

# safety bulletin

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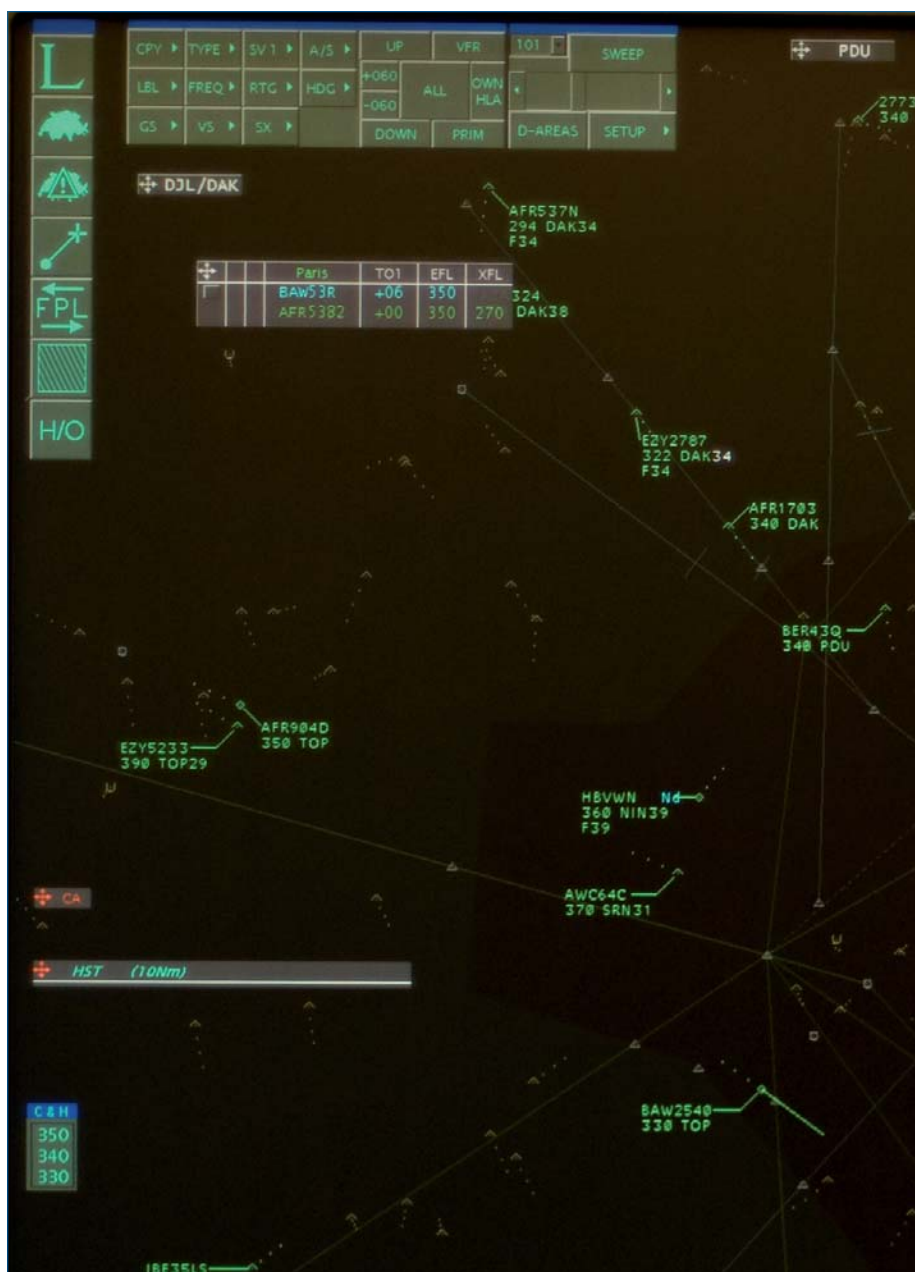
by Simon Maurer, S

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# Dear colleagues,



**The Safety People of the «higher risk» domains, such as railway, aviation, power production, chemical industry, oil drilling (!), rescue and fire fighting to name a few, have comparable questions and issues, so we do seek the exchange from time to time.**

This morning, I was invited to an SBB train ride in the «cockpit», in the locomotive. I was riding with a «type rating examiner» (in the aviation speak, «Prüfungsexperte»), so we had a lot of interesting discussions on incidents, human performance, and related problems.

