Course Manual

Simulator Version: 8.12

Document Version: 8.12

Contents

Preamble:

VV Approach™ is a Windows-based Air Traffic Control trainer that provides basic skills development in Terminal Area (TMA) sequencing and traffic management. It is ideal for deployment at the commencement of a radar (or surveillance) ATC course, or for candidates transferring from another discipline in ATC. Skills taught include:

- Vectoring;
- Conflict recognition and resolution;
- Application of radar/surveillance separation;
- Application of wake turbulence separation;
- Sequencing;
- Interface usage;
- Task management;
- Prioritisation;
- Communications and phraseology;
- Scanning.

VV Approach™ is focused on teaching the efficient sequencing of aircraft for landing on a single runway. This is one of the most challenging roles in ATC, and as it determines the efficiency of the airport it is also one of the most important.

The program includes a choice of regional airlines, to allow local preferences for aircraft callsigns to be selected in simulation. This enables familiarity with the telephony likely to be required for local traffic to be developed. Metric and imperial measures of distance, height and speed are available.

On all platforms traffic levels and complexity rise as progress is made through the simulator exercises. The portable and modular nature of the training package makes it suitable for delivery in a classroom or computer laboratory environment, or for learning in private. The training is self-paced.

Learning Outcome

The Learning Outcome from *VV Approach™* is the skill to process high-speed aircraft onto a runway of any alignment with a spacing of 5 Nautical Miles (NM) at landing, with a tolerance of - 0 and + 0.4nm, for a period of one hour.

The aircraft are inbound from all directions, from the square downwind (right and left) to the straight-in (runway extended centreline) and in all conflict configurations.

Aside from skills acquisition, this has other significant benefits. It confirms to the student that he/she has the necessary cognitive capacity to cope with the unique mental demands of the job, and so promotes a vital factor in all learning - confidence. Traditional ATC training in many cases does not do that, because it is a high-pressure learning environment with very limited lesson time and even more limited opportunity for practice. The Learning Outcome is achieved from a zero-skills base.

Training structure

All *VV* training follows a sequence widely recognized as the optimum method of transferring practical skills from one person to another:

Training Lessons

Instruction presented as slideshows but run as MP4 movies. Full control of the *flow of information* is available by pausing and forward/reverse scanning the movie player.

Demonstrations

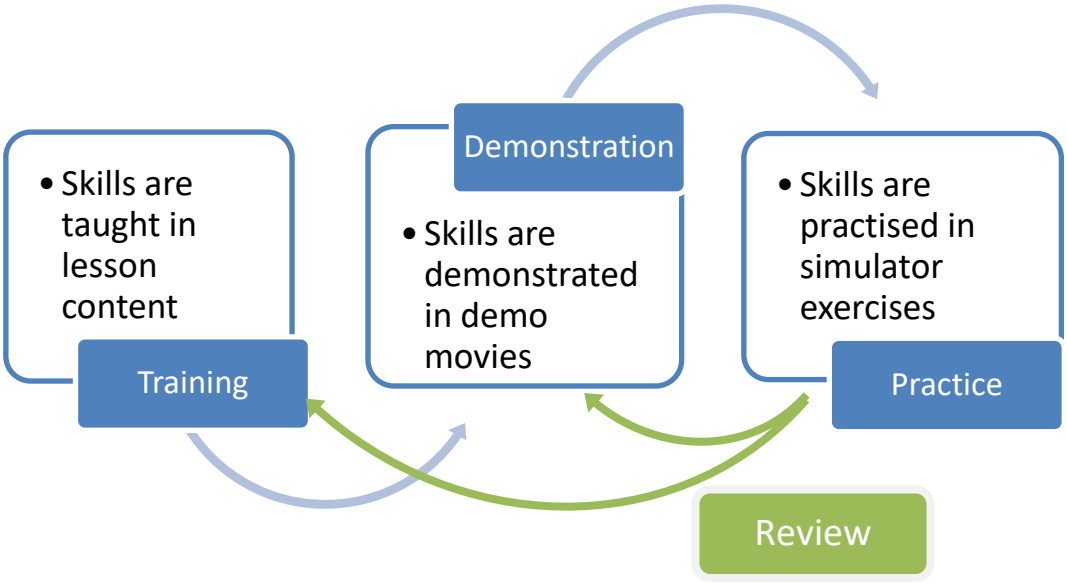
Screen-capture MP4 movies of actual simulator performance of a selection of traffic scenarios from the upcoming exercise series, with audio. Graphic overlays of the radar relate the techniques being used to the lesson content. The movies can be paused and reviewed at will. The controller voice is replaced with a synthesised one. Aircraft responses are generated by the simulator.

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.

Review

Following self-assessment, the trainee is free to revisit the lesson and demonstration content to review and consolidate.



Course Content

There are six training modules in the *VV Approach* course.

Phase 1: Vectoring aircraft around the circuit, and to join a circuit for landing.

At the end of this first phase of the course the student will be capable of:

- Approving departure of jet and prop-jet aircraft and vectoring them around the circuit for a visual approach and landing; and
- Vectoring them to any location within the TMA, and then to rejoin the circuit for landing.

Sim Tour

This lesson introduces the student to the platform used by VV to teach radar vectoring. It contains explanations of simulator operation, airspace, runways, arrival and departure procedures and demonstrates aircraft radar display. A three-dimensional moving graphic showing airspace structure and separation of controlled and uncontrolled aircraft is included.

Lesson 1: Reading the Radar Information

Lesson 1 explains the significance or the various elements that make up a radar presentation for an aircraft; introduces the visual cues on the radar screen that convey movement to the eye; describes the controller-entered clearance altitude on an aircraft's label and the correct method of changing it.

Lesson 2: Measurement of Bearing and Distance

This lesson explains the methods of reading distance and direction on the radar screen visually and teaches techniques for the development of the necessary subconscious skills.

Lesson 3: Turns

This lesson introduces the student in how aircraft are instructed to make a turn, how the turn is judged to achieve a precise result, how its progress is monitored, and how it is corrected if required. Includes techniques to detect and react to incorrect turns, and phraseology for use in radio transmissions to control turning aircraft.

Lesson 3 Demonstration: Basic Vectoring

This demonstration Introduces the student to simulation and shows how the following three exercises should be performed.

Simulator Task Trainer 1:

This short exercise provides the student with the opportunity to practice basic simulator functions.

Lesson 3 Exercises.

