



visual vectoring

Product Description



vvcompsepTM

Critical safety training for air traffic control

Version 3.0

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Summary

VVCompSep™ is a self-contained PC-based safety training program for Air Traffic Controllers. Specifically, it teaches a correct response to a Compromised Separation event, which is a situation in which two aircraft under Surveillance Control are discovered to have (or to be about to have) less than the required vertical or horizontal spacing.

The *VVCompSep™* package provides instruction on developing appropriate responses to these events and, with the use of the included ATC Simulator ([VVSIM](#)), a means of practicing those responses.

Context

Throughout the Air Traffic Control world, rising traffic levels are leading to increased airspace congestion. There is a trend for airline companies to service more and more routes with smaller aircraft, making tactical airspace management more complex. Also, the advent of ADSB technology is opening up more airspace to Surveillance Control.

The CompSep Event

Safety hazard events often develop from complex interconnecting circumstances involving a series of latent and active failures. In the case of separation events, contributing factors can include airspace design, congestion, controller training, pilot non-compliance and weather. As the event unfolds, system defences such as conflict alerting systems and controller intervention may intervene to prevent a collision. Ultimately, Traffic Collision Avoidance System (TCAS) may have a role to play as a final defence.

In a compromised separation event the controller will at some point become aware of the situation. That may occur before or after a TCAS alert is triggered. In any case, once aware of the situation, a response is required of the controller and it must serve to minimise the chance of a collision. The content of this response will depend on the amount of time available and the disposition of the aircraft, and may include a positive control action and/or the passing of traffic information.

Controller Response

In managing everyday traffic, the Controller will use his/her skills and experience to make control decisions. Over time, repeated exposure to conflict events in simulation and real life will result in the development of an expert level of response, even to novel scenarios.

However, controllers are very rarely exposed to CompSep scenarios that require a specific time-critical response using precisely correct phraseology, so they typically have limited experience at managing these types of problems. Often, due to the difficulty in simulating surprise and stress, even expert controllers may lack the skills to provide an effective response (see figure 1).

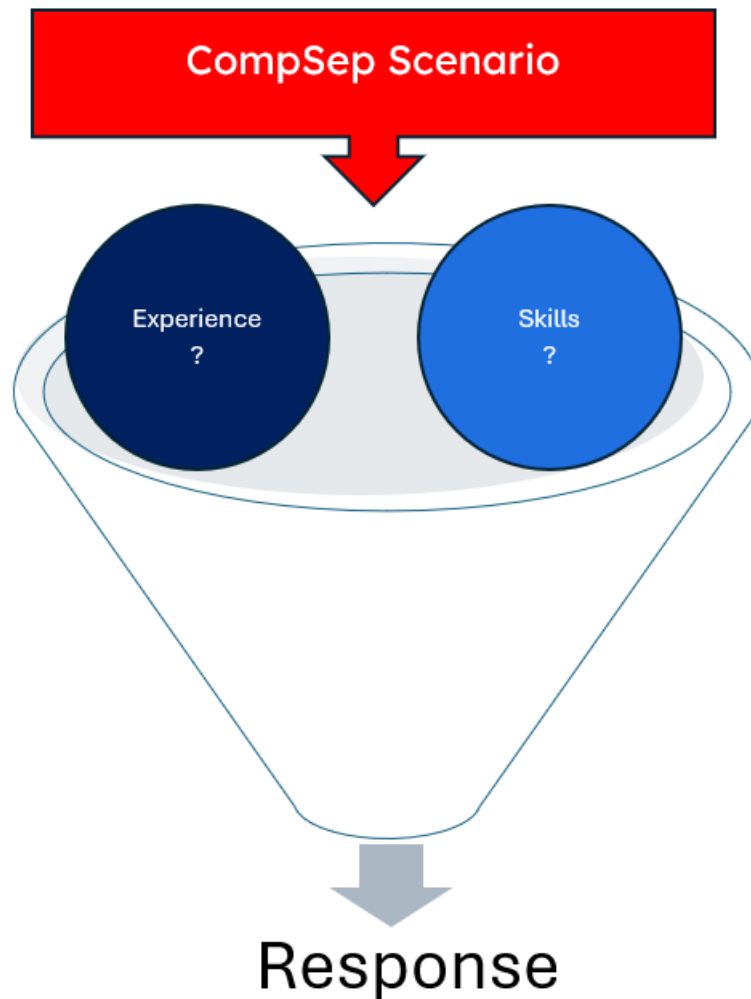


Figure 1: The decision process: Controllers may lack the experience and skills to make an effective response.