We talked about trend monitoring, namely the ability to be able to detect slow operational drifts, which are usually hidden, and reveal themselves only when there is an incident (sometimes not even then). The SBB have the possibility to scan through recorded data (registered by the locomotive) to detect such trends. The analysis may or may not lead to measures, such as changed procedures, changed training, but also changes to the infrastructure (like signaling in the case of trains).

The airlines have even more recorded data available, allowing them a very detailed monitoring of normal operations (findings could be for example increasing landing distances on a particular runway or in general). Neither of these data are used for disciplinary action, of course but regularly as a basis for a safety discussions with the concerned staff in cases where this is deemed appropriate.

We don't have that much data. The primary sources are radar and

voice, and absence of other triggering values than separation minima infringements provide us with a very limited capability to monitor normal operations including our ability to detect operational drifts based on recorded data.

Our most important source for improvement measures remains reporting, your reports. I know, this has been said again and again... still, here it comes once more.

Data mining into recorded data is one thing, but it only tells you what the outcomes were, not what the perception of the staff in charge was. And the perception is clearly the more important part of the information in order to understand a situation!

Furthermore, consistent reporting is important. while the content remains the most important information, the number of reports (the density, if you like) remains a significant factor to be able to judge criticality and thus priorities for action.

I know also that filling a report after a long and stressful shift may not be the most desirable thing to do – but it is an integral part of the job and eventually you all profit from the organizational learning that can be achieved from it.

I do understand very well the fears with regard to a possible prosecution based on a voluntarily filed report, and of course the stress felt by those who actually have been indicted or prosecuted. This issue is being addressed by various initiatives with all the stakeholders, name-

ly FOCA, the prosecutors, the AAlB, and others. I am personally engaged in this together with Francis Schuberth (C). Luckily, these cases are very rare, and have not led to a criminal conviction in Switzerland to date. The judicial system of course has an important societal roles to fulfill. Strong freedom of information acts may have many advantages but have backfired within our industry. Since these acts are a strong foundation of our society they are not likely to be changed. The discussions we have with representatives of the judicial system will therefore concentrate on the creation of a common understanding of what would constitute gross negligence or criminal acts in order to avoid that normal people are prosecuted for doing normal work that for multiple reasons may have resulted in an incident..

## The message?

Please report all events which are or which you think are reportable, and as completely and consistently as possible! Without those data, we're flying in IMC without guidance.

Last but not least, the reports are also the basis for good «share the experience» articles, which we would like to publish in the Safety Bulletin more frequently from now on (as wished by many readers).

I wish you a good reading of the Safety Bulletin!