There are three exercises included here to introduce basic vectoring skills.

- Exercise 3a: Heading selection for vectoring towards a target;
- Exercise 3b: Timing of turn instructions to achieve a new aircraft flight path precisely;
- Exercise 3c: Vectoring multiple aircraft around a Maze.

Lesson 4: Separation

Lesson 4 describes the separation standards used in a typical TMA to separate aircraft and demonstrates the use of these standards. Full attention is paid to the understanding and application of wake turbulence separation standards. A three-dimensional demonstration of wake turbulence effects on aircraft is included.

Lesson 5: Standard Circuits

This lesson Includes the theory of circuit flying; dimensions of circuits, entry procedures, reference points on the radar screen and the vectoring of aircraft both *around* a standard circuit and *to join* the correct leg of a standard circuit for landing. It a Includes three-dimensional graphic of circuit flying and joining the correct base leg.

Lesson 5 Demonstration: Circuit Vectoring

A practical demonstration of how aircraft are vectored around, and into, the circuit. All the relevant techniques and radio phrases are explained in detail. The method of passing departure instructions to the control tower and how airborne calls from aircraft are monitored and checked for correctness are detailed.

Data entry to the Simulator by mouse and keyboard, and methods of assigning climb and descent to aircraft are included. Basic separation and sequencing of aircraft in the circuit area is displayed. Teaches students the practical operation of the *VV Simulator* in preparation for their first Circuit Vectoring exercises.

Simulator Task Trainer 2:

This Task Trainer provides an opportunity to practice some required interface tasks in preparation for circuit vectoring in the following exercises.

Lesson 5 Exercises.

- Exercise 5a: Circuit vectoring with ten jet aircraft;
- Exercise 5b: Circuit vectoring with six jet aircraft and four non-jets.

The student is required to issue departure Instructions to the tower for the aircraft, and then vector them around the circuit at a level of complexity commensurate with confidence and skills acquired. Aircraft may then be then vectored to all points on the radar screen and returned for a landing in a controlled manner, and in accordance with techniques taught by the lesson and demonstration.

Phase 2: Vectoring aircraft for an intercept of the Instrument Landing System (ILS)

At the conclusion of this phase the student will have extended the vectoring skills acquired in Phase 1 to vector circuit and TMA aircraft for a landing via an ILS Approach.

Lesson 6: Intercepting the Instrument Landing System

Describes ILS operation and demonstrates the cockpit indications it gives the pilot. Localiser intercept techniques are explained, including the requirements for vectoring aircraft for a correct intercept and the radio phrases used in instructing pilots to carry out the procedure. Variations to the intercept angle to achieve correct timing when sequencing aircraft for a landing are explored.

Lesson 6 Demonstration: ILS Circuits

This is a demonstration of the application of the theory of vectoring aircraft for ILS Approaches using aircraft flying full ILS circuits. The requirement to maintain descending aircraft within the limits of controlled airspace is emphasized. Vectoring of aircraft off an ILS Approach and back into a landing sequence is shown.

Lesson 6 Exercises.

The student is required to vector aircraft around a full circuit for an ILS approach and landing. Vectoring to *join a circuit* for an ILS approach is included. Again, workload is controlled by the student limiting aircraft numbers to allow steady buildup of traffic-handling skills.

Two exercises are included:

- Exercise 6a: ILS Circuits with ten jet aircraft;
- Exercise 6b: ILS Circuits with six jet aircraft, and four Turboprops.

between two aircraft

On completion of this phase the student will be able to vector the circuit aircraft into a precisely controlled landing sequence onto the runway, with a prescribed landing spacing.

Lesson 7: Sequencing Concepts 1: Closure

This lesson explains the closure (reduction in distance spacing) that occurs between aircraft as they reduce speed for landing. Key to the process of sequencing is to understand the closure that occurs between landing pairs and how to allow for this in setting the landing spacing at any distance from the runway.

Lesson 7 Demonstration: Straight-in sequence

This is a demonstrates of a moving series of aircraft spaced correctly along the runway extended centerline to show the distance required between typical aircraft at different distances from touchdown that will result in precise spacing as the lead one of each pair touches down.

The movement of the aircraft accurately simulates real traffic, allowing a sound visual appreciation of their speeds, altitudes and spacing at various distances to touchdown to be established.

Lesson 8: Sequencing Concepts 2: The Turn onto Final – Fine-tuning the sequence

Lesson 8 explains how to set the precise spacing between aircraft by timing the turn onto final. Allowance for closure, and how it is assessed visually is emphasized. This directly relates to the relevance of localiser Intercepts at different angles as learned in Phase 2.

Lesson 9: Sequencing Concepts 3: Selecting the Base Leg – Coarse-tuning the sequence

The spacing between two aircraft can be adjusted within a small tolerance by timing the base turn. This lesson describes positive techniques for recognizing visually the correct time to commence the turn, irrespective of the relative positions on the screen of the two aircraft in a sequence pair.

Lesson 10: Sequencing Concepts 4: Adjusting the Base Leg – Medium-tuning the sequence

This lesson details the method of correcting a base turn that has been misjudged by an amount exceeding that available from the turn onto final. It includes radio phrases used in adjusting the base leg.

This lesson completes the *VV* three-step sequencing routine.

Lesson 10 Demonstration: Circuit Sequencing

Basic sequencing of aircraft on right and left circuits to establish precise landing spacing between them is demonstrated. Techniques taught in Lessons 8, 9 and 10 are developed to explain fully the positive *VV* three-step process for the setting of precise spacing between pairs of landing aircraft.

Each step is demonstrated by reference to the visual cues provided by the radar display.

Lesson 10 Exercises

These exercises allow the student to put into practice the sequencing theory explained and demonstrated in Lessons 8, 9 and 10, and so to prove their understanding of it. Circuit aircraft are again used to provide a wide variety of traffic situations, and to allow the student to control his or her workload.

- Exercise 10a: Basic Sequencing – Square circuits, using ten jet aircraft.
- Exercise 10b: Basic Sequencing – Square circuits, using six jet and four non-jet aircraft.

Phase 4: Sequencing aircraft inbound from multiple directions

On completion of Phase 4, the student will be able to vector complex traffic into a prescribed landing sequence onto Runway 27.

