **skyguide** side, a prototype for detection of simultaneous transmissions using a new generation of receivers is under development and field tests on ZRH airport are planned for summer 2012.
A measure on short term has been implemented mid of September 2011 where the ADC controller can work with both receivers in BSS mode or can select, based on traffic criterias, one receiver only (RX1 or RX2) to have a higher probability to detect a simultaneous transmission.
The lead of all activities in this domain has TNV (Engineering of Voice Communication Systems) and for more information please refer to the report on USiT by Stephan Meister TNV (see REF)

Otto Grimm
SRO

Glossary

A/C	Aircraft
BSS	Best Signal Selection
EC	Eurocontrol
FRQ	Frequency
RX	Receiver (Radio)
TX	Transmitter (Radio)
USiT	Undetected Simultaneous Transmission
VCS	Voice Communication System
VHF	Very High Frequency

References:
If you like to get more and detailed information, please refer to:

Action Plan from EUROCONTROL for Air Ground Communication systems
http://www.eurocontrol.int/esp/gallery/content/public/library/AGC_action_plan.pdf

skyguide internal investigation report on the incident of 18.6.2010
http://skydoc.skyguide.corp/Livelink/llisapi.dll?func=ll&objId=4944261&objAction=Open&viewType=1&nexturl=%2FLivelink%2Fllisapi%2Edll%3Ffunc%3Dll%26objId%3D2191768%26objAction%3Dbrowse%26cdsort%3Dordering%26viewType%3D1

AAIB report on the incident of 18.6.2010

TNV analysis on USiT; Phenomena description and potential solutions by S.Meister

People fill the gaps with what they expect

To all public transport users: Do you remember the day when the bus stop at Dübendorf main station has been moved under the bridge? Many of us went to the familiar bus stop position… so did I. This cognitive dissonance was based on our experiences and our expectation that the bus stop is still there where it was the day before.

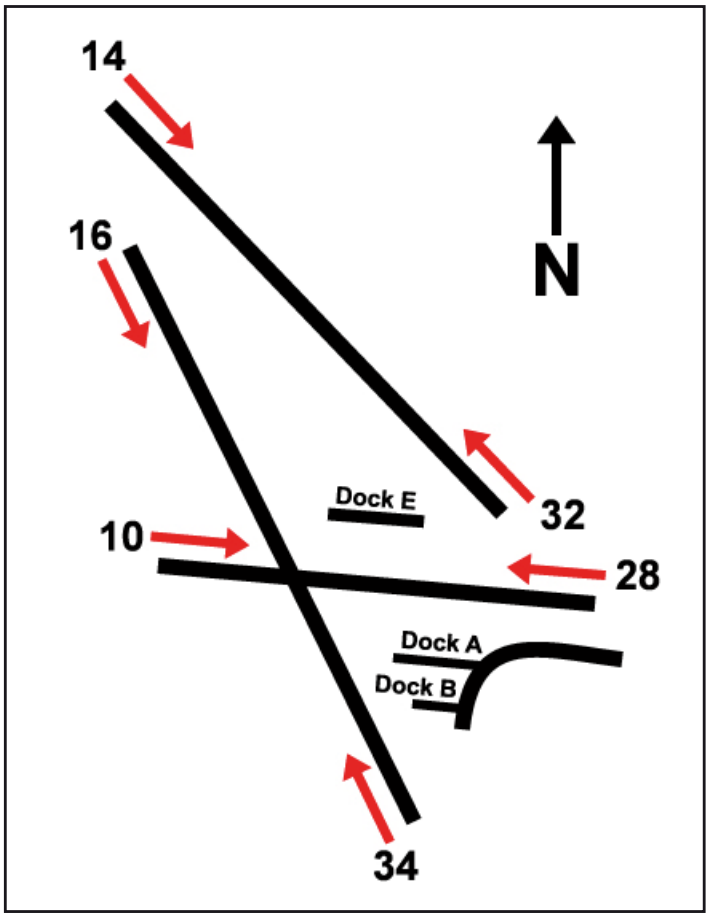
We have similar reported incidents in ATC: After landing on runway 28 at Zurich airport, several aircraft from different airlines used runway 16 (alternatively 34) as taxiway to the parking position without a clearance. Why? First of all Airliner Crews save time (and time is money) when they taxi via the runway instead of the complex taxiway system to their parking position. It's simply the faster track. Furthermore many pilots got the clearance to taxi via the runway several times before. Nevertheless, a runway incursion onto an active runway could lead to a risky situation.