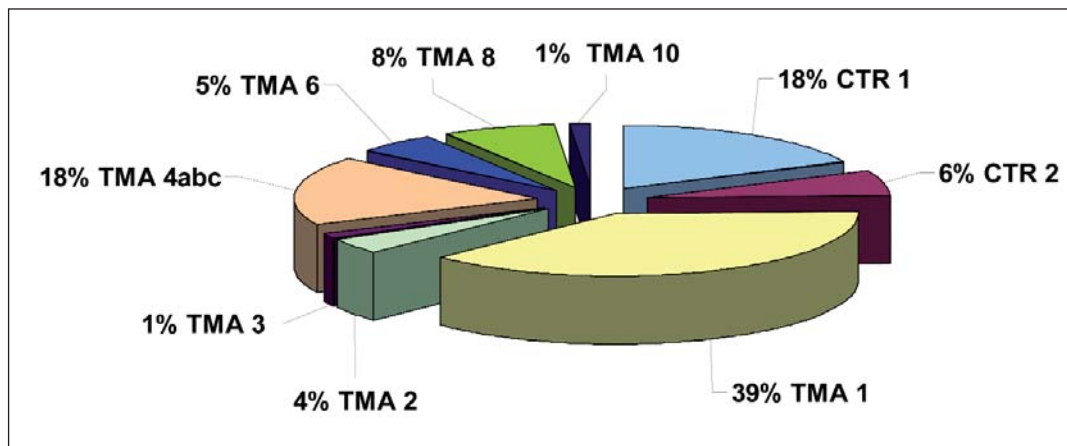
All the best,

SIMON  
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# VFR intruders

a glance at the topic based on an internal investigation from 5. November 2009

I was able to publish my «very first» investigation just a few months ago (link: <http://skydoc.skyguide.corp/Livelink/lisapi.dll/open/2781640>) – unaware of the fact that Eurocontrol had been working on the same topic: Airspace Infringement by VFR. The headline of their paper was «European Action Plan for Airspace Infringements» including 11 guidance notes for pilots with additional information such as flight preparation, getting information, different navigation methods, etc.



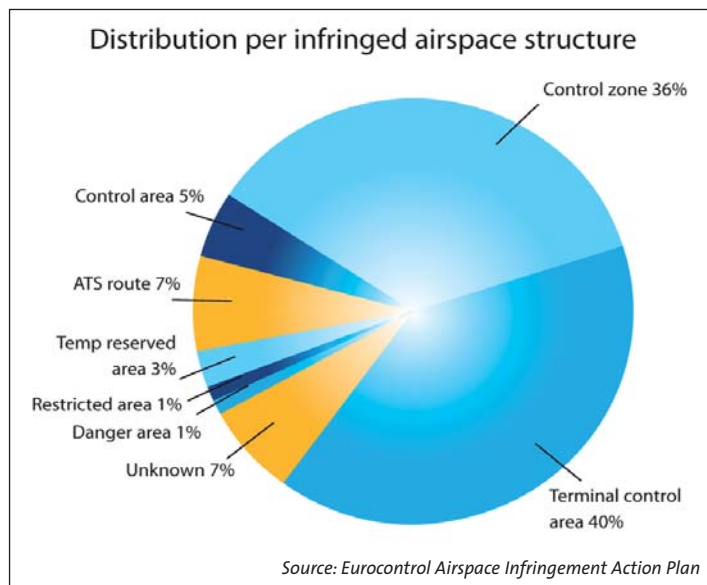
Location of infringements around Zürich.

Airspace infringement is generally defined as a flight into notified airspace without previously requesting and obtaining approval from the controlling authority of that airspace in accordance with international and national regulations.

Eurocontrol states that the effective design and management of airspace and associated procedures for the use of airspace are critical to aviation safety. Airspace infringement is a major operational hazard that can result from the division of

airspace into different classes and structures, with their associated procedures and services, and its joint use by different categories of users, often with competing objectives and different operational requirements and capabilities.

Looking at our Zurich Area Chart (see next page) a number of small airports are visible in the vicinity of Zurich. The pilots flying to and from these places have to navigate above, below or around noise restricted areas, specified routes, TMA sectors, glider areas, etc. The almost daily changing airspace around Zurich challenges general aviation pilots to be certain of «active» and «non-active» temporary TMA sectors (DVO on/off, German Public Holidays). The limitations of the TMA sectors are designed and based on «PANS-OPS» requirements and seldom comply with terrestrial navigation / guidance for VFR. The narrow layer of 500ft between the lowest IFR- and the highest VFR-altitude within the TMA requires a rigid adherence to the altitude restriction by the VFR pilots. Hence just by telling them «you should do better» would over-



Source: Eurocontrol Airspace Infringement Action Plan

Where do infringements occur?