Lesson 11: Sequencing Concepts 5: Sequencing Overview

Lesson 11 explains the methodology employed by this course to teach traffic processing onto a runway in a series of learning steps. It details how each step will be integrated with those that preceded it as the course progresses. Simplification of the assessment of a particular sequencing situation by representing the lead aircraft's notional position on the runway extended centerline is described.

Lesson 12: Sequencing Concepts 6: Delay Turns and Headings

In this lesson, the significance that a turn made by an aircraft has on its progress towards the runway. The angle of turn is a significant visual cue that needs to be recognized subconsciously.

The importance of scanning to assess the amount of delay being imposed on an aircraft by a radar heading is stressed.

Lesson 13: Sequencing Techniques 1: Aircraft approaching from between square downwind and square base directions.

Lesson 13 develops the sequencing techniques learned with aircraft flying square circuits to situations where the downwind leg is at an angle to the runway extended centerline, not parallel to it. It further explains positive methods of selecting an *oblique* downwind heading that will position an aircraft ideally to be sequenced behind the one it is following - using the *VV* three-step routine.

Lesson 13 Demonstration: Sequencing from between square downwind and square base directions

This pivotal demonstration shows the selection of positioning headings to produce an ideal base leg. It then relates the recognition of the visual cues that determine the correct base turn to aircraft on oblique downwind headings.

The student is introduced to aircraft arriving in the TMA on Standard Arrival Routes (STARs). The following techniques and processes are demonstrated:

- Acceptance procedures and responsibilities;
- Profile altitudes and speeds on transfer;
- Planning the sequencing of each aircraft on first accepting it;
- Allowance for possible communication loss when assigning descent when there exists a converging traffic conflict;
- Use of the 'Inbound Sequence' window, including the method of changing the nominated landing order.

Simulator Task Trainer 3:

This final Task Trainer provides targets the processing of inbound aircraft and some extended functions.

Lesson 13 Exercises

This series of exercises is designed to allow the student to apply sequencing techniques to aircraft arriving on STARs in the quadrant between square downwind and square base. Each exercise builds on the complexity of its predecessor, allowing the student to acquire traffic-handling skills in an incremental manner.

The Test Exercise (13t) requires the student to demonstrate expertise in the handling of aircraft from this quadrant. The running of this exercise cannot be controlled by the student. As for all Test Exercises, it must be run at normal clock speed, cannot be paused, and aircraft cannot be deleted from it.

The following exercises are included:

- Exercise 13a-13j: Aircraft from Oblique Downwind directions;
- Test exercise 13t.

Lesson 14: Sequencing Techniques 2: The Whirlpool

Lesson 14 extends the processing of aircraft from between square downwind and square base to include multiple aircraft on the same side of the circuit. Techniques for maneuvering them into a natural flowing pattern, called '*The* 'Whirlpool', are detailed.

Lesson 14 Demonstration: Whirlpool sequencing

The positioning of an aircraft on oblique downwind leg outside the one it is following in the landing sequence is demonstrated, leading to how its final spacing is set to the *VV* three-step routine. Converging series of aircraft are maneuvered into a controlled flow onto the runway by use of *Whirlpool* techniques.

Lesson 14 Exercises

This series of exercises will develop sequencing skills with multiple aircraft to be maneuvered into a flowing Whirlpool pattern. Complexity rises as the exercises are performed. A Test Exercise again completes this stage of skill development.

- Exercise 14a-14j: Vectoring to join *The Whirlpool*;
- Test exercise 14t.

Lesson 15: Sequencing Techniques 3: Aircraft approaching from near-square directions

This lesson extends the range of directions from which aircraft approach to include angles that are near to, but less than square to the runway centerline. Methods of visualising and planning an aircraft's entry into a flowing traffic pattern from these directions are explained.

Lesson 15 Demonstration: Sequencing from near-square directions

The sequencing of aircraft approaching from near square to the runway centerline with aircraft approaching from all other directions is demonstrated.

Lesson 15 Exercises

This series of exercises contains aircraft approaching on STARs that are near to square to the runway. The aircraft must be sequenced with others from all directions. The Test Exercise again tests the student's understanding of all the sequencing techniques learned to this point of the course and indicates a readiness to proceed to the next stage.

- Exercise 15a-15j: Aircraft from near-square directions;
- Test exercise 15t.

Phase 5: Sequencing from difficult directions

The module builds on previous content and includes the sequencing of aircraft from the more difficult directions. The angle an aircraft's inbound track makes with the runway extended centreline gradually reduces to zero – aircraft are actually inbound along that line ('straight-in'). Finally, the skills learned are reinforced with a series on consolidation exercises containing typical ILS sequences.

Lesson 16: Sequencing Techniques 4: Sequencing in a corner

This lesson shifts the direction from which aircraft are approaching to the region approximately halfway between square base and straight-in. Complications caused by the fact that aircraft can no longer be simply maneuvered onto an oblique downwind leg are discussed, and techniques to control them in a positive, predictable manner are taught.

Lesson 16 Demonstration: Sequencing in a corner

This demonstration shows aircraft being sequenced in tight corners, in accordance with set procedures, and with very limited maneuvering area available. Integration of aircraft from the new approach directions into the overall flow of traffic onto the runway is included, including the assurance of separation between aircraft on intersecting flight paths.

Lesson 16 Exercises

Initially, these exercises contain aircraft approaching from 'corner' directions, requiring them to be sequenced with others from all directions. Later exercises include aircraft from directions already mastered with a view to consolidating them and integrating them into an overall traffic pattern. Steady increase in complexity occurs as the series of exercises is performed

- Exercise 16a-16j: Sequencing in a corner;
- Test exercise 16t.

Lesson 17: Sequencing Techniques 5: Straight-in Sequencing

Positive techniques are described for the sequencing of aircraft approaching from the most awkward direction of all, those entering the TMA along the runway extended centerline. Methods of controlling such aircraft and setting their precise spacing behind another approaching from any direction, are taught.

Lesson 17 Demonstration: Straight-in Sequencing

The application of the techniques taught in the management of straight-in traffic is demonstrated.

Lesson 17 Exercises

These exercises feature aircraft approaching along the runway extended centerline, requiring them to be sequenced with others approaching from every direction. Complexity again rises, and the Test Exercise checks the student's understanding of this, the most difficult of sequencing directions.

- Exercise 17a-17j: Straight-in sequencing;
- Test exercise 17t.

