



visual vectoring

# Product Description

**vvstack**<sup>TM</sup>

Training in delay management for inbound aircraft

Version 3.0

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## Summary

*VVStack™* is a self-contained PC-based safety training program for Air Traffic Controllers and is an extension to the traffic processing and sequencing training provided in *VVEnroute™*. Specifically, *VVStack™* teaches the management of significant delays to inbound traffic in a surveillance Enroute/Area environment. This includes instruction and extensive simulation in the use of speed control, vectoring, holding, and time issuance to achieve a specified trail distance or flowed gate time.

## Context

At any busy aerodrome, unusual events such as poor weather, runway closures and emergencies can affect the runway landing rate and require that inbound aircraft are delayed. At the strategic level, there are various strategies for dealing with this such as cancelling departures, diversions the used of Arrival Management (AMAN) systems and Collaborative Decision Making. For the controllers managing the inbound sequence, a tactical approach is needed, requiring a set of skills for effecting delays such as vectors, speed control and holding.

*VVStack™* provides low-cost, targeted training in the full range of essential skills that will serve to prepare students for the complex requirements of this work.

## Applicability

The *VVStack™* course is suitable for use by ANSPs and ATC training providers for delivery to ab initio trainees who have completed the *VVEnroute™* course. It may also be used for Colleges and Universities as part of a generalist ATC familiarization course, or as preparation for a career in ATC.

## Delivery

The course may be delivered in an on-site laboratory or computer lab, or from the Control Zone™, our cloud-based Learning Management System. These modes of consumption support instructor-led, supervised, semi-supervised and self-directed learning. *VVStack™* is completely self-contained, containing instructional content and practical simulation exercises. Performance data is uploaded and stored in the LMS, allowing the monitoring of student performance and generation of reports and visualisations.

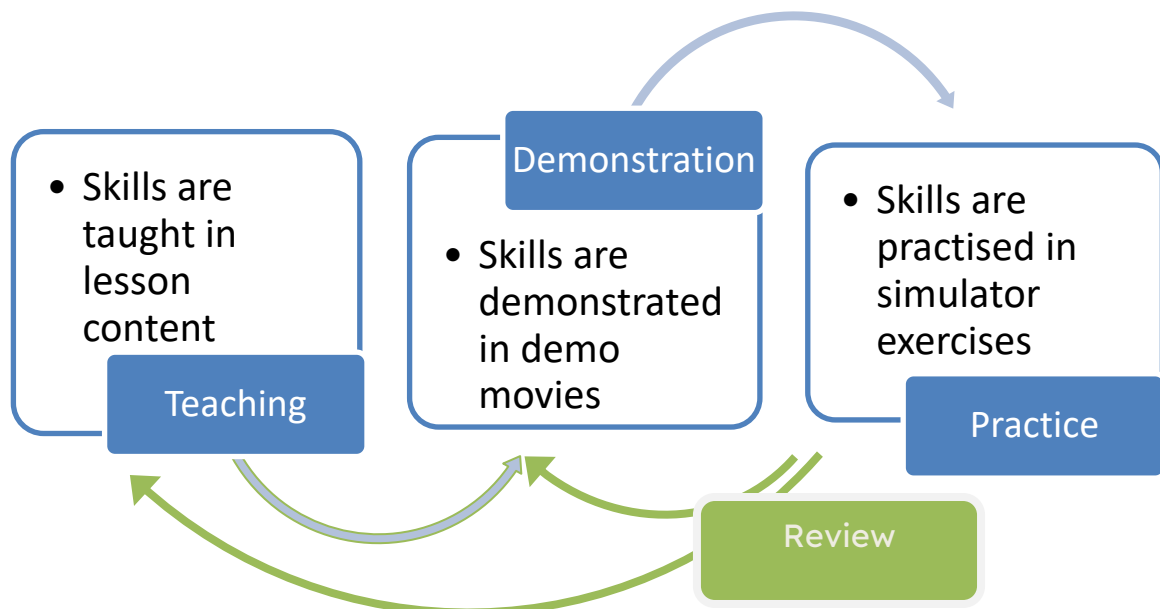
Training content may be consumed on any device. Simulation requires a PC with Windows 7 or greater (English language version).

## The Learning Process

The task of administering and applying delays within an arrival sequence requires the development of a range of complex and interrelated skills. Firstly, there is a planning component, in which the controller will assess the traffic sequence and determine which intervention, if any, is required, such as vectoring, speed control, holding and/or time issuance. These correct instructions must then be issued to pilots to implement the traffic management plan. Finally, the traffic disposition must be continually monitored and reviewed to assure separation, achieve the required exit conditions and maintain a correct interface display.

The *VVStack™* course teaches students how to perform these complex, time-critical tasks through a structured set of learning steps that establish essential skills, on which more aggregate skills can be built. Each step begins with a lesson that teaches the context and application of a particular technique. This is followed by a demonstration of its practical application. These skills are then applied and reinforced through practice simulation exercises designed to target what has been learned. Finally, the student can review and perform practice simulation as needed before proceeding to the next learning step.

The Visual Vectoring learning process is depicted in the diagram below.



## Customisation

Teaching and simulation are presented on a neutral platform designed to generalise the learning process. The phraseology used is as specified in ICAO Procedures for Air Navigation Services - Air Traffic Management documents (Document 4444) and Manual of Radiotelephony (Document 9452). Where these documents do not contain applicable examples, the phrasing taught in *VVStack™* is that which is commonly used by many Air Navigation Service Providers.

Simulation on local airspace, and customisation of the interface functions is available and requires the assistance of local training experts.

