



visual vectoring

Product Description

vvenrouteTM

Foundational skills training in surveillance control

Version 3.0

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Product description:

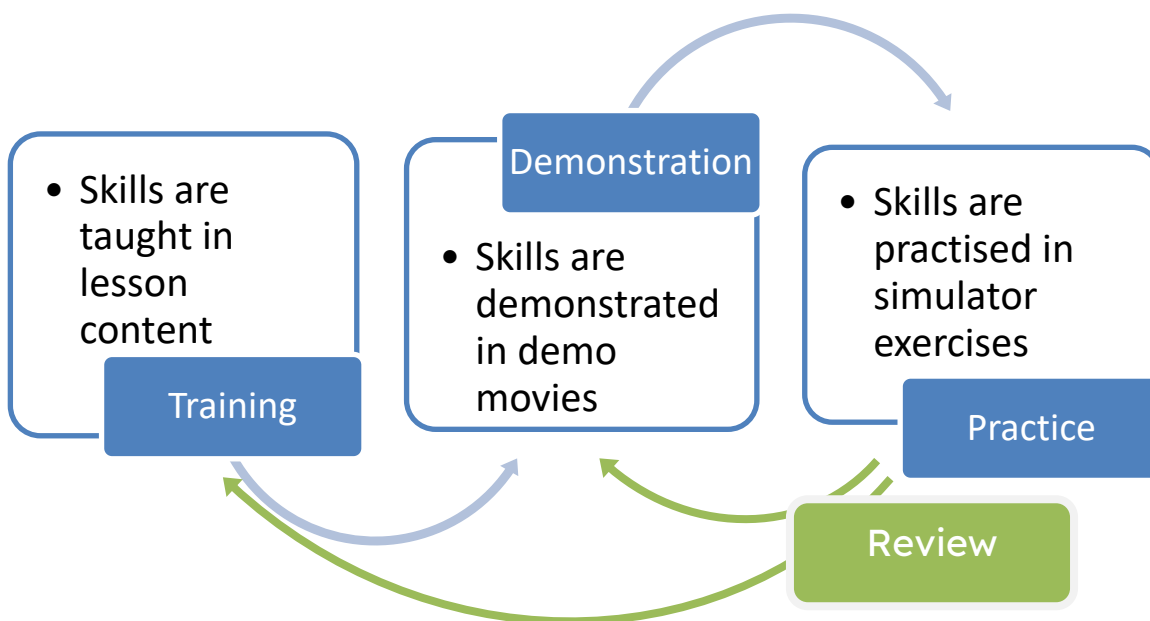
Skills taught:

- Radar vectoring of aircraft in all configurations by reading visual cues to movement provided by a Radar Display.
- Separation of aircraft by their Radar position and movement,
- Separation of aircraft by the use of vertical separation.
- Separation of crossing aircraft.
- Separation of nose-to-nose aircraft.
- Aircraft performance: Speeds, turn rates, climb and descent rates.
- Radio Telephony phrases for control of aircraft.
- Aircraft callsign formats and usage.
- Sequencing to gates on 16 different tracks evenly spaced around the compass.
- Sequencing multiple aircraft to a gate. Same-track and multi-track configurations are included.
- Sequencing aircraft with speed differences.
- Acceptance and Hand-off procedures.
- Transfer-of-aircraft communications procedures.
- HMI (Human Machine Interface) skills.

Training structure:

Training is structured in modules, each of which constitutes a Learning Step. Skills acquisition is cumulative as the modules progress – each adds to what has been learned earlier. Training is self-paced and may be done in private or under instructor supervision. Instruction elements can be reviewed at will and unlimited practice simulation is provided at each Learning Step, ensuring positive rates of development.

Learning Step structure:



Lessons

Learning content is presented as a slideshow run as an MP4-style movie. Full control of the flow of information is available by pausing and forward/reverse scanning the movie player.

Demonstrations

These are screen-capture movies of actual simulator performance of a selection of traffic scenarios from the upcoming exercise series, with audio. Graphic overlays of the radar relate the techniques being used to the lesson content. The movies can be paused and reviewed at will.

Practice Simulation

A series of exercises to be performed on the incorporated simulator provides unlimited practice opportunity to establish control techniques to the level required to progress to the next Learning Step. A performance assessment (score) is provided at the end of

each exercise to allow the student to self-assess his/her readiness to progress to the next. This information is available to instructors for performance reporting and analysis.

A list of simulator features are provided later in this document.

Review

The student is free to revisit the training and demonstration content to review and consolidate, and perform any additional practice simulation that might be needed.