Eurocontrol has a clear position towards the question «where do infringements occur?»: In a colorful chart they show that the majority takes place in terminal control areas and airport control zones and are mostly committed by GA VFR. Their Europe-Wide Action Plan aims to assist airspace users, civil and military service providers and national authorities in implementing the recommended actions. You are very welcome to read the report link: [http://www.eurocontrol.int/safety/gallery/content/public/library/Airspace%20Infringement/Action%20plan/AI\\_ActionPlan%202010\\_released.pdf](http://www.eurocontrol.int/safety/gallery/content/public/library/Airspace%20Infringement/Action%20plan/AI_ActionPlan%202010_released.pdf)

► VFR intruders

simplify and underestimate the actual situation.

In the year 2009 there were over 75 OIR upon VFR intruders within Zurich TMA sectors, wherefrom only three were in contact with FIC. Pilots do not always establish two-way radio communication

with FIC and the reasons therefore cover a wide range: the frequency is overloaded; the intended flight path is below airspace C; the expected flight time is short; the pilot has little experience with radio communication or is otherwise occupied with navigation, system management, etc. Today

FIC operators are not «licensed» to provide radar services to VFR traffic and the exchange of information with the appropriate sector may perish because of other obligations they need to meet.

In my point of view the simplification of our airspace with adequate

assistance for GA VFR would significantly improve the system and protect us all from hazardous situations.

We still have a long way to go.

VALERIE JOST  
ATCO investigator



TMA Zürich

# HANDOVER – always a critical period to go through

In November 2009, a loss of separation occurred in the region of AOSTA between a departure from Milano Malpensa and an aircraft with destination Geneva. The Internal Investigation conducted by the SR team permitted to highlight some interesting aspects, in particular about handover situations in high work load period, and working at the boundary of two different interfaces (UAC stripless – INI with strips).

## A short description of the circumstances:

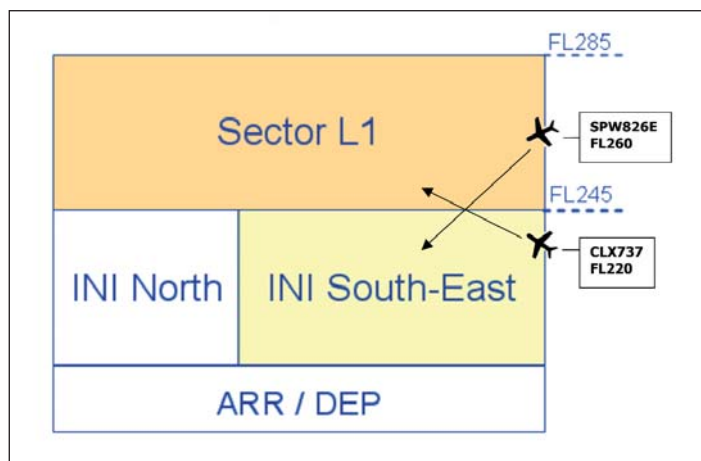
CLX737 (B744), outbound Milano Malpensa, contacted the sector INI South-East (INSE) climbing to FL220.

SPW826E (C25A), destination Geneva, was in contact with the L1 sector, and was cleared to descend to FL230 after coordination with the INSE planner.

Shortly after, CLX737 was cleared to climb to FL240 by the INSE Executive.

When INSE was offered a higher FL (sfl 260) for the CLX737 by electronic coordination, the INSE Executive decided to send the CLX737 to L1, being certain that L1 would provide the separation. By performing the «flash» function, the electronic coordination was automatically refused.