Meanwhile SWISS published a Safety letter including the following extract:

"...*Over* [a high percentage] *of the landing clearances for runway 28 ZRH contain the supplemental "beneficial" information to be able to vacate via runway 16 (respectively runway 34). Remember that a specific clearance from the respective ATC unit to enter an active runway is always required before entering an active runway for any reason.*"

Before we judge the pilot's behavior to use an active runway as a taxiway without permission, let's have a look at the following definitions:

to expect: to think or believe something will happen, or someone will arrive



People fill the gaps with what they expect

to anticipate: to imagine or expect that something will happen, sometimes taking action in preparation for it happening

to assume: to accept something to be true without question or proof

Despite the well-known saying "*never assume!*" aviation, and human behavior in general, is very much based on assumptions and expectations. Otherwise it would not be possible to handle today's amount and complexity of traffic any longer, neither in the air nor at an airport. So e.g. pilots are expected to follow clearances or restrictions while controllers are expected to follow procedures and maintain a safe and orderly flow of air traffic. At the end we might be ending up concluding that we always expect the others to behave according to our own plans – even by not stating this in every controller-pilot-interaction. We assume…

Fortunately, in most cases the expectations will be fulfilled and lead to a positive outcome. But what about the other few cases? Why do people not always follow procedures and instructions? Is it just negligence or is there any chance, that the observed – and with hindsight judged as risky or non-conformal – behavior made sense to the people at that time and under the given circumstances?

Let's just look at a simple example. What do you see in the following graphic? And – this might be even more interesting – what do you expect others to see?

What was your first guess? "B" or "13"? Might be that some suspense comes up. That's exactly the point when humans rely on anticipations based on experiences and expectations (e.g. "Our stand is to the left, so we might take the runway as taxiway, as the last nine times before.")

The more these anticipations have been fulfilled in the past, the more people base their expectations on them. Actually, some people almost rely on the "beneficial supplement" being granted – which is not always the case.

The two options most often mentioned (from Badke-Schaub/ Hofinger/Lauche, 2008, p.63):

vs.

In this connection it is interesting to see that various ANSPs all over the world, and so skyguide, have developed an extremely customer-friendly and – oriented way of working. This "per se" is not wrong, but in the present context, it is essential to understand that unwanted outcomes may become a natural by-product of a culture within which service-based expectations are created and regularly reinforced.

This short article is not about the incident mentioned at the beginning. It is not about telling who is wrong and who is right. It is not about saying that "service" is the bad, "safety" the good one. And it is definitely not about defending people's action, like using an active runway without clearance. Having said this very last sentence it might however get more and more clear, that we very much rely on expectations and assumptions. They are not only common but rather normal and in most cases very helpful and even essential to reduce workload and complexity to an acceptable level, what means not being mentally overloaded.

The flip side of the coin is that each positively fulfilled expectation reinforces the person's behavior and decision-making in a similar future situation. So always expect the unexpected…