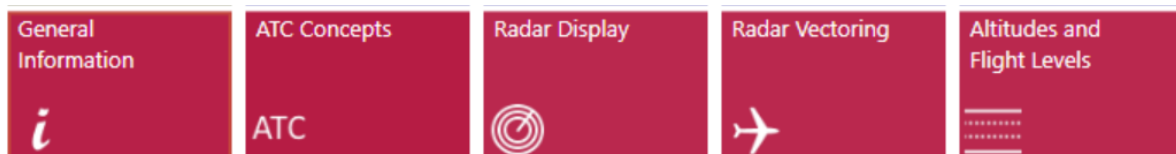
Training modules

Six modules are included in *VVEnroute™*. Each module contains lessons, denotations and simulator exercises designed to allow mastery of a particular set of competencies.



Introduction to *VVEnroute™*

This module contains five lessons. Each is a slideshow run as a movie and contains a range of information required for the student to establish a knowledgebase of ATC structure, procedures and control techniques. Whilst the content may be familiar to some students experienced in aviation, it is still recommended that this content be consumed because the context of the course and details of the airspace in use are covered.



Maze Vectoring:

This module teaches basic radar vectoring and is divided into two parts – Basic and Complex. Each part consists of a *lesson*, a *demonstration* of theory application on moving traffic and *simulator exercises* for the development of skills. A Simulator Task Trainer providing practice on basic simulator interface functions is included..



GRID Vectoring

This module teaches the separation of aircraft on converging flight paths by radar vectoring methods. A sector of aircraft containing tracks crossing at a wide range of angles and configurations, called *GRID*, is the training and practice platform. The training is divided into two parts:

Part 1: Conflict recognition.

Details the methods of determining whether two aircraft will maintain required separation if allowed to converge or cross at non-vertically separated levels.

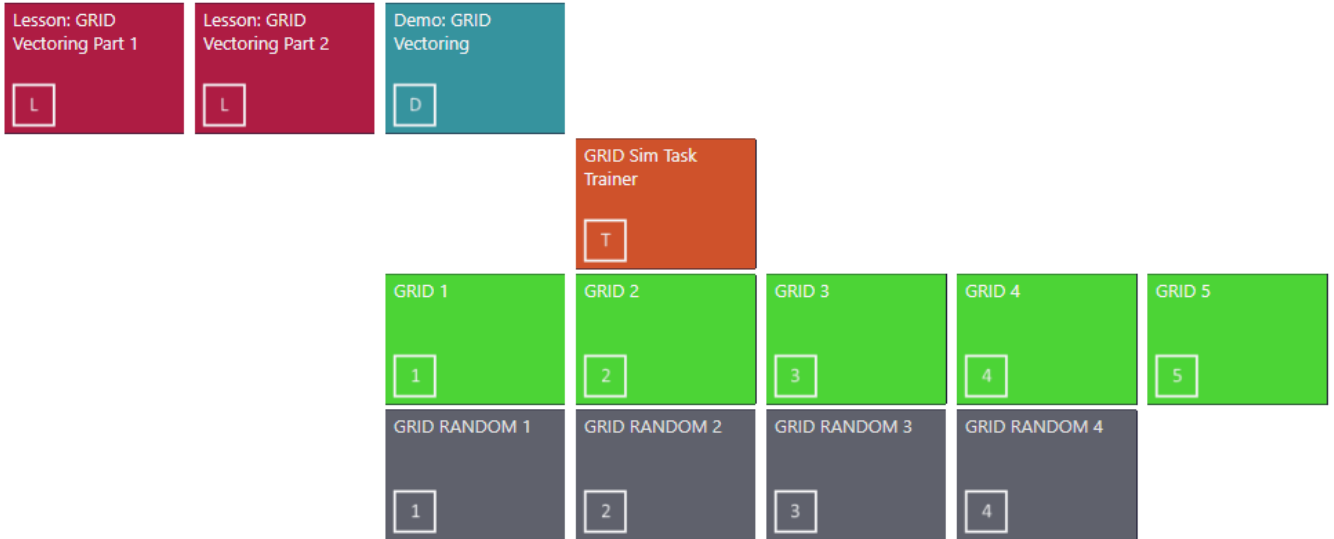
Part 2: Conflict resolution.

Teaches the methods of vectoring an aircraft to ensure separation is maintained as it crosses another's flight path. Vertical separation is precluded as an option.

Simulation

Five structured simulator exercises are provided, rising in difficulty from easy to extreme. Then follows four levels of randomly generated traffic, affording a virtually infinite range of scenarios for practice and development of skills.

A wide range of HMI skills are taught in this module: Aircraft acceptance and handoff, display manipulation, data entry, radiotelephony phrases, use of coordination prompts etc.



Same-track sequencing:

This module teaches the sequencing of aircraft through a gate with specified distance spacing. Training is done in two stages, first with pairs of aircraft, then with groups of four. Airspace called *DIAMOND* is used as the training platform; it has four Exit Gates, each with four tracks to it. Structured exercises present aircraft on sixteen tracks for sequencing.