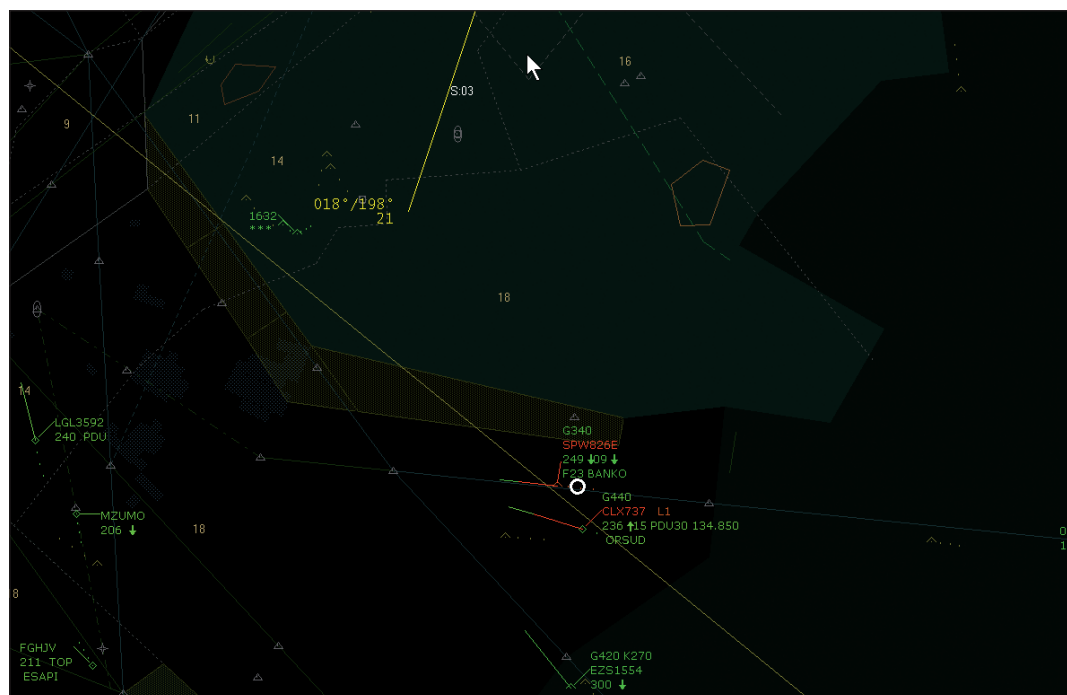
During the readback of the CLX, the STCA triggered an alarm between the CLX and the SPW. The



Picture 1: vertical trajectories.

ATCO managed to recover the CLX on the frequency, give him an avoiding instruction and provide

the SPW826E, who had called at the same time as the STCA alert, with a traffic information. The minimum recorded separation was 3.5NM / 300ft.



Picture 2 : screenshot

## Handover during a high workload period

The traffic situation at the sector INSE was complex and the workload was high. Several separations and vertical movements had to be monitored and planned at different locations.

The incoming ATCO took over the frequency to replace the outgoing ATCO at the end of his shift. Less than 3 minutes later, the incident happened.

«Handover situations are critical moments, when a number of failures are most likely to occur and lead to incidents.»

(From the EATM «Study Report on Factors Affecting Handovers» published by Eurocontrol in 2007)

► **HANDOVER - always a critical period to go through**

Amongst other interesting aspects that are shown in that report, the average time needed for a controller to «get the picture» was measured at 3.26 minutes.

Another one is the use (or absence) of handover-checklists. The experience in Geneva ACC shows that the existing handover checklists are never used. This might be explained by the fact that a checklist is, by definition, very rigid and linear, whereas a handover has to follow the dynamic of the real traffic situation.

All the most it could be useful to think about the moment when the outgoing ATCO unplugs his headset, as the moment at which he effectively passes over the responsibility to the incoming ATCO. This action should take place at the end of every handover.

Also, it seems useful to compare the common handover procedures at the INI sectors with the ones at the UAC (stripless) sectors. At the UAC sectors, if the RE has to be replaced, very often the RP takes over the RE position by selecting the frequencies and without having to move physically into another position. The 3rd position available at the sector unit allows the incoming ATCO to sit down, charge his personal radar setup and «get the picture».