The Training Problem

The response to a CompSep event must be devised and implemented in a very few seconds, and often under great stress.

Development of the required conflict resolution skills requires the learning of sound techniques and exposure to a large number of conflict scenarios. Then, the skills must be perfected and maintained by regular practice.

The required outcomes are difficult to achieve using traditional training and simulation methods, due to the costs involved and the challenge of simulating the surprise element.

The Training Solution

VVCompSep™ is a unique, self-contained training course and practice simulator that enables controllers to develop the required skills and to maintain proficiency in them. VVSIM employs accurate speech recognition technology that has been proven with a wide range of speaking accents to provide high levels of realism.

The *VVCompSep™* course provides ATC Service Providers with a convenient, efficient means of equipping its controllers with the ability to resolve critical conflict situations, making its acquisition an invaluable investment in the safety system.

Course Contents

VVCompSep™ training is divided into four lessons and four simulator exercises, all structured to build skills in a gradual and positive manner. Control techniques are first taught and demonstrated as part of the lesson, and then these techniques may be practiced in simulation (figure 2).

Each simulator exercise is matched to the training content preceding it, allowing the development and reinforcement of the skills required in such scenarios.

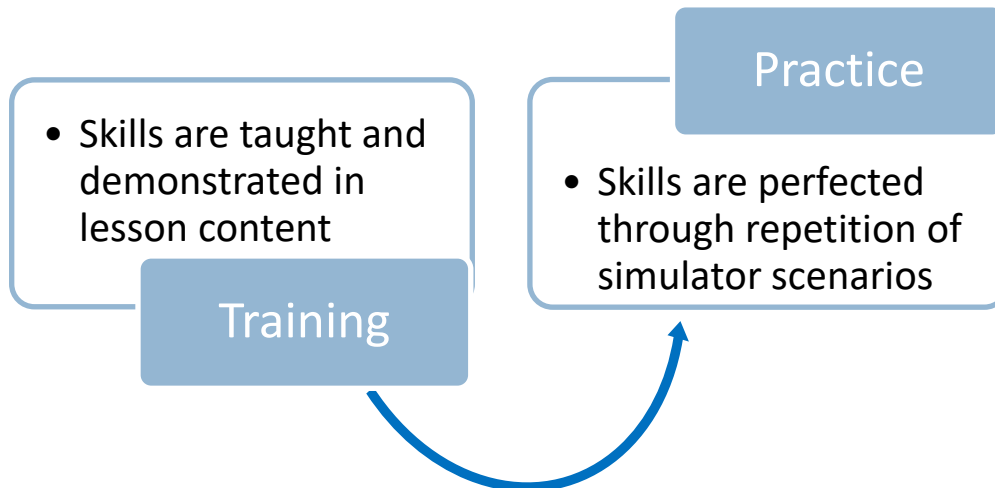


Figure 2: *VVCompSep™* Training Methodology

The four training lessons provide an organised and sequential approach to the response to CompSep scenarios as described below:

Traffic Information

The Traffic Information lesson provides a thorough grounding in the assessment and issuance of traffic advice to pilots. Particular attention is paid to the recognition of the correct clock bearing reference - the direction a pilot should be instructed to look for the conflicting aircraft.

The required skills take considerable practice to perfect and errors in this aspect of traffic information can have serious consequences in real-life incidents.

Response to a Predictive Alert

Any response to a CompSep event must allow for the possibility that TCAS avoidance advice may be received by one or both pilots. In the PCA lesson, the timeline for TCAS alerting is laid out visually so that controllers can quickly determine the available options. If there is any possibility of a clash with TCAS instructions vertical solutions must be discarded.

The simulator exercise following this lesson requires the resolution of twenty conflict scenarios of aircraft in various configurations just before a Predictive Conflict Alert appears.