Multi-track sequencing

This module advances sequencing training by presenting aircraft on multiple tracks to each of the four gates. Again, two stages of development are used: pairs of aircraft, followed by groups of four. Exercise structure is as for same-track sequencing: aircraft in various configurations progressing to each of the four gates.



DIAMOND Traffic Module:

This module combines all the skills learned in earlier modules and presents complex traffic simultaneously on all tracks to all gates in various configurations. The Lesson and Demonstration are followed by four structured simulator exercises and four levels of random traffic, affording limitless scenarios for skills development and practice.



:This module is a culmination of the course and requires students to perform the following tasks.:

- Accept aircraft hand-offs from all four adjoining Sectors.
- Recognise all conflicting traffic along an aircraft's flight path to its Exit Gate.
- Resolve all conflicts, either by Radar Vectoring or Vertical Separation.
- Ensure all aircraft are *at* the specified level as they pass their Exit Gate.
- Sequence aircraft through multiple Gates, with specified spacing.
- Maintain a correct display of every aircraft's current Cleared Level.
- Pass control of aircraft to the appropriate adjoining Sector prior to the Exit Gate.
- Control aircraft using standard radio transmission phrases.
- Manipulate the HMI (simulator display) for all the above.

By the end of the course, students are presented with very realistic simulation of high-density Enroute/Area traffic, providing an ideal preparation for formal ATC training.

Delivery

Academy Environment

All *VV* training differs from traditional delivery methods for practical ATC in that it may be done independently by the student at his/her own pace and without the constant need for the physical presence of an instructor. The overarching training philosophy is directed at the development of strong formative skills rather than fixed performance milestones, and independent learning towards this end is encouraged. Subject to local resources and preference, within the Academy environment, courseware may be completed either at scheduled times, or using a more flexible arrangement.

Online Delivery

VVEnroute™ is also available with the use of an online Learning Management System (LMS). This enables remote and distributed learning delivery with all performance information uploaded from the simulator to the cloud. The LMS incorporates teleconferencing for desktop sharing, consultation, and performance monitoring. Other optional features, such as gamification, badges and leaderboards promote a collaborative learning environment.

Learning Outcomes

Graduates of *VVEnroute™* will display high levels of radar control skill. They will have learned positive control techniques and practised them for as many hours as is individually required. The techniques are universal and easily adaptable to any live ATC traffic configuration in any sector of airspace. Use of *VVEnroute™* has the potential to reduce simulation and on-the-job training times and improve final pass rates.

Simulation

The Visual Vectoring simulator ([VVSIM](#)) emulates a modern radar workstation and provides a very realistic teaching and practice platform. Its principal features include:

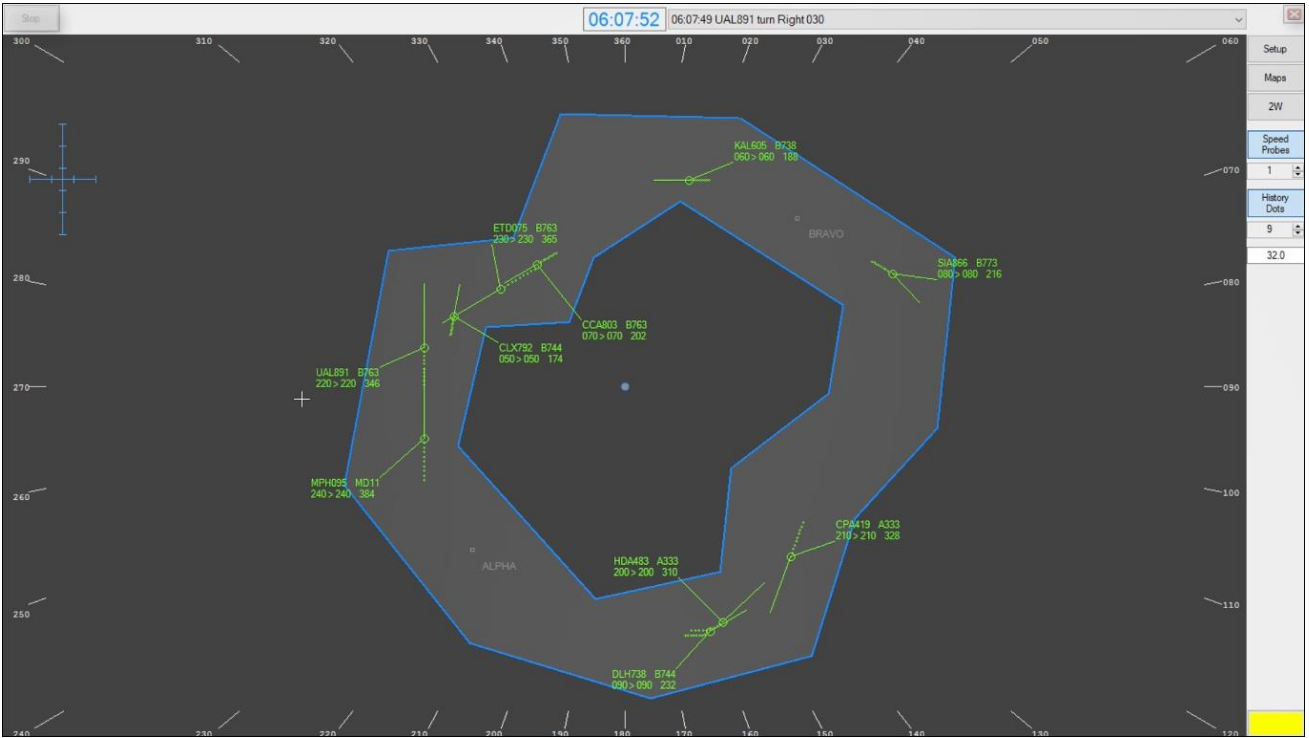
- PC-based. Laptop machines are ideal and low-cost machines are adequate
- Speech Recognition operation with synthesised aircraft replies
- Realistic pilot prompts: Illogical control instructions are queried
- Variable clock speed from x0.5 to x2
- Instant clock speed change between x1 and x2 (F keys) to minimise 'dead' time.
- Clock may be paused and backstepped to afford re-processing and correction of situations not ideally handled.
- Electronic measurement of bearing and range
- Conflict alerts
- Conflict prediction tools
- Graphic route function
- Aircraft callsign text display
- Route alerts
- J-Rings
- Electronic flight progress strips
- On-screen text entry.
- Label display of aircraft callsign, type, Mode C Level, Cleared Level and groundspeed. Other data can be manually entered.
- Coordination prompts
- Customisable interface (HMI)
- Aircraft speed performance prompts
- Performance evaluation: The distance spacing achieved between pairs of landing aircraft is displayed and recorded for later analysis.
- Display of an aircraft's current Indicated Airspeed and the maximum and minimum speeds it can accept at its present distance from touchdown.
- Full mouse control for use when speech is not convenient.
- Performance measure built-in and uploaded to the Control Zone LMS.

Frequently Asked Questions

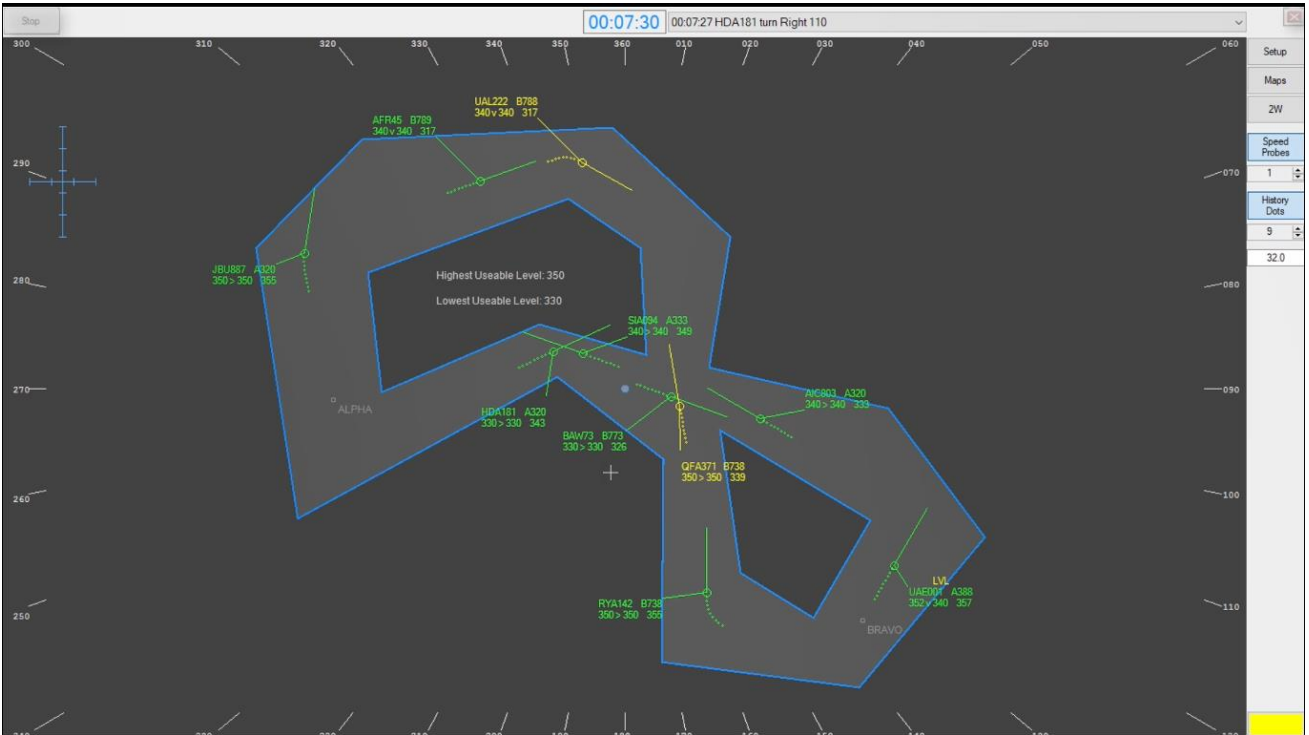
Who will benefit from VVEnroute™ training?	VVEnroute™ is intended for delivery to <i>abinitio</i> and cross-stream conversion students with limited or no Radar ATC experience.
