STCA training - yes, we can!

By Rui Manuel Santos Filipe

We all know the consequences of a loss of separation or risk of collision can be extremely severe – psychologically, emotionally, socially – for the controller(s) involved, even in a no-blame just culture environment.

We know that, but sometimes we do nothing or very little in our training to prevent it from happening. In Lisbon we were aware of the problem, so what did we do?

The need for a simulation replica of the operational system was initially identified in 2003, when the first refresher course for Lisbon controllers took place at the NAV training centre. The participants found the existing simulation platform inadequate for the refresher courses. The differences from the operational system in terms of both functionalities and user interface were very considerable, e.g. no availability of OLDI and STCA, flight strips with a different layout and sometimes not event-printed etc. The decision to develop a simulation platform capable of replicating the operational LISATM system was taken by NAV in 2004. The new simulation system would be used not only for ATS training at local units (like Lisbon ACC) but also for pre-implementation testing and staff training.

The new SIMATM simulation platform was installed in the Lisbon ACC training room during the 3rd quarter of 2009, aiming to provide the Lisbon controllers (both ACC and APP) with a simulator which could cover all the functionalities, tools and capabilities of the operational system, including the user interface.

Between October and December, the 2010 area surveillance control refresher course modules (sixteen of them) were conducted using the SIMATM, allowing us (finally!) to train controller response to STCAs, as recommended by NAV SEGNA back in 2004.

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The need for specific training in this area had been identified early on. We have learnt from the incidents. Our incident investigation process is very efficient and always directed at practical improvements. After all, the product from investigation is not just the investigation report but the real improvement of safety. Training, together with operations management and procedure and equipment design, constitute areas where improvements are made and where the incident investigation 'products' can ultimately be found.

The incident analyses which I refer to here are events involving STCA. We found that late issuing of conflict avoidance instructions, lack of use of precise and adequate avoiding instruction phraseology and insufficient corrective instructions for the flight profile resulted in otherwise avoidable loss of separation. Prompt and decisive action would have solved the

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STCA training – yes, we can! (cont'd)

problem with no infringement of the applicable separation minima.

It is important to note that although the purpose of avoiding action is to prevent collision, the use of it should not be restricted to the cases where the required separation has already been lost. Indeed, proper avoiding action can be efficient in the cases where an instant action is required in order to preserve separation and to prevent the situation from further deteriorating and becoming less controllable for ATC.

The team made it very clear that any potential conflict situation should be treated separately. The Avoiding Action phraseology should always be applied - not only when a potential risk of collision is detected, but also in every situation where a potential loss of separation exists.

It is difficult to precisely describe to controllers exactly what sort of action should be taken for any particular collision risk because the combinations of encounter geometry are too great.

Nevertheless, we believe that what we learn from incident investigations can be incorporated into some sort of generic learning scenarios.

We took up the challenge and the team resorted to trigonometry. This resulted in findings in terms of adequate amount of vectoring, which were demonstrated through simulated scenarios (opposite direction, crossing traffic and same direction). For example, two aircraft are vectored or only one, comparing the time remaining to actual loss of separation.

We tried to identify the feasibility of an efficient controller's reaction in the available timeframe following an STCA activation. We tried to answer questions like "What is the adequate amount of vectoring?", "How long do we have to decide and react?

The following principles were established:

- **STCA is not a loss of separation, the alert takes place 120 seconds before separation minima might be breached;**
- **It is recommended that vectoring instructions should be provided to ensure separation minima;**
- **If minimum distance is projected to be 0 NM (if no vectoring provided), this is considered as the most severe situation. Full horizontal separation minima must be regained in the time available;**
- **Minimum response time for ATC – 7 seconds,**
- **Time for communications exchange (Avoiding Action instructions) and aircraft manoeuvre (considering the aircraft inertia) – 23 seconds.**

HERE ARE SOME OF THE LEARNING POINTS WE EXTRACTED:

OPPOSITE DIRECTION

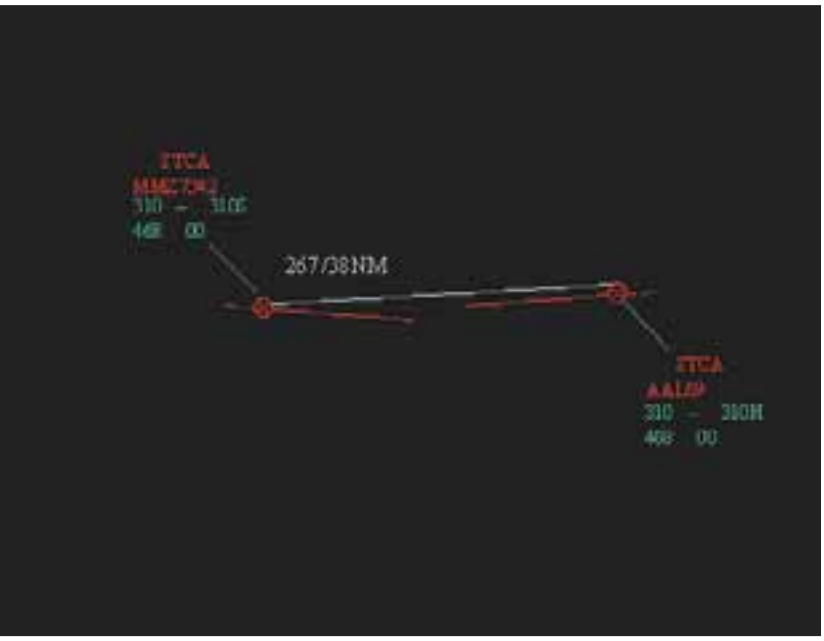
- Climb or descent instruction may interfere with ACAS;
- Consider turning both aircraft;
- Consider the exact crossing geometry – in the case above right turns are preferable;
- Visual acquisition of the conflicting traffic by the pilots is unlikely even in VMC due to the high relative speed;
- Provide sufficient turn magnitude, since a small turn may indicate lack of urgency to the pilot;
- The turn direction should preferably be the same – both turned to the right or both turned to the left;