Urgent Conflicts

In this lesson, scenarios are considered in which the conflict becomes apparent after the point at which a vertical solution is available because the possibility of a TCAS intervention precludes such a response. An average time-to-crossing of around one minute is used as a reference for establishing assessment and resolution techniques.

At this time interval before intercept, a crossing or merging of aircraft flight paths can still be prevented with prompt turn instructions to one or, in some cases, both aircraft.

Emergency Conflicts

This final lesson examines highly critical conflicts, i.e. those that are discovered when the aircraft have reached a point within about forty seconds from crossing. There is very little time available to devise and implement a resolution plan before it is too late to issue a traffic statement or to cause one or both aircraft to commence a turn.

These conflicts are the most critical traffic situations an Air Traffic Controller can be presented with, and sound techniques and considerable practice are necessary to achieve and maintain the required levels of expertise and confidence to resolve them.

Simulation

Visual Vectoring's custom ATC simulator, VVSIM has the capability of displaying several sub-scenarios within a single simulator exercise. Conflicts are presented individually with no warning and may be selected in any order. Each must be resolved with verbal instruction(s) using standard phraseology. The use of sub-scenarios is extremely effective in simulating the element of surprise, as the controller has no forewarning about the dispositions of the conflicting traffic, and so must formulate a response immediately.

After each sub-scenario an analysis of the outcome is provided, detailing the separation that was achieved and a comparison to that which would have been achieved had no action been taken. The report also identifies whether a Loss of Separation (LOS) occurred.

All results are uploaded into the Control Zone Learning Management System (LMS) where they can be reviewed by both the student and training supervisors.

In some simulation exercises, sub-scenarios are presented in which there are additional non-conflicting aircraft on the screen. These need to be considered in the response to the CompSep event, adding to realism. Variety may be added by the addition of wind, extra cascading scenarios and airspace rotation.

Customisation

Training content and simulation is present using ICAO phraseology and procedures. On request, variations to this can be implemented with input from local training experts.

The sub-scenario simulation capability also lends itself to teaching and testing response to unusual events that require a very specific phraseology, such as an emergency squawk or transmission. Such scenarios can be presented as part of refresher and recurrent training programs.

Delivery

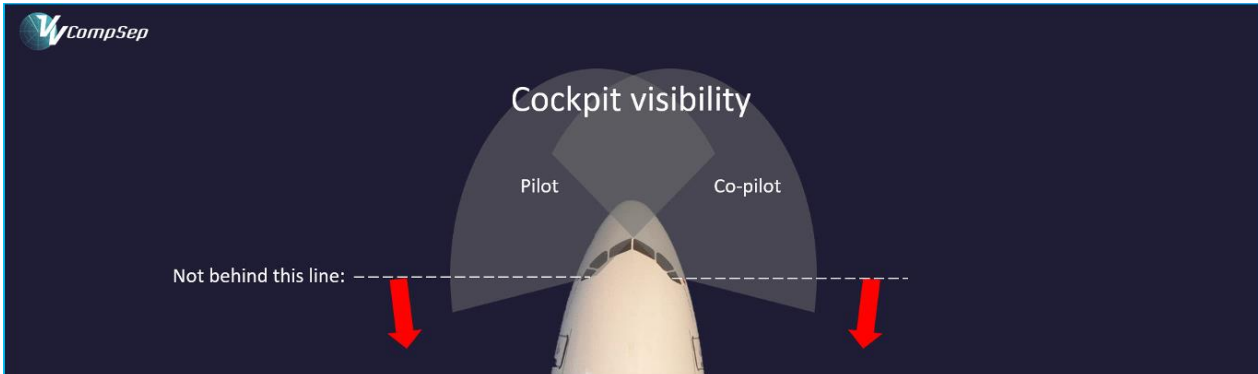
Delivery is available through a traditional computer training laboratory or through the cloud-based the Control Zone LMS. Training content can be consumed on any device. Simulation requires a Windows PC or laptop with English language capability.