How is the training delivered?	The program may be delivered in an instructor-led classroom environment or distributed on desktop or laptop computers for self-paced learning. It may even be deployed to prospective recruits as part of an aptitude-testing process.
What does it teach?	VVEnroute™ teaches basic Area/Enroute Radar Control, including vectoring, vertical and lateral separation and sequencing. See Page 2 for a full list of skills that are covered.
What doesn't it teach?	Airspace specific services, including clearance requirements, aeronautical information services such as meteorological advice and Inflight emergencies are not covered. Enroute holding included in the VVStack™ course as an extension of VVEnroute™
Can extra content be added?	Yes. With the collaboration with local training experts, extra theory content may be added by the construction 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 VVEnroute™ is designed to be generic in nature but may be readily customised to local phrasings and procedures. Similarly, the VV Simulator can be programmed with specific speech and data parameters to support any local requirements.
How much does it cost?	VVEnroute™ is licensed to training organisations for use on an annual basis. Fees depend on the number of students that will be using the program, and whether they are <i>abinitio</i> or cross-stream. Customised features that may be required are extra. We believe that the overall cost of the use of VVEnroute™ will be a small fraction of the cost of delivering the same training by alternative methods. Contact us on sales@visualvectoring.com for more information.
Can I trial the program?	Yes, a demo version is available for testing and evaluation by ANSPs, Colleges, Universities and ATC Training providers.