### Working at the boundary of two different interfaces (INI-UAC)

One could ask why the INSE Executive did not see the Cleared

Flight Level (CFL230) on the label of SPW826E. Because if he HAD seen it, as he stated during the interview, he would not have cleared the CLX to FL240. Besides the fact that he was not yet fully «in the picture» after the handover, one has also to consider that data which is available, is not necessarily observed (data availability vs. data observability). This means that not all data that is available somewhere on the screen or on the strips can be observed and assimilated by the human brain. Therefore it is possible that data, which, in hindsight, seems essential, can be overlooked by the ATCO. Typically for this case, where data which is generated in the stripless environment (CFL on SPW's label), is normally not used at the INI sectors.

On the other hand, the L1 ATCO's had no information about the CFL of the CLX737, since at the INI sectors, no CFL inputs have to be done in the label, they are still written on paper strips.

### Communication breakdown

And why was the Planner not able to draw the Executive's attention to the fact that it was his task to do the separation between the two aircraft?

As the investigation showed, the Planner was busy most of the time on the phone and handling the paper strips, whereas the Executive was talking to the aircraft and getting the handover from the outgoing ATCO, so there was actually

no time to talk to each other. In the absence of a powerful scanning tool (i.e. HST/DST) and/or a cross-check system (i.e. «close the loop»), the only available «tools» at the INI sectors are the paper strips, which proved to be insufficient in that case.

### So what now...?

The future implementation of the stripless system at the INI sectors and in Zurich (in line with the Stripless CH Concept Document project - SCCD) should permit to absorb at least some of the contributing factors that played a role in this incident: the availability of scanning tools and/or conflict detection tools will permit a more efficient detection of conflicts. The absence of the paper strip handling-workload for both Planner and Executive, combined with a «close the loop» system should allow an easier communication and more efficient cross-check

system between both ATCO's at the sector.

Despite these positive prospects, there are at least two points that might dampen our optimism: the stripless system at the INI sectors will not be implemented tomorrow... a step by step introduction is foreseen between 2011 and 2013 (at the earliest). And, although identified as such, the problem of the boundary between two different interfaces (moving from UAC-INI to INI-Approach) will need special attention during the development of the stripless project.

The full report, including also the EATM «Study Report on Factors Affecting Handovers», is available on skydoc: <http://skydoc.skyguide.corp/Livelink/lisapi.dll/open/2828767>

ALAIN GABERELL  
ATCO-Investigator.

### Abbreviations:

**ATCO** – Air Traffic Control Officer

**RE** – Radar Executive (Radarist)

**RP** – Radar Planner (Coordinator)

**UAC** – Upper Area Control; term used for the sectors L1 to L6 at Geneva ACC, working with the stripless system

**DST** – Dynamic Scanning Tool (available at the UAC sectors)

**HST** – Horizontal Scanning Tool (available at the UAC sectors)

**INI** – Initial Control Sectors; term used for the sectors North, South and East, working with paper strips (and without the stripless tools)

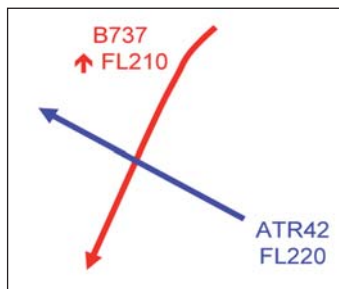
**sfl** – suggested flight level

**STCA** – Short Term Conflict Alert

**SCCD** – Stripless CH Concept Document project

# TCAS RA – green target fascination

A B737, heading south, is climbing to FL210. An ATR42 is in level flight at FL220 on a crossing track.