Frequently Asked Questions

Who will benefit from <i>VVCompSep™</i> ?	<i>VVCompSep™</i> is intended for delivery to licenced Air Traffic Controllers in a surveillance (Radar and ADSB) environment. It is also suited to incorporation into basic training for such duties.
How is the training delivered?	The program may be delivered in an instructor-led classroom environment, or distributed on desktop or laptop computers for self-paced learning.
What does it teach?	<i>VVCompSep™</i> teaches the response to unexpected Compromised Separation events in a Surveillance Control environment.
What doesn't it teach?	Airspace specific services.
Can extra content be added?	Yes. With the collaboration with local training experts, extra theory content may be added by the development of PowerPoint-style lessons (run as movies) which are added to the main interface.
Does the training content support regional variations in procedures and phraseology?	Yes. The instruction content in <i>VVCompSep™</i> is designed to be generic in nature, and makes use of published ICAO procedures, but may be readily customised to local phrasings and procedures. Similarly, the VVSIM can be programmed with specific speech and data parameters to support any local requirements.
How is <i>VVCompSep™</i> supplied?	The <i>VVCompSep™</i> training program is delivered from the Control Zone LMS. Simulation requires the download and installation of the VVSIM program.
How much does it cost?	<i>VVCompSep™</i> is licensed to ATC Service Providers and Training Organisations for use on an annual basis or permanently. Fees depend on the number of controllers that will be using the program. Customised features that may be required are extra. The overall cost of the use of <i>VVCompSep™</i> represents a fraction of the cost of delivering the same training by traditional methods.
Can I trial the program?	Yes, a demo version is available for testing by ANSPs and ATC Training Organisations.

Screen captures

Lesson: Traffic Information



Cockpit visibility

Pilot Co-pilot

Not behind this line:

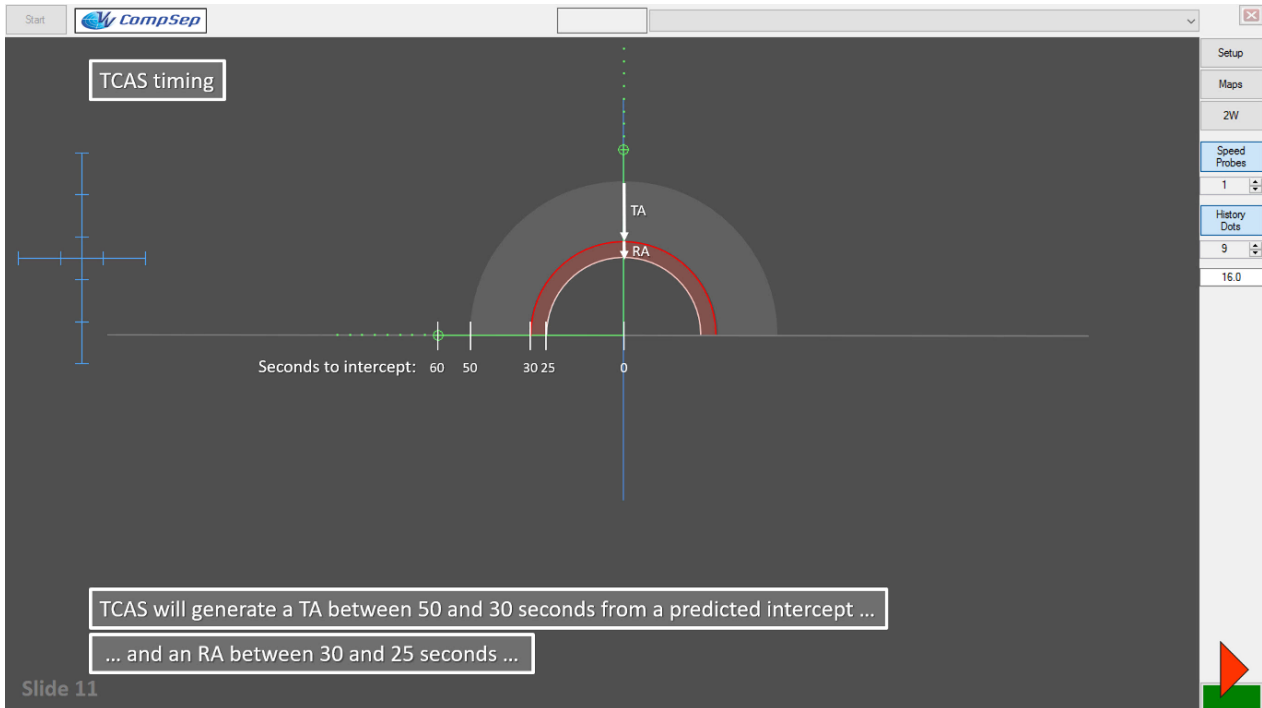
In azimuth, the pilots' field of vision extends from slightly behind the square direction on one side a similar angle on the other ...