Screen Captures

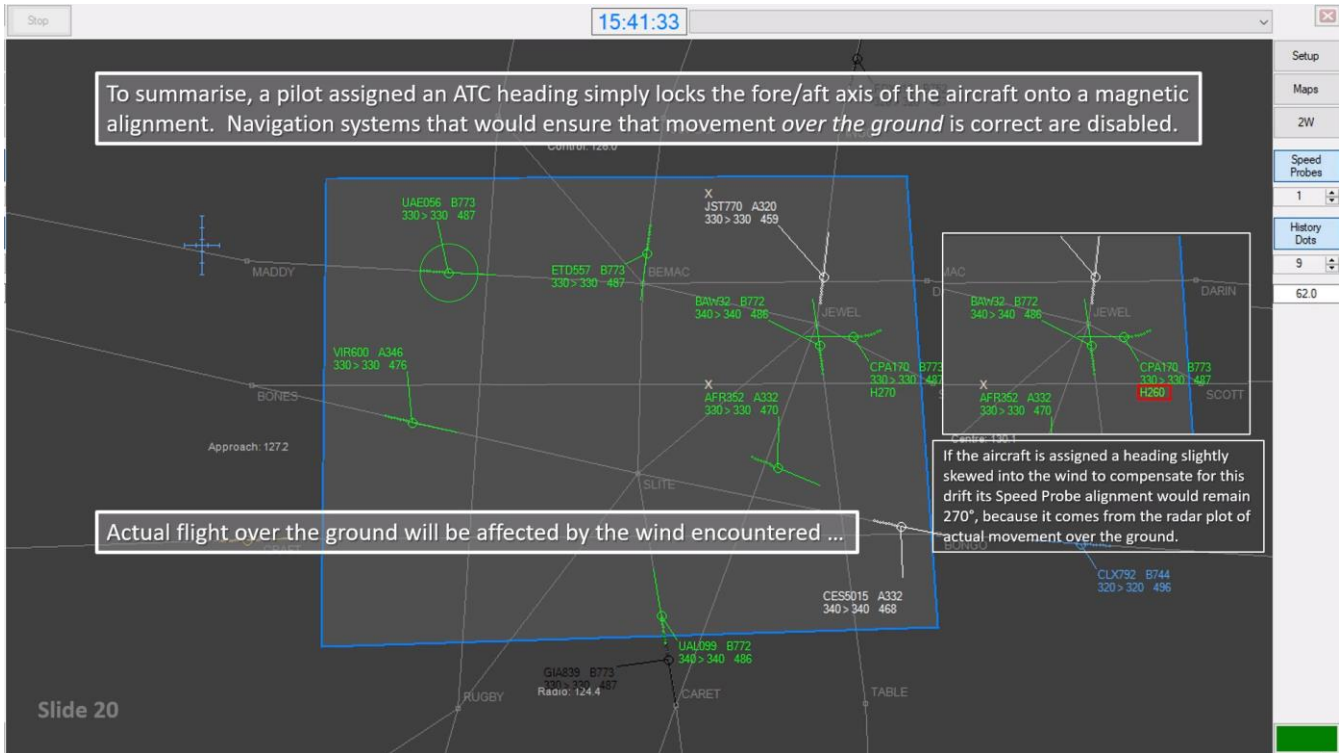
Basic Maze Map



Complex Maze Map



Grid Lesson Part 2



15:41:33

Stop

To summarise, a pilot assigned an ATC heading simply locks the fore/aft axis of the aircraft onto a magnetic alignment. Navigation systems that would ensure that movement *over the ground* is correct are disabled.

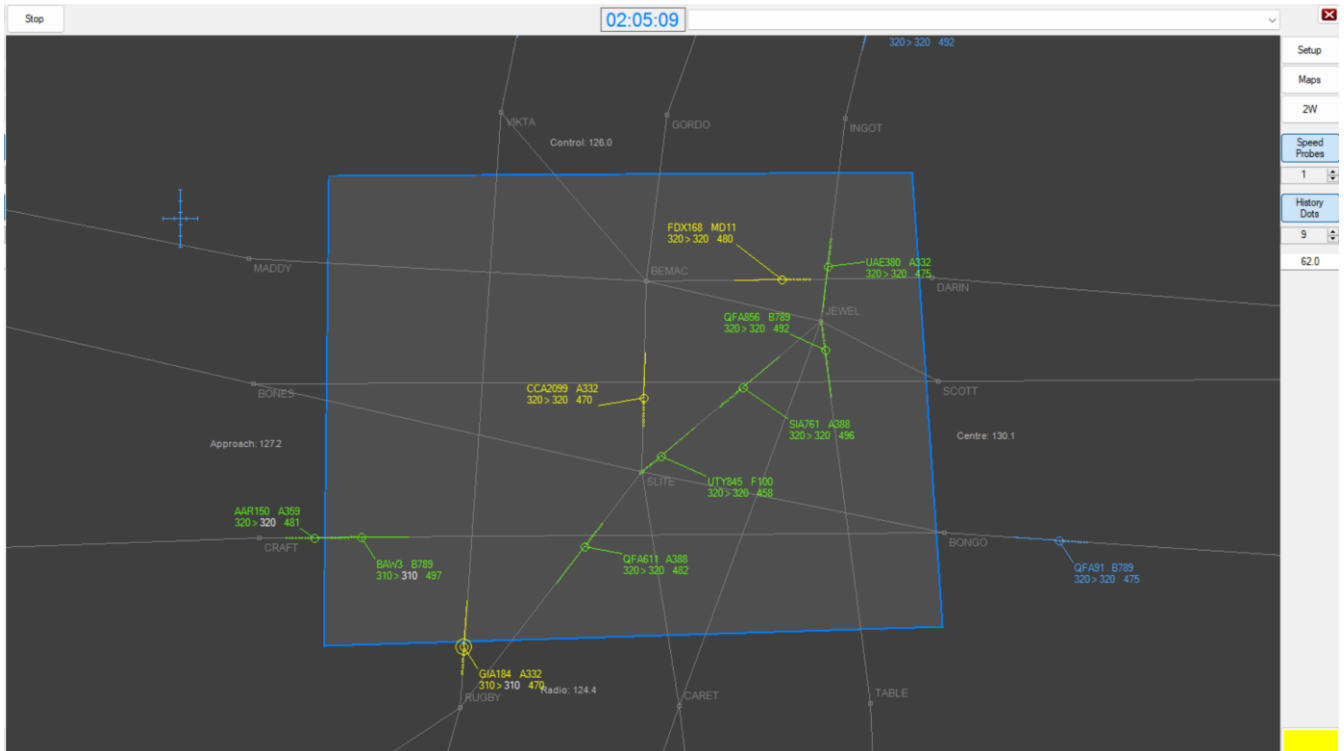
Actual flight over the ground will be affected by the wind encountered ...

If the aircraft is assigned a heading slightly skewed into the wind to compensate for this drift its Speed Probe alignment would remain 270°, because it comes from the radar plot of actual movement over the ground.