Lesson 18: The typical ILS sequence

This lesson consolidates all the sequencing techniques learned in the preceding lessons and demonstrates the handling of a typical ILS sequence. The method of instant assessment of the track miles to touchdown of an aircraft being vectored for sequencing is detailed, allowing the controller to keep pilots informed of vital distance-to-run data during the vectoring process. Non-essential radio communication control phrases that have been largely ignored during the course is reintroduced.

Lesson 18 Exercises

This series of exercises contain jet and prop-jet aircraft approaching from all directions in a random fashion. Each is a very typical arriving sequence of aircraft as would be experienced in a modern busy TMA. High levels of traffic complexity are presented to the student for controlled processing.

- Exercise 18a-18j: Typical ILS Sequences;

Phase 6: Ancillary skills development

On completion of this phase of the course, the student will have adapted the vectoring skills acquired in the earlier phases to situations different to the standard platform on which they have learned those skills. Details such as drift, different runway alignments, and the use of speed control as a sequencing tool will be mastered.

Lesson 19: Drift

Up until this point in the course, wind components have been set to zero to allow the student to learn visual traffic handling within minimum complication. This lesson describes the effect of different wind directions and speeds on vectoring in the Terminal Area, and how they are recognised and compensated for.

Lesson 19 Exercises

A series of sequences of arriving aircraft is presented for processing onto the runway. Twenty different wind conditions are included, ranging from full headwind to full crosswind, and both light and strong wind speeds. This allows the student to adapt the vectoring techniques learned to traffic that is affected by drift. High levels of skill in compensating for drift are attainable with these exercises.

- Exercise 19a-19j: Adjusting for Drift.

Lesson 20: Speed Control

This lesson describes the theory of sequencing aircraft by adjusting the speeds at which pilots are instructed to fly. The use of speed control is compared to radar vectoring as a means of resolving individual sequencing problems, enabling a clear assessment of which method is better for a particular scenario. Typical speeds for common aircraft at various stages of their approach are discussed. The use of the maximum/normal/minimum speed information provided by the VV Simulator, and how it is used as a training aid, are included.

Lesson 20 Exercises

Sequences of aircraft that contain situations that can be resolved by speed control are combined with others that require radar vectoring.

- Exercise 20a-20j: Speed Control.

Lesson 21: Adapting to other runway alignments

This lesson is included to guide the student through the transfer of vectoring skills to the runway alignment that will be encountered in future training. Methods of recognising all the important visual cues and critical headings are described.

Lesson 21 Exercises

In these exercises the simulator may be configured to any runway alignment. The speed control and wind component facilities are also enabled. The combination of the three functions allows a wide variety of traffic scenarios to be created, presenting the student with the practice facility to develop very high levels of traffic-handling expertise in preparation for formal training.

- Exercise 21a-21j: Speed Control.

Scoring

Competencies

After the simulator exercise has been completed the Termination Panel will display some feedback on performance, provided the exercise has been run for at least one minute.

For Target and Circuit Exercises, some specific detail will be displayed here. For other exercises, a score will be reported in up to five competencies. These are:

- ATC;
- Interface;
- Separation;
- Sequencing; and
- Vectoring.

Algorithms for calculating the score in each of these competencies are outlined below.

Where used, the score for each competency is weighted and combined to produce an overall score.

For exercises that have been run for a minimum period of time (normally one minute), a Detailed Feedback panel is available by clicking the top button in the Feedback Panel. This panel will provide a detailed summary of metrics captured during the exercise.

Completion

For an exercise to be completed, the following criteria must apply:

- For Target exercises, at least 80% of the Targets in the exercise must be completed. So, for exercise 3a and 3b at least 8 individual targets must be completed for the exercise to be marked as completed.
- For Maze exercises (3c), the student must run the exercise for 20 minutes with all aircraft added to the Maze. The exercise length the Maze exercise is 30 minutes, so this effectively means all the aircraft must be added within the first ten minutes, or the exercise cannot be completed;
- For Circuit exercises (5a, 5b, 6a, 6b, 10a, 10b), 9 or more aircraft must be departed and 7 or more of these processed for a landing for the exercise to be completed;
- For Task Trainer exercises, at least 80% of the tasks must be completed;
- For Sequencing exercises (exercises 13, 14, 15, 16, 17, 18, 19, 20 and 21), the simulator must be run for 80% of the design length of the exercise. Most of these exercises are one hour in length, so at least 48 minutes must be run. This does not include repeated time from backstepping the simulator. From version 8.11 of the course, the simulator also allows completion when at most one aircraft is still airborne, and not more than one aircraft has been killed (removed).

Success

For an exercise to be marked as successful, the following criteria must apply:

- Score in each individual competency (ATC, Interface, Sequencing, Separation and Vectoring) must not be less than 70%; and
- Overall score must not be less than 80%.

Passing

For a student to be deemed as having passed the exercise, the following criteria must apply:

- The exercise must be Completed; and
- The exercise must be Successful.

Weights

Sim Task Trainers:

For Sim Task Trainers, there are no individual competencies scored only an overall score. The overall score is the percentage of tasks that have been completed. This score is used to determine Completion, Success and Passing.

Target Exercises

For Target exercises, only the Vectoring competency is scored. It thus as a weight of 1.0 and is used to determine the Success parameter. The Completion parameter is based on the number of Targets that have been completed.

Maze Exercise

For Maze exercises, the ATC, Vectoring and Interface competencies are scored. Separation is not scored in the VVA Maze because all aircraft are vertically separated. The weighting is:

Competency	Scoring Weight
ATC	0.5
Interface	0.5
Vectoring	1.0

Circuit Exercises

For Circuit exercises, the ATC, Interface and Separation competencies are scored. The weighting is:

Competency	Scoring Weight
ATC	0.8
Interface	0.8
Separation	1.0

Sequencing Exercises

For other exercises in the VVA course, the ATC, Interface, Separation and Sequencing competencies are scored. The weighting is:

Competency	Scoring Weight
ATC	0.8
Interface	0.8
Separation	1.0
Sequencing	1.0

ATC Competency:

Description

The ATC Competency is designed to capture the student's performance in performing general ATC tasks, other than separation and sequencing. This is generally related to the service provided to the aircraft, such as ensuring that the aircraft is assigned appropriate descent, kept in controlled airspace and

Applicability

The ATC Competency not scored in Task Trainer or Target exercises. It is scored in all other exercises.