As a general rule, asking a pilot to look for traffic *behind* the square direction ('over the shoulder') should be a last option to resolve a conflict.

Within the very limited timeframe, other options are more likely to be effective: turn instructions to one or both aircraft or Traffic Information to the *other aircraft* (its pilots would be in a better position to achieve a sighting, and be better able to execute an avoidance manoeuvre).

Slide 3

Lesson: Predictive Alert



Start 

TCAS timing

Seconds to intercept: 60 50 30 25 0

TA


RA

TCAS will generate a TA between 50 and 30 seconds from a predicted intercept ...

... and an RA between 30 and 25 seconds ...

Slide 11

Lesson: Urgent Conflicts

Continue 

Setup

Maps

2W

Speed Probes

1

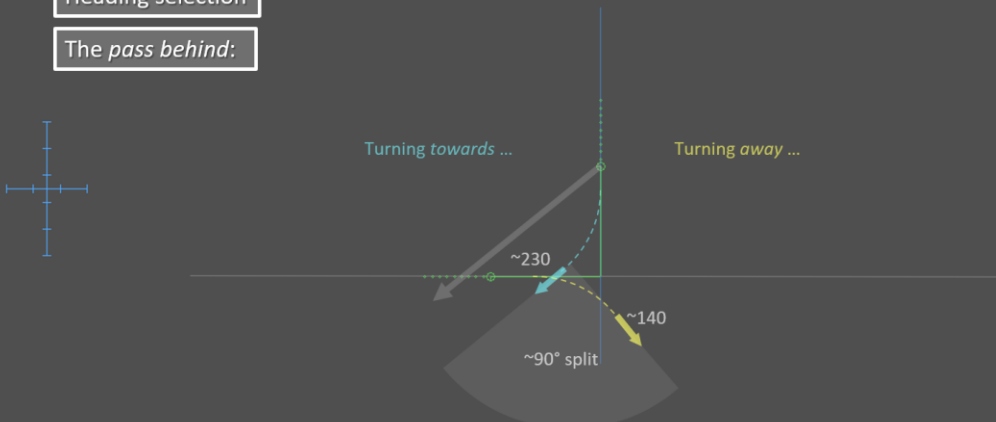
History Dots

9

27.0

Heading selection

The *pass behind*:




The aircraft that is to do the *pass behind* is the first to be turned. The turn is *towards* the conflicting aircraft, so it must be the *furthest* aircraft from the crossing point if not equidistant. A positive cue to the ideal heading is one that passes just *behind* the conflict.

A 90° split is then created by turning the second aircraft *away* from the flight path of the first.

Observe the manoeuvre, with timing similar to the last demonstration ...

Slide 12

Lesson: Emergency Conflicts

Continue 

Setup

Maps

2W

Speed Probes

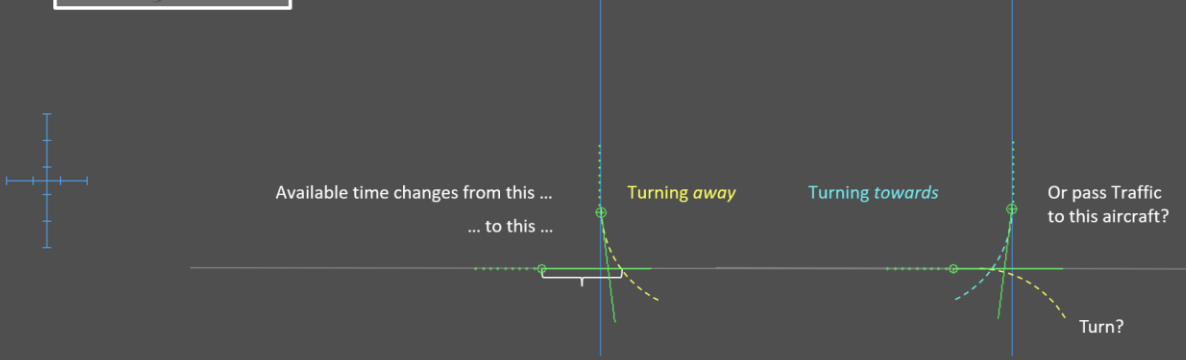
1

History Dots

9

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How long do I have?