Despite traffic information from the controller about the ATR42 and confirmation of the clearance, the pilot of the B737 is still climbing at 2600 fpm when passing FL205. This high rate of climb results in the TCAS on both aircraft issuing coordinated RAs: a «Climb» for the ATR42 and an «Adjust Vertical Speed» to limit the climb rate to 2000 fpm for the B737.

to ATC that he also received a «TCAS RA to climb».

As a result, the B737 climbed through its cleared flight level by 700 ft, reaching FL217. Meanwhile, the ATR also deviated by 700 ft from its cruising level.

The ATR pilot follows the RA and advises ATC of his «Climb» RA. The B737 pilot also follows the RA and reduces the vertical speed. However, he continues climbing, maintaining the vertical speed needle in the green area, even after having passed through his cleared flight level. He does not stop climbing until TCAS generates the «Clear of Conflict» message. Afterwards, the B737 pilot reports

This type of level bust is the consequence of pilots maintaining the vertical speed needle in the green area of the RA display or the pitch angle at the base of the red trapezoid while responding to the «Adjust Vertical Speed» RA.

An «Adjust Vertical Speed» RA always requires a reduction in the

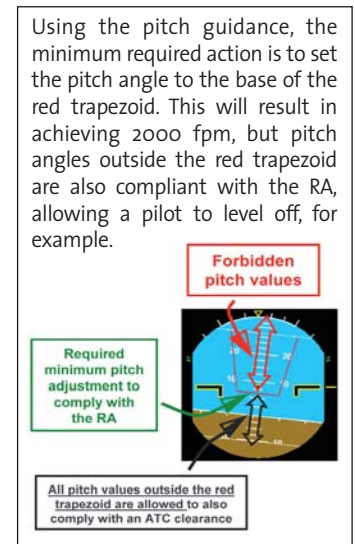
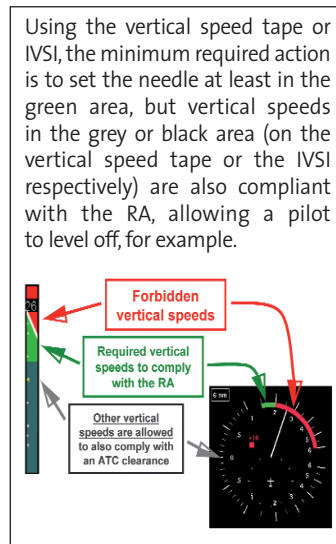
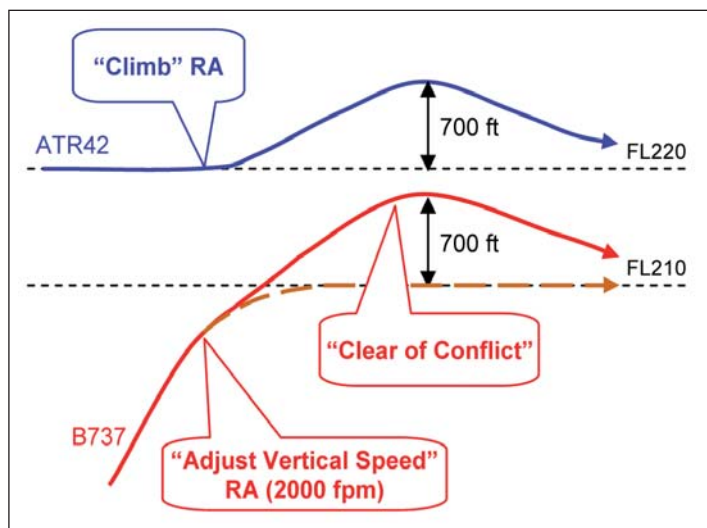
vertical speed (which was performed correctly by the B737 pilot). However, the «ACAS Manoeuvre Training» section of ICAO PANS-OPS Doc 8168 states: «when possible, an ATC clearance is complied with while responding to an RA. For example, if the aircraft can level at the assigned altitude

while responding to a reduce climb or reduce descent RA, it should be done.» This does not require that a pilot maintains the achieved vertical speed (i.e. 2000 fpm in this case) if a further reduction in the vertical speed would allow him to comply with the ATC clearance.