Metrics

The following Metrics are used in scoring the ATC competency:

Metric	Details
Pauses	The number of times the exercise was paused.
Aircraft 'Killed'	The number of aircraft removed from the exercise.
Requests	The number of aircraft requests made. This is normally when descent is needed because the aircraft is too high when close to the airport.
Bad Phrases	The number of bad phrases that were issued in the exercise. Examples: • An aircraft is given descent to a level above; • An aircraft is given climb to a level below; • An aircraft is issued a right turn to a heading that is to the left; • An aircraft is issued a left turn to a heading that is to the right; • An aircraft is issued a visual approach when not visual; • An aircraft is issued an ILS approach when not established and not issued an intercept heading.
Frequency Changes Incorrect	The number of frequency changes (transfers) incorrectly issued in the exercise.
Updates ALT	The number of individual radar/surveillance updates for which the aircraft was outside controlled airspace.
Updates Slow	The number of individual radar/surveillance updates for which the simulator clock speed has been slowed.
Go-Arounds	The number of aircraft which execute a go-around (missed approach) in the exercise.
QNH Issuance (only scored in sequencing exercises (13-21))	The number of times: • An aircraft is issued an incorrect QNH; • An aircraft is not issued a QNH prior to landing; • An aircraft lands without having an incorrect QNH corrected.

Algorithm

The following table describes how the ATC score is calculated:

Metric	Deduction	Note
Pauses	0.25% for each Pause during the exercise.	One Pause is allowed without penalty.
Aircraft 'Killed'	7.5% is deducted for each aircraft 'Killed' (removed from the exercise).	Maximum deduction: 40%. Note that version 8.8 corrected bug where this was not deducted.
Requests	1.5% is deducted for each request (such as a descent or intercept request).	
Bad Phrases	1.5% is deducted for each Bad Phrase detected.	
Frequency Changes Incorrect	Incorrect frequency changes (to Tower) are recorded but not scored in VVA.	
Updates ALT	0.1% is deducted for each individual aircraft surveillance update detected outside controlled airspace.	Not in Maze exercise, Maximum deduction: 15%;
Updates Slow	15% is deducted if more that 25% of the exercise time was conducted at a reduced clock speed.	
Go-Arounds	2.5% deducted for each Go-Around.	Not in Circuit Exercises; Also scored in Sequencing
Incorrect QNH	1.5% deducted for each incorrect QNH issued.	Maximum deduction: 15%
No QNH Issued	1% deducted for time an aircraft lands without having a QNH issued.	Maximum deduction: 10%
Incorrect QNH uncorrected	1% deducted for time an aircraft lands having an incorrect QNH issued.	Maximum deduction: 15%

Interface Competency:

The Interface Competency is designed to capture the correct interaction with the label interface, such as keeping label contents up to date, and handing off and accepting aircraft ion t timely fashion.

Applicability

The Interface Competency not scored in Task Trainer or Target exercises. It is scored in all other exercises.

Metrics

The following Metrics are used in scoring the Interface Competency:

Metric	Description
Updates CL Incorrect	The number of individual radar/surveillance updates for which Cleared level in the label did not match the assigned level.
Updates CL Highlight	The number of individual radar/surveillance updates for which Cleared level highlight in the label was on. This is an indication that level readbacks and initial calls are not being monitored.
Acceptances Late	The number of inbound aircraft tracks that were accepted too late (after crossing the airspace boundary).
Updates off Frequency Inside Sector	The number of individual radar/surveillance updates for which the aircraft was inside the sector but not on the user's frequency. This is an indication of a late acceptance.
Assumptions	The number of aircraft tracks that were assumed (forced acceptances without a handover).
Updates on Frequency Outside Sector	Individual radar/surveillance updates for which the aircraft was outside the sector but on the user's frequency. This is an indication of a late handoff/transfer.

Algorithm

The following table describes how the Interface score is calculated:

Metric	Deduction	Note
Updates CL Incorrect	0.1% is deducted for each individual aircraft surveillance update detected when the assigned level does not match the level in the label.	Two updates are allowed for each level change; Maximum deduction: 15%;
Updates CL Highlight	0.05% is deducted for each individual aircraft surveillance update detected when the CL is highlighted.	Allowance is applied of 2 updates per level change, 5 updates per acceptance and 15 updates for each departure; Maximum deduction: 15%;
Acceptances Late	1% is deducted for each late acceptance.	Maximum deduction: 15%
Updates off Frequency Inside Sector	0.1% is deducted for each individual aircraft surveillance update detected inside sector and off frequency.	Maximum deduction: 20%
Assumptions	1% is deducted for each Assumption.	Maximum deduction: 10%
Updates on Frequency Outside Sector	0.1% is deducted for each individual aircraft surveillance update detected outside sector and on frequency.	Maximum deduction: 15%

Separation Competency:

The Separation Competency is designed to measure the ability to detect conflicts and apply (or regain) separation.

Applicability

The Separation Competency not scored in Task Trainer or Target exercises. It is scored in all other exercises.

Metrics

The following Metrics are used in scoring the Separation Competency:

Metric	Description
Updates Loss of Separation	The number of individual radar/surveillance updates for tracks subject to a CA (loss of separation).
Losses of Separation	The number of conflicts (losses of separation) during the exercise.

Algorithm

The following table describes how the Separation score is calculated:

Metric	Deduction	Note
Updates Loss of Separation	0.5% is deducted for each individual aircraft surveillance update subject to a CA (loss of separation).	
Losses of Separation	10% is deducted for each individual CA (loss of separation).	

Sequencing Competency:

The Sequencing Competency is designed to measure the ability to correctly space arrivals onto a runway.

Applicability

The sequencing Competency not scored in Task Trainer, Circuit, Maze or Target exercises. It is scored in all other exercises.

Metrics

The following metrics are used in scoring the Sequencing Competency: In the table below, the reference distances make use of the default target sequencing trail distances. If the trail distance is changed from default, then the reference distances will change proportionally. These reference distances are saved in the performance record.