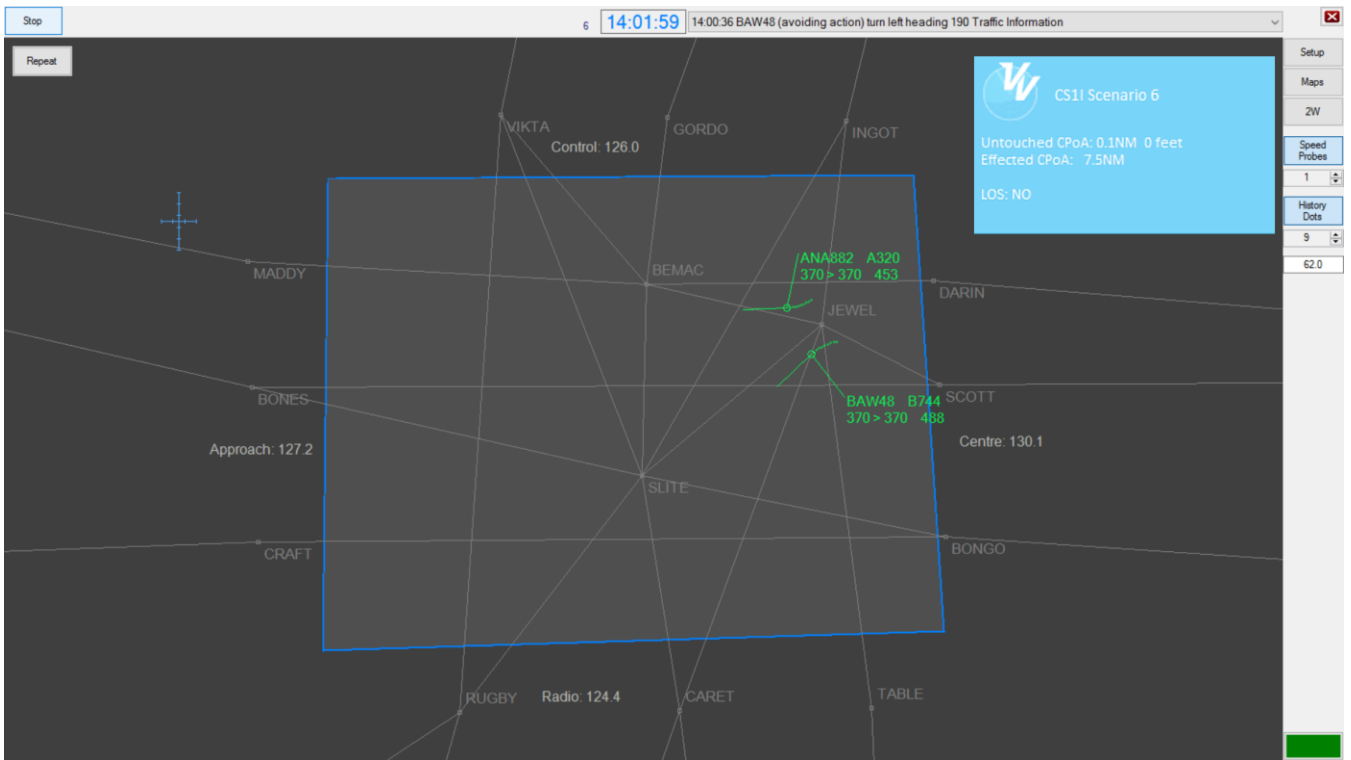
Available time changes from this ...
... to this ...

Assessment of available time is dynamic, it changes as the aircraft move, so it must be done instantly. This is particularly relevant when the second aircraft of a conflicting pair is considered. The actual or anticipated turn of the first aircraft moves the crossing point.

Can a useful turn by the second aircraft be achieved in the available time (i.e. before flight paths cross) or is it better to pass traffic to one or both pilots?

Slide 4

Simulation: Single pair conflict



Simulation: Multiple aircraft