Slide 20

Setup
Maps
2W
Speed Probes
1
History Dots
9
62.0

GRID Simulation

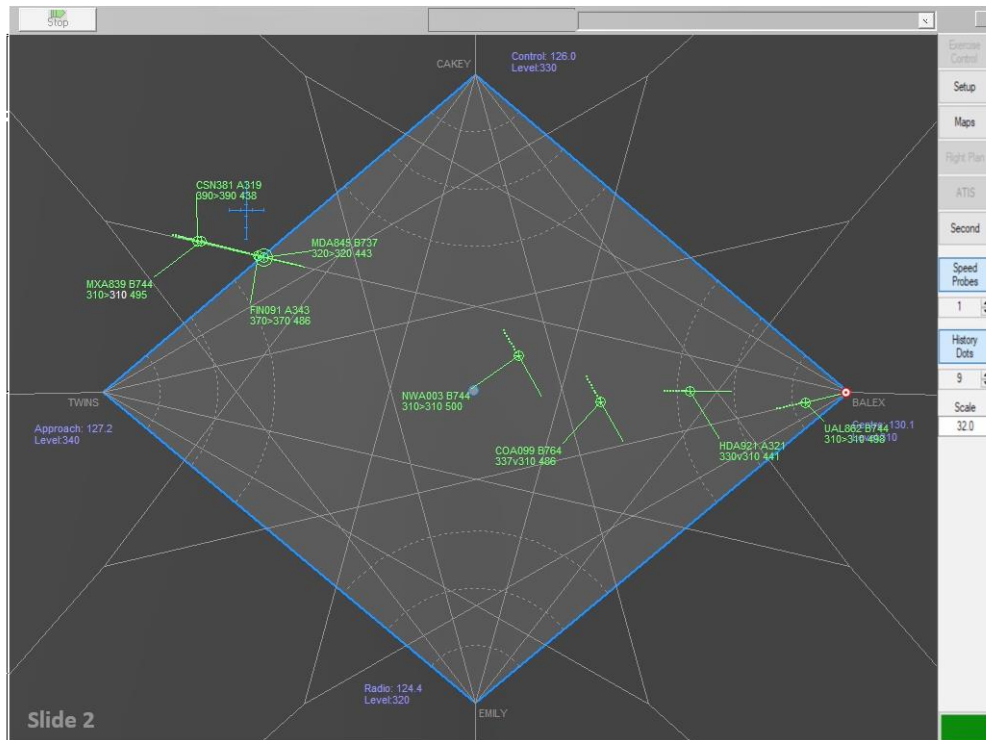


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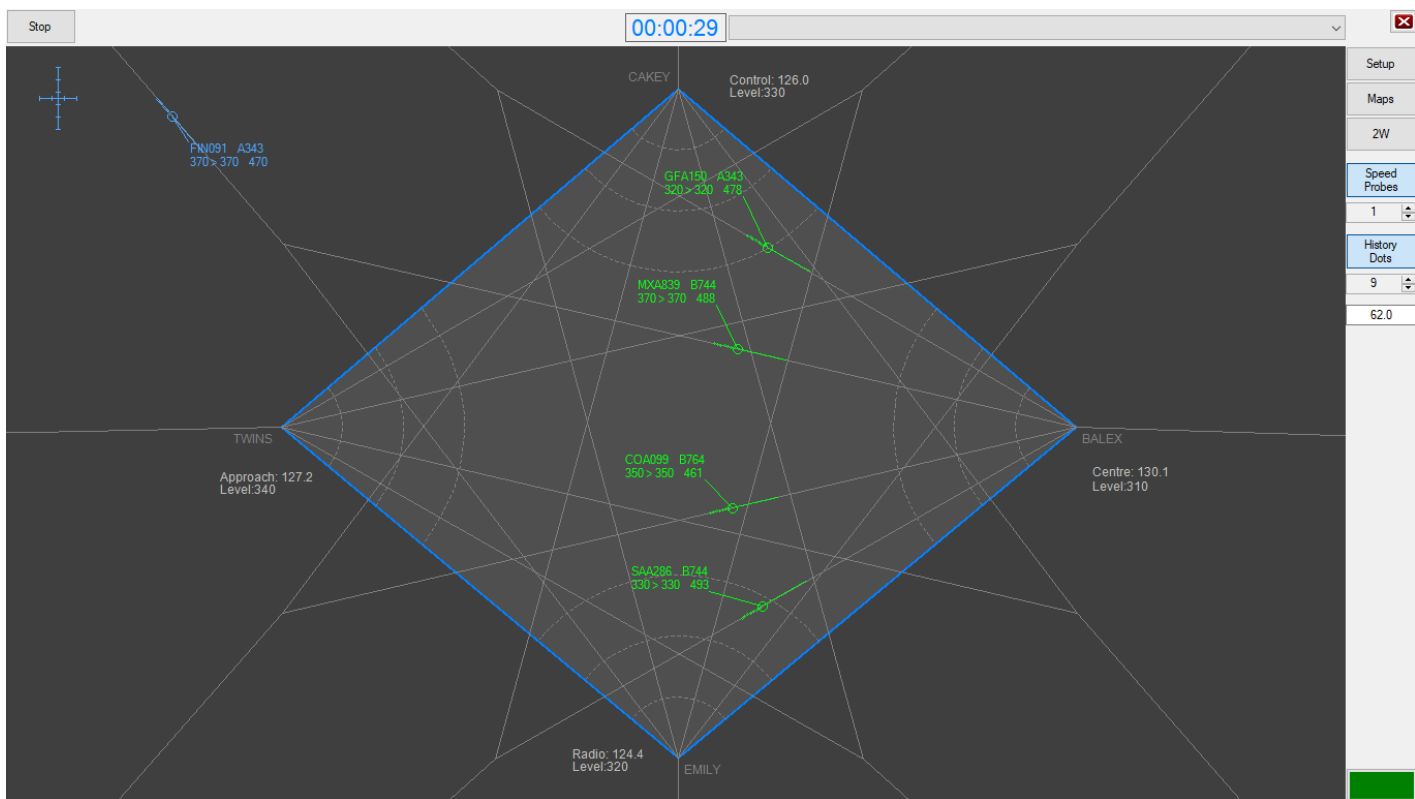
Stop