Metric	Description	Reference Distance (Km)	Reference Distance (NM)
Go-Arounds	The number of aircraft which execute a go-around (missed approach) in the exercise.	-	-
Trails Very Low	The number of sequencing trails to the runway that were measured as 'Very Low'.	<9.0	<4.5
Trails Low	The number of sequencing trails to the runway that were measured as 'Low'.	9.0-10.0	4.5-5.0
Trails Ideal	The number of sequencing trails to the runway that were measured as 'Ideal'.	10.0-11.0	5.0-5.4
Trails High	The number of sequencing trails to the runway that were measured as 'High'.	11.0-13.0	5.4-6.0
Trails Very High	The number of sequencing trails to the runway that were measured as 'Very High'.	13.0-18.5	6.0-10.0
Trails Low and Vector	The number of sequencing trails to the runway that were below 'Ideal' and the following aircraft was under a vector.	<10.0	<5.0
Trails Ideal and Vector	The number of sequencing trails to the runway that were 'Ideal' and the following aircraft was under a vector.	10.0-11.0	5.0-5.4
Trails High and Vector	The number of sequencing trails to the runway that were above 'Ideal' and the following aircraft was under a vector.	>11.0	>5,4
Missed Gate	The number of times an aircraft tracking by via a sequencing gate is directed to miss this gate,	Not used in VVA	

Algorithm

The following table describes how the Sequencing score is calculated:

Metric	Deduction	Note
Go-Arounds	2.5% deducted for each Go-Around.	Also scored in ATC.
Trails Very Low	4% is deducted for each 'Very Low' trail	
Trails Low	2% is deducted for each 'Low' trail	
Trails Ideal	1% bonus is applied for each 'Ideal' trail	Maximum score limited to 100%
Trails High	1.5% is deducted for each 'High' trail	
Trails Very High	3% is deducted for each 'Very High' trail	
Trails Low and Vector	1% is deducted when the following aircraft is below 'Ideal' distance in trail and still under a vector.	
Trails Ideal and Vector	0.5% is deducted when the following aircraft is at an 'Ideal' distance and still under a vector.	
Trails High and Vector	4% is deducted when the following aircraft is above 'Ideal' trail distance and still under a vector.	

Vectoring Competency:

The Vectoring Competency is designed to measure the ability to select and issue vector instructions.

Applicability

The Vectoring Competency scored in Maze and Target exercises only.

Metrics: Target

The following Metrics are used in scoring the Vectoring Competency for Target exercises:

Metric	Description
Target Good	The number of Target scenarios for which a 'Good' outcome was achieved.
Target Keep Trying	The number of Target scenarios for which a 'Keep Trying' outcome was achieved.

Algorithm: Target

The following table describes how the Sequencing score is calculated:

Metric	Deduction	Note
Target Good	2.5% is deducted for result of ‘Good’.	
Target Keep Trying	5% is deducted for result of ‘Keep Trying’.	

Metrics: Maze

The following Metrics are used in scoring the Vectoring Competency for Maze exercises:

Metric	Description
Updates Outside Maze Laterally	The number of individual radar/surveillance updates outside the lateral confines of the Maze.

Algorithm: Maze

The following table describes how the Sequencing score is calculated:

Metric	Deduction
Updates Outside Maze Laterally	0.25% is deducted for each individual aircraft surveillance update laterally outside the Maze.

Course Improvement

Aviation is a dynamic industry. Airlines grow - and sometimes go out of business. Aircraft types are introduced and withdrawn from service. Visual Vectoring is committed to providing quality services for the delivery of ATC training. We prioritise the regular updating of our courseware to ensure an efficient training outcome.

Lesson Updates

Lessons will be updated when the content contradicts current working procedures and on request from the end user.

Exercise Updates

Exercises are constantly updated to reflect airline fleets and airlines that fly in certain regions. Exercises after 5a will employ types that are commonly in use, to maximise students' familiarisation with them.

The metric exercises will contain airlines and types customised for the end user. This will enable students to learn the callsign and radio telephony for local airlines that they will experience later in their training.

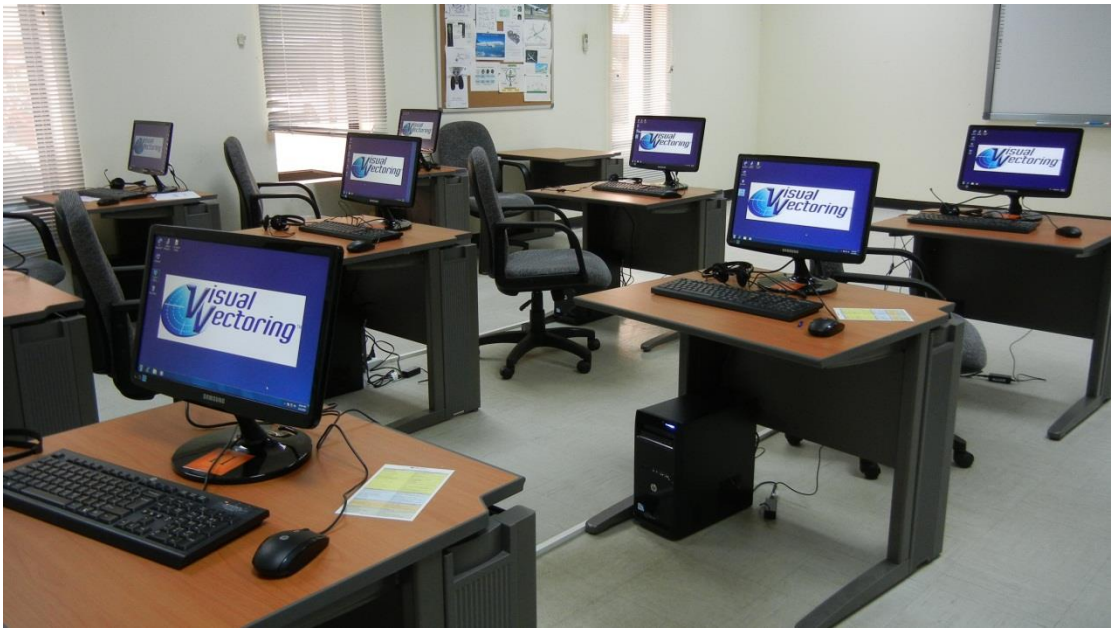
Appendix 1: Frequently Asked Questions:

Who will benefit from *VV Approach™* training?	*VV Approach™* is intended for delivery to *abinitio* and to *cross-stream* conversion trainees with limited or no Radar Approach 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. An overview of a student's progress by a qualified instructor should be maintained.
What does it teach?	*VV Approach™* teaches practical Radar Approach Control, including vectoring, vertical and lateral separation and sequencing.
What doesn't it teach?	Airspace-specific services, including clearance requirements, aeronautical information services such as meteorological advice and Inflight Emergencies are not covered.
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. Contact Visual Vectoring for more details.
Does the training content support regional variations in procedures and phraseology?	Yes. The instruction content in *VV Approach™* is designed to be generic in nature but may be customised to local phrasings and procedures. Similarly, the *VV* Simulator can be programmed with specific speech and data parameters to support any local requirements.