Monika Baumgarten, SRO
Stéphane Barraz, SR

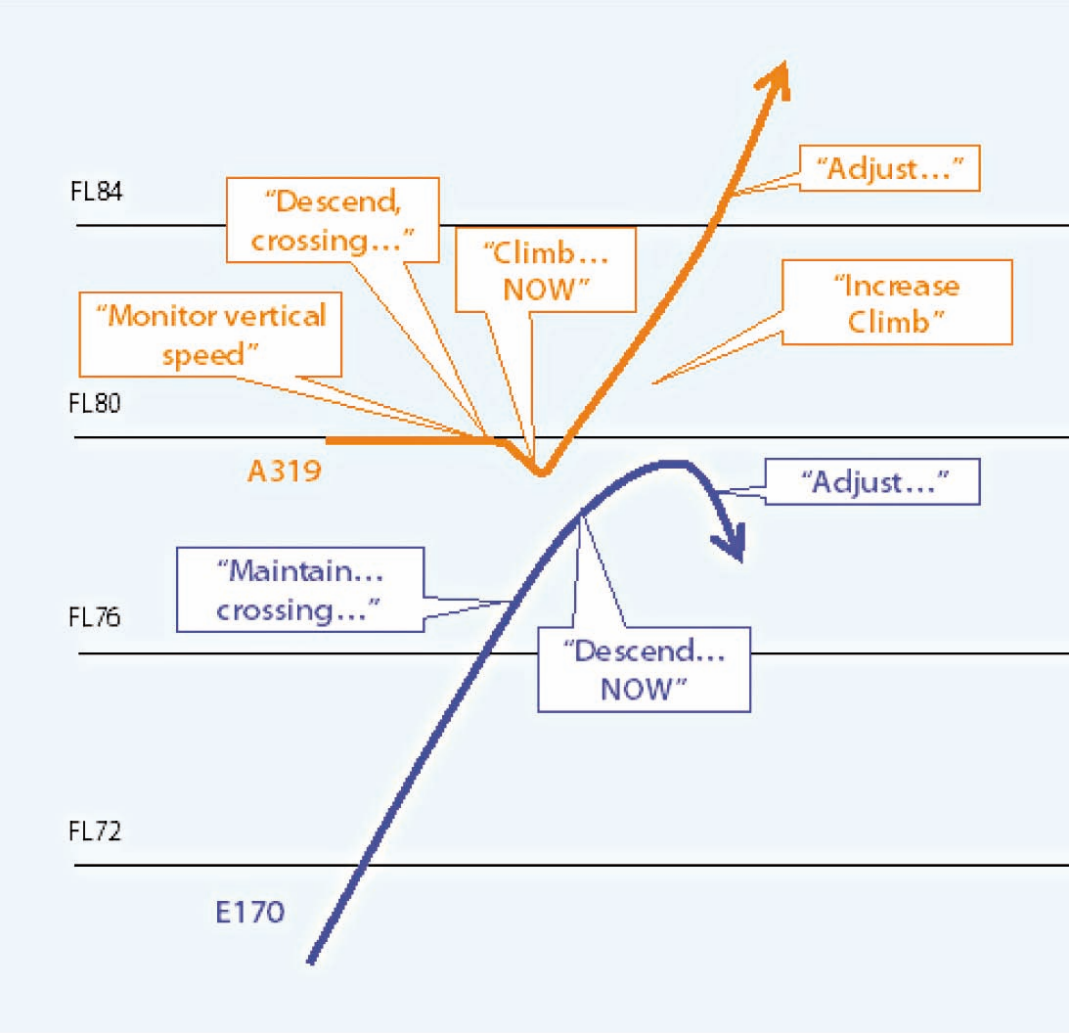
ACAS II bulletin by Eurocontrol

Hereunder you will find an interesting event about a reversal RA *(i.e. "Climb NOW" or "Descend NOW")*, which is a rare but critical event. The following text is a courtesy from Eurocontrol and is entirely extracted from the ACAS II bulletin, September 2011, issue N.13. The complete issue is available at the following link: http://www.eurocontrol.int/msa/gallery/content/public/documents/ACAS_bulletin_13.pdf

Introduction

On some occasions, when an initially issued RA is no longer predicted to provide sufficient vertical spacing, it will be modified to either increase the strength or reverse its sense (a reversal RA). Although making up less than 1% of all RAs, by their nature of reversing the vertical sense of the aircraft, reversals are the most challenging RAs to fly.

The event in this bulletin illustrates how correct pilot responses to both reversal and crossing RAs provided successful collision avoidance in a situation where separation provision had been seriously compromised. This event also demonstrates the benefits of pilots practising flying RAs in the simulator.



ACAS II bulletin by Eurocontrol

Reversal RAs successfully followed

A departing Embraer E170 is climbing to FL70 and talking to the departure controller. An inbound Airbus A319 on a reciprocal heading is maintaining FL80 and talking to the TMA controller. When the E170 calls on the TMA frequency, the controller overlooks the fact that the two aircraft are on opposite tracks and instructs the E170 to climb to FL90.

When the distance between the aircraft reduces to 5.5 NM horizontally and less than 900 feet vertically, TCAS generates a TA in both aircraft. Thirteen seconds after the TA, coordinated RAs are issued: a "Monitor vertical speed" RA for the A319 (which tells the crew to stay in level flight) and maintain crossing climb ("Maintain vertical speed, crossing maintain") RA for the E170 (which means that the crew should continue to climb with the current rate, crossing through the level of the other aircraft). The monitor vertical speed climb RA for the A319 changes to "Descend crossing, descend" within a second of the initial RA.

Simultaneously, the controller instructs the E170 to stop the climb and then, a few seconds later, to take an avoiding action by making a 130-degree right turn. The pilot does not turn but responds saying that he is following an RA. The A319 pilot, prompted by the controller, also reports a TCAS RA while starting to descend in response to the second RA.

When the aircraft are less than 3 NM and 200 feet apart, TCAS assesses that the previously issued RAs are not enough to provide sufficient vertical spacing and generates reversal RAs: a reversal descent ("Descend, descend NOW") RA for the climbing E170 and a reversal climb ("Climb, climb NOW") RA for the descending A319. Both pilots respond to the reversal RAs.

After another 5 seconds, the RA for the A319 strengthens to "Increase climb". The aircraft continue to follow the RAs and as the vertical separation increases, the RAs for both aircraft weaken to "Adjust vertical speed, adjust", in this instance requiring a reduction in vertical rates to 0 ft/min. When the aircraft pass each other they are separated by 0.15 NM horizontally and 1370 feet vertically.

"Clear of conflict" messages are posted for both aircraft 30 seconds after the first RAs.

Learning points (pilots):

Always follow the RA: Follow the RA even if the RA is contradictory to ATC instructions.

Responding to reversal RAs: Pilots must be prepared to respond to reversal RAs within 2.5 seconds. Reversal RAs require a 1,500 ft/min. climb or descent rate.

Only one sense reversal can occur per conflict, but as shown by this example, RAs can be strengthened and/or weakened subsequent to the reversal.

Simulator training: Both crews involved in the incident were trained in simulators for RA reversals which helped them to fly the aircraft in the challenging conditions. However, both crews were surprised by the large control input required to follow the reversal RAs.

Do you want to discover the second event presented int the ACAS bulletin ? follow the link:

http://www.eurocontrol.int/msa/gallery/content/public/documents/ACAS_bulletin_13.pdf