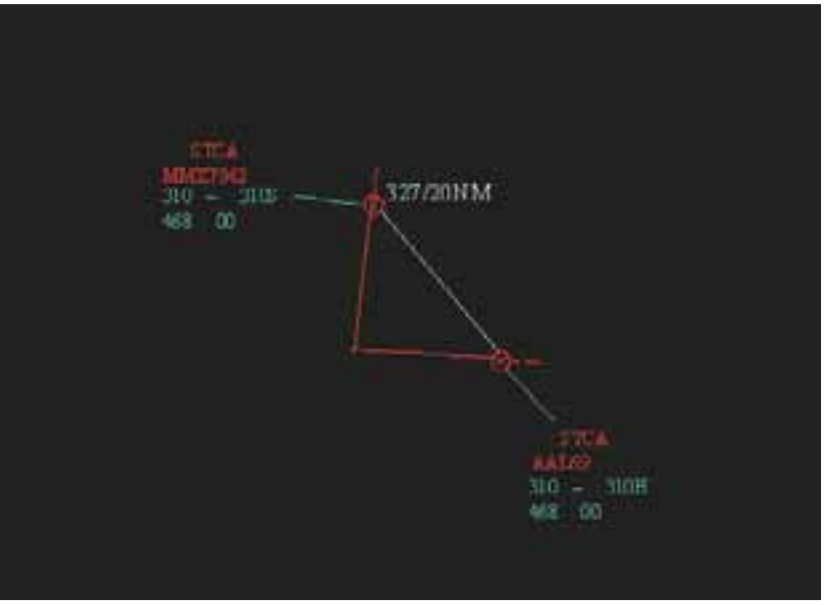
CROSSING TRAFFIC

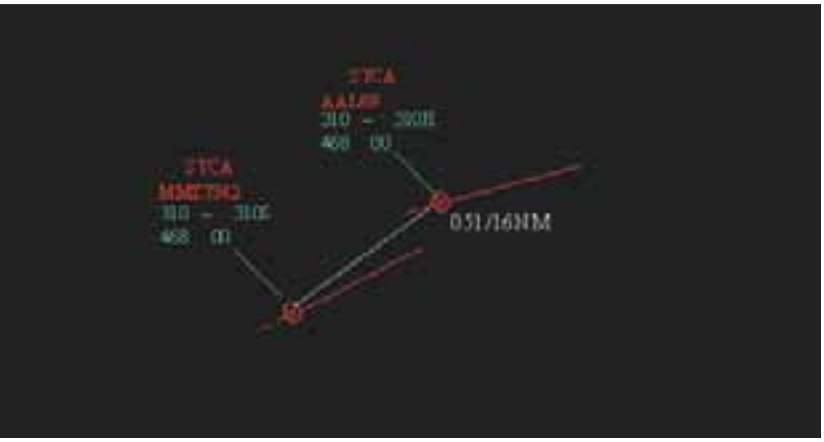
- Climb or descent instruction may interfere with ACAS;
- Consider turning both aircraft;
- In certain conflict geometries turning only one aircraft may result in a head-on encounter;
- Visual acquisition of the conflicting traffic by the pilots is possible;
- Turning one aircraft behind the other is often better than turning one aircraft ahead of the other;
- The turn direction should preferably be the same – both turned to the right or both turned to the left;

SAME DIRECTION

- Consider descending and/ or turning one or both aircraft;
- Visual acquisition of the conflicting traffic by the pilots of the second aircraft is possible;
- Descending and/or turning the second aircraft first is preferable;
- If turning both aircraft, the turn directions should preferably be opposite;







Finally, practical training was conducted in the SIMATM with each participant carrying out three simulation exercises which incorporated all the potential conflict cases addressed. These simulation exercises validated the proposed strategies for modifying flight profiles to avoid effective loss of separation, using the assumptions referred to above.

With the experience from the simulations, we recognised that loss of separation is avoidable in most cases. This conclusion was valid provided that adequate change of flight profiles took place no later than 60 seconds before the time of estimated minimum distance.

Nevertheless, and as anticipated by the instructor's team, this single simulator exercise alone was clearly insufficient to provide the fellow controllers with the required training for the establishment of a routine for the response to STCA situations. In their final report, the instructor's team recommended that training of controller response to STCAs should be periodically performed. Regular training should be included in the ATC refresher courses.

The provisions applicable to a loss of separation, both in the ICAO PANS-ATM and in the Portuguese general and local procedures, require the controller to continue issuing instructions to regain, as soon as possible, the separation minima infringed (or apply a different type of separation).

Personally, I've been involved in preparing and conducting the annual refresher training for fellow controllers' ACS ratings in Lisbon ACC since 2003, and the course last year was by far the most successful one. To my mind, unusual situations and contingency refresher training is somewhat like defensive driving training, in the sense of "driving to save lives, time, and money, in spite of the conditions around you and the actions of others". We save lives and avoid creating psychologically, emotionally and socially affected human beings.

Never give up! Our latest training was concluded with a unanimous "Yes, we can!" followed by a "Therefore, we must"!