Appendix 2: Computer specifications

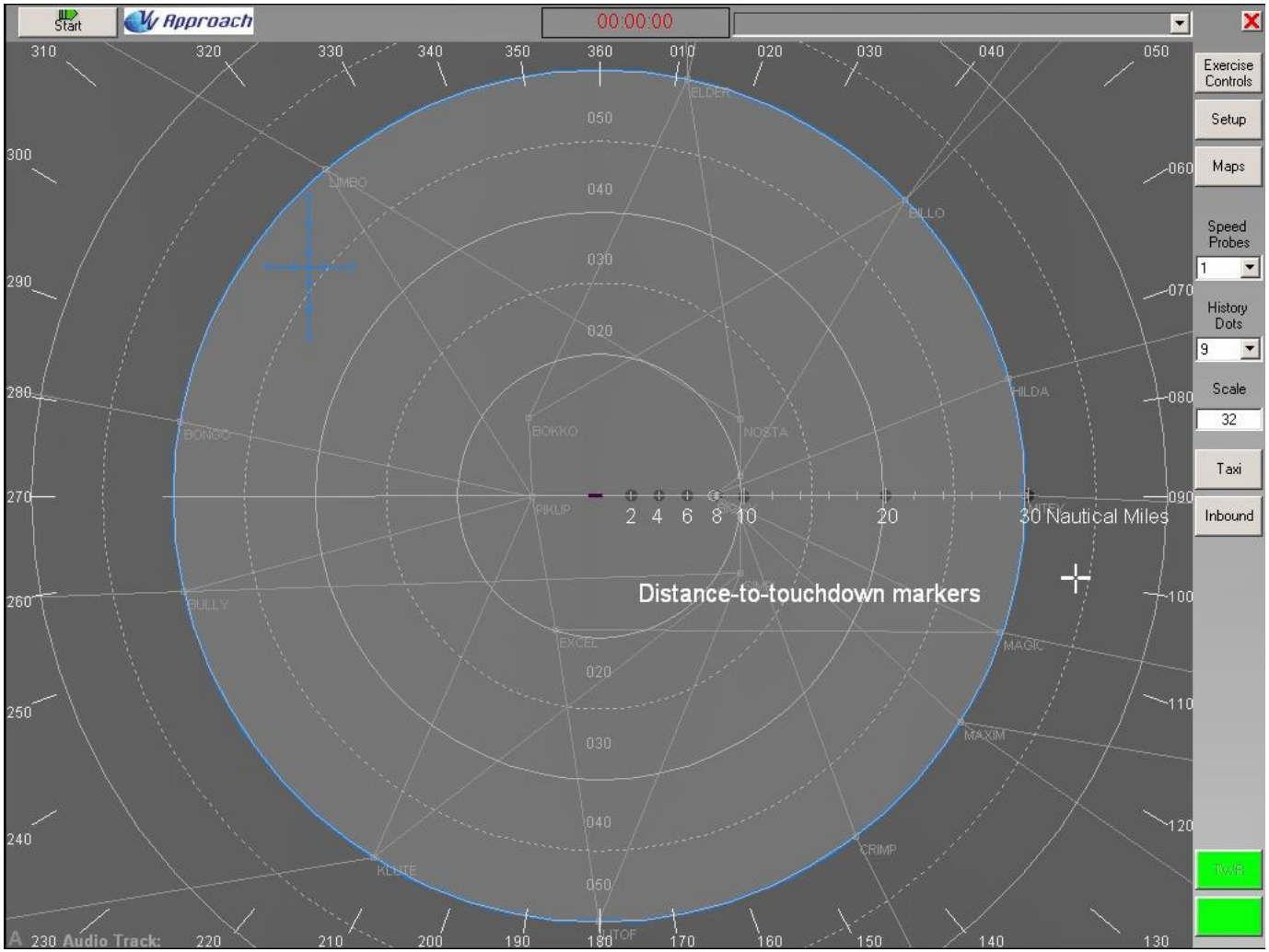
- Windows 7 (Ultimate), 8, 8.1 or 10 operating system (English version of Speech Recognition essential)
- Minimum (and recommended) screen resolution: 1366x768 pixels
- Minimum screen size: 15.6”
- PDF reader
- Headset: 2 earphones + microphone. Common types are usually suitable, but USB devices are recommended.

In Academy or University training it is highly recommended that computers dedicated to *VV* training be used, and that they be made accessible to students for practice during otherwise unutilized hours. Monitors with 22”-24” screen and 1366x768 pixel resolution are ideal.