## Display of «Adjust Vertical Speed» RAs and associated response

The examples below show an «Adjust Vertical Speed» RA requiring a reduction in the vertical speed to 2000 fpm or less, displayed on an Electronic Attitude Display Indicator (red trapezoid as pitch

guidance), a vertical speed tape (with red and green areas) and a round-dial Instantaneous Vertical Speed Indicator (IVSI). Other possible required vertical speed reductions can be 1000, 500, 0 fpm.



It should be noted that both the new TCAS II version 7.1 (through the introduction of a new «Level-off, Level-off» RA) and the new «AP/FD TCAS» mode on some Airbus aircraft (through automatic compliance with the Selected Flight Level) will prevent level busts while pilots are complying with an initial «Adjust Vertical Speed» RA.

Source : Eurocontrol ACAS II Bulletin 11

# Safety training for ATCO Students

## The Beginning

During the last few years, new Air Traffic Controller (ATCO) students learnt about important safety topics during their basic course.

Now, Eurocontrol has written a new training syllabus for ATCO students. Consequently, the skyguide training center asked our division «Safety development» (SD) to adapt the existing course and enlarge it to nine basic lessons and another three hours when students attend the rating course. Topics remain the same during both the basic and the rating course. However, during the rating course the focus is put on details about the domain the students were assigned to.

## Safety Goals

With this extended program students get prepared for the essential work in their safety domain. It is a possibility to make students aware of some basic principles in safety and at the same time Eurocontrol requirements are fulfilled. One of the main goals will be to clarify that safety is everybody's business. Therefore, it is important to strengthen trust and



increase communication which will lead to an improvement of our safety culture.

## Quality Control

Interesting discussions within SD division were held about different viewpoints and to which degree some theoretical knowledge should be taught – if at all.

Before we start with our classes in the middle of July we will accomplish a pilot course with attendees from the departments Safety and Operations. Their feedback will be taken into account to improve the course. Additionally, more students will be asked to give their comments as well (anonymously) to make sure that following classes will benefit

from them. A pool of future classroom teachers will be selected to make sure that there is enough staff available to give these classes with best qualified people. Therefore, the teaching competence will also be part of the students evaluation done after the course.

## Course Topics

According to the Eurocontrol training syllabus for ATCO students the following listening shows what topics need to be taught.

The first part will be very similar to the presentation, which is showed during the welcome days for new skyguide employees but goes more into detail. It belongs to the module Law which we cover with the topics

- regulatory framework
- the regulatory requirements, e.g. parts of a Safety Management, goals, procedures)
- Responsibility (different kinds of responsibility as for example welfare, social)

Later lessons are a part of the module «Human performance», including discussions about

- Dangers of error in ATC (for example equipment handling or communication errors)

We will also explain the different views about Human Error and discuss them with the students. Further topics are:

- Causes for errors (e.g. fatigue, inadequate knowledge, inadequate supervision, distraction, workload, stress,..)
- Types of error (slips, laps, mistakes, violations)
- Performance levels (skill, rules and knowledge based)
- Changing focus on «human error» – learning perspective
- Error models

Additionally we will have a short look into the theory of the Hindsight bias, the need for capacity/safety trade offs and talk about relationships and dependencies.

## Methods

For easier understanding these theoretical topics will be explained with lots of examples, movies, discussions and groupwork. Additional lectures will be placed on ILIAS, the specialized training platform. For some of the topics students will have to prepare a short presentation at home, for other ones it will be done within groupwork at school.

The teaching will take place in the skyguide training center which offers a lot of perfect tools for presentations.

We are looking forward to meeting our first students and all the interesting discussions we will have. This new course will become another important element to strengthen skyguide's safety culture.

IRÈNE MEYENBERG  
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