Setup
Maps
2W
Speed Probes
1
History Dots
9
62.0

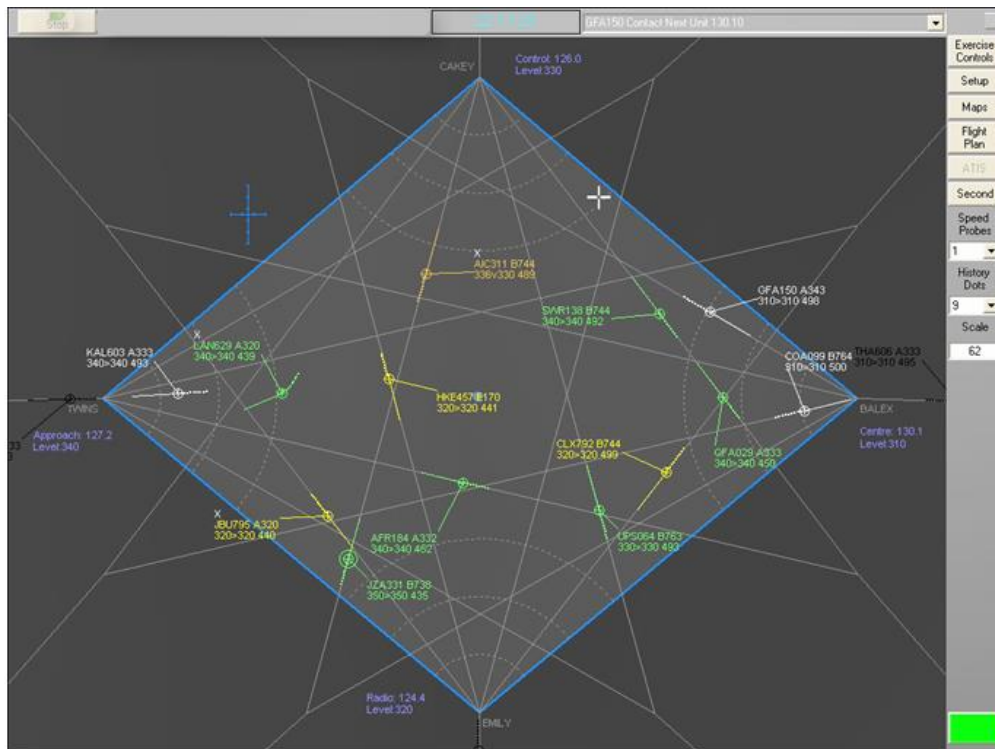
DIAMOND Lesson- Same-track, multiple aircraft



DIAMOND Exercises: Multi-track, multi-aircraft exercise



Demonstration: DIAMOND Traffic



Simulator Feedback:

Results and Feedback

ATC

ATC Score: 95.5
Weight: 0.8

Deduction (%)	Explanation	Number	Remedy
4.5	Aircraft requests	3	Issue climb or descent prior to the aircraft requesting it.

Interface

Interface Score: 89.0
Weight: 0.8

Deduction (%)	Explanation	Number	Remedy
6.0	Failure to Remove XPrompt.	4	Ensure that the Xprompt is removed after the readback of the transfer frequency.
0.9	Transmission without Track Selection.	9	Ensure that the aircraft track is selected before a transmission is made to that aircraft.
1.5	Failure to Set IQL.	1	Ensure that the IQL is set prior to initiating a handover.
2.6	Radar track updates when an aircraft was on frequency outside the sector	26	Ensure you handover and transfer aircraft prior to the airspace boundary.

Separation

Separation Score: 100.0
Weight: 1.0

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