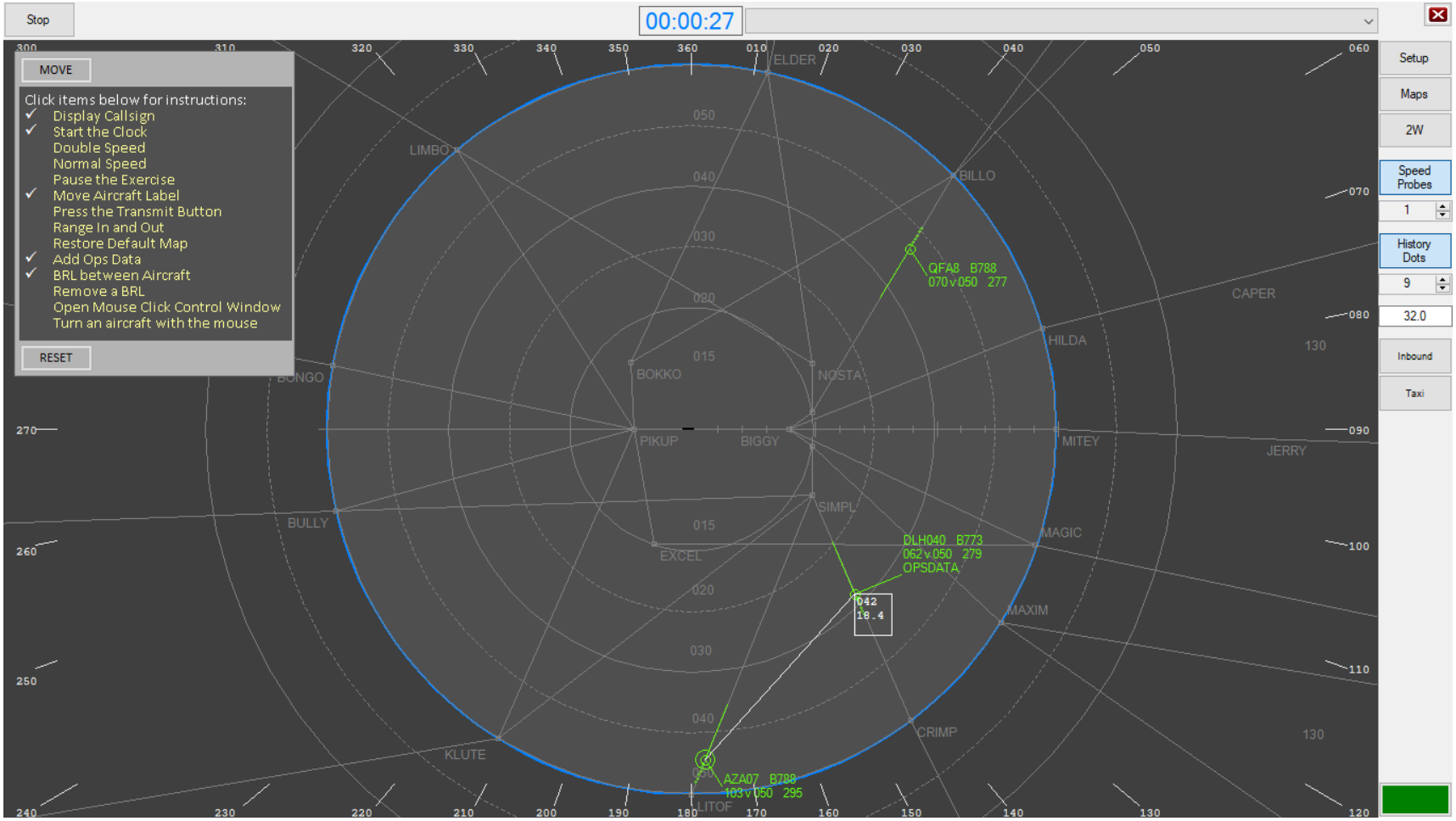


Appendix 3: Screen captures

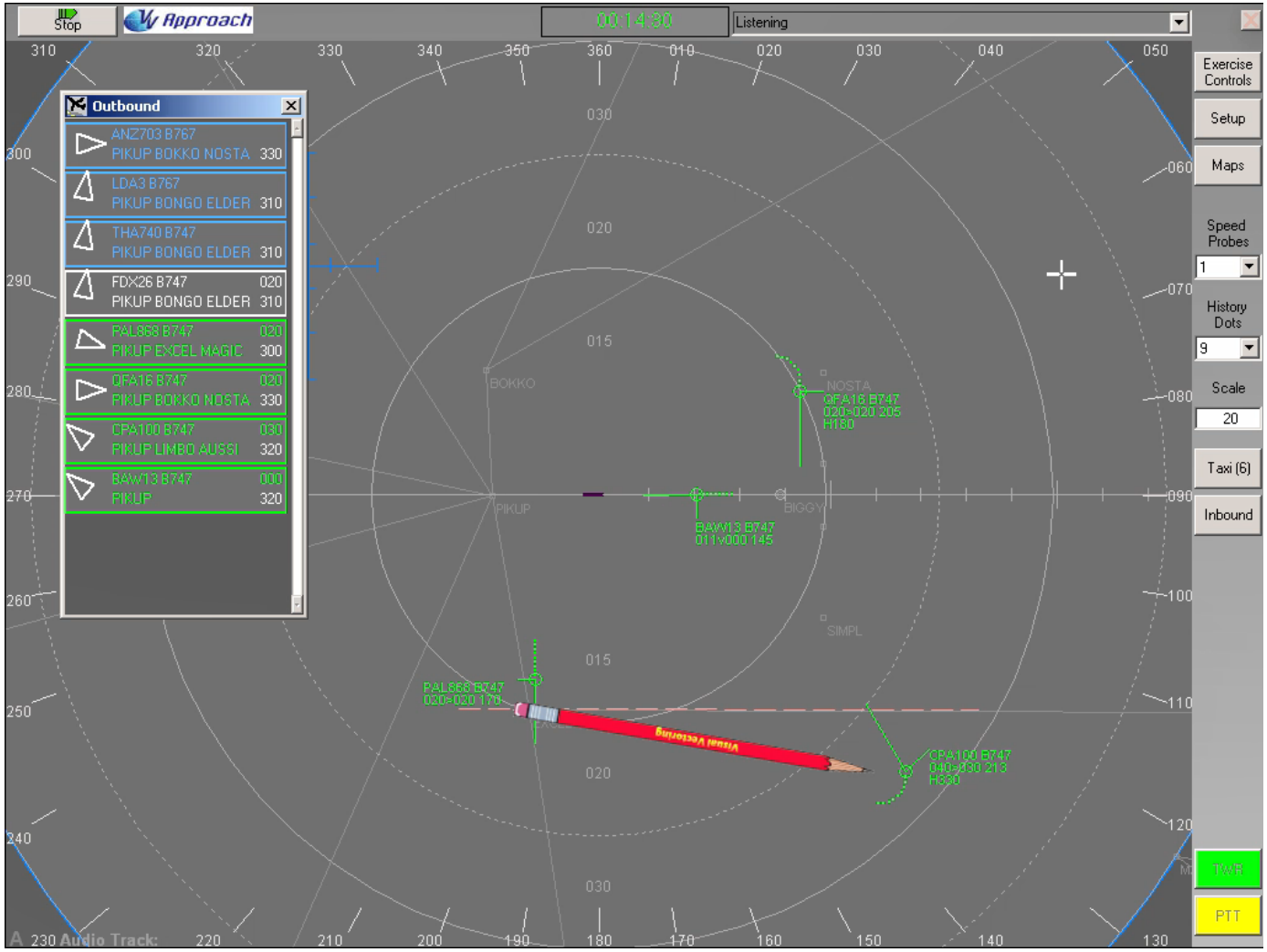
Lesson: Sim Tour



Exercise: Sim Task Trainer 1



Lesson: 5 Demonstration:



Exercise: 15j