## Course Structure

The *VVStack™* course consists of three modules, each containing several lessons, demonstrations, and simulator exercises:

### Arriving Traffic:

This module covers the use of vectors and speed control for achieving the required spacing for traffic entering the Terminal Area as an extension to the skills acquired in the *VVEnroute™* course.

### Holding Traffic:

In this module, the procedures and phraseology for the processing of aircraft into, within, and out of the holding pattern is introduced. The implementation of assured separation is emphasised. Simulation scenarios involving managing airport closure events requiring skills to indefinitely delay a busy traffic sequence until arrivals can resume, and then processing the arrivals in an orderly sequence.

### AMAN Traffic:

This module teaches the interpretation of a typical Arrivals Management (AMAN) system and how this information informs the control decisions for the processing of the inbound sequence to meet the required gate times. This requires the ability to interpret the AMAN delay and to develop and apply various strategies to achieve the required sequencing outcomes.

The simulation exercises in this module provide a very realistic representation of an arrivals sequence into a major aerodrome and are a culmination of the surveillance training provided in the *VVEnroute™* and *VVStack™* courses.

## Skills Taught

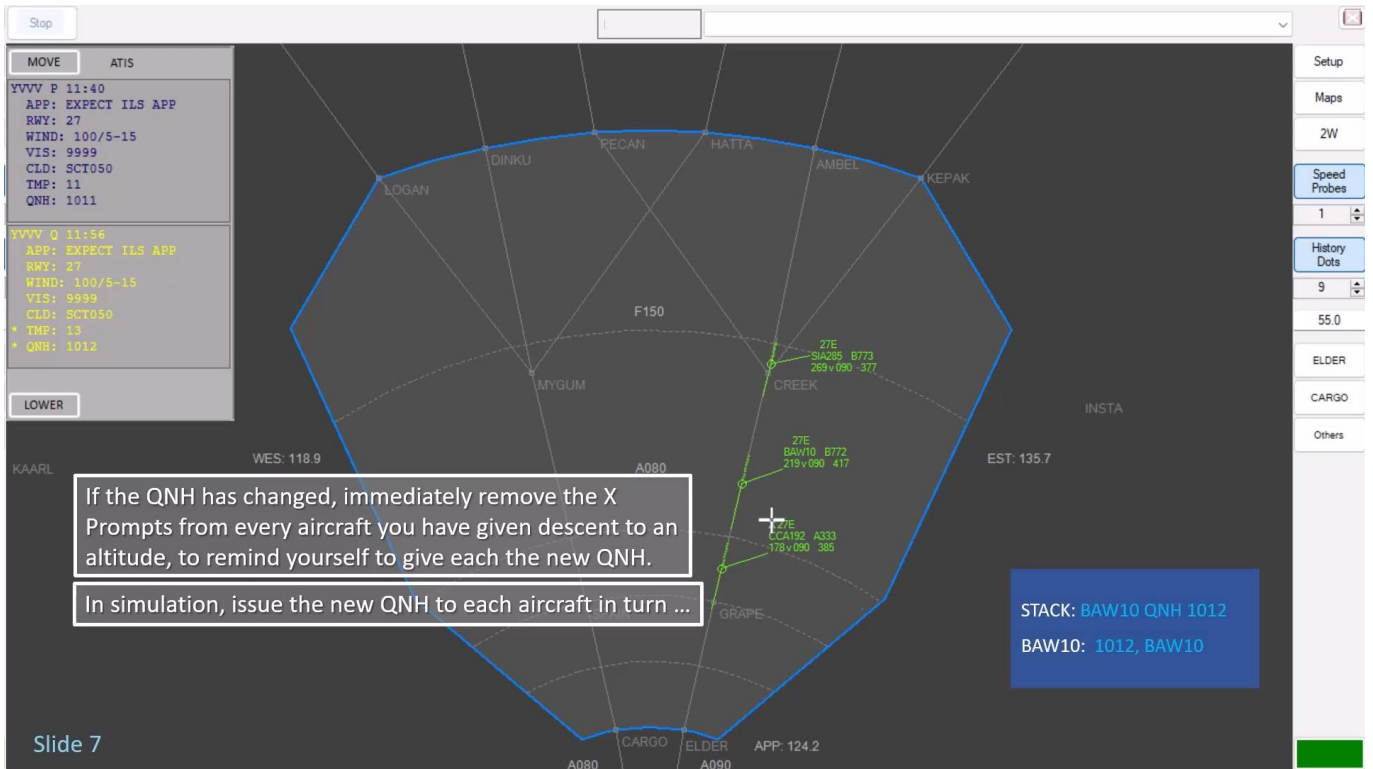
The following skills are covered in *VVStack™*:

- Processing an inbound arrivals sequence.
- Issuance of altimeter pressure information.
- Transmitting changes to pressure information.
- Issuance of holding instructions.
- Issuance of level requirements.
- Usage of standard phraseology.
- Separating traffic inbound to a holding pattern.
- Maintenance of vertical separation within the holding pattern.
- Processing of traffic exiting the holding pattern to meet the sequencing requirements.
- Processing traffic through a TMA entry gated based on a required longitudinal spacing and/or a required gate time.
- Workload management.
- Holding phraseology.
- Interface usage.
- Interpreting the AMAN system.
- Applying control techniques such as vectoring, holding, speed control and time issuance to implement an AMAN sequence.
- Projecting and planning.
- Workload management.

## Availability

*VVStack™* is currently available for evaluation through the Control Zone™ LMS.

## Screenshots Procedures Lesson



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STOP

MOVE ATIS

YVWV P 11:40  
APP: EXPECT ILS APP  
RWY: 27  
WIND: 100/5-15  
VIS: 9999  
CLD: SCT050  
TMP: 11  
QNH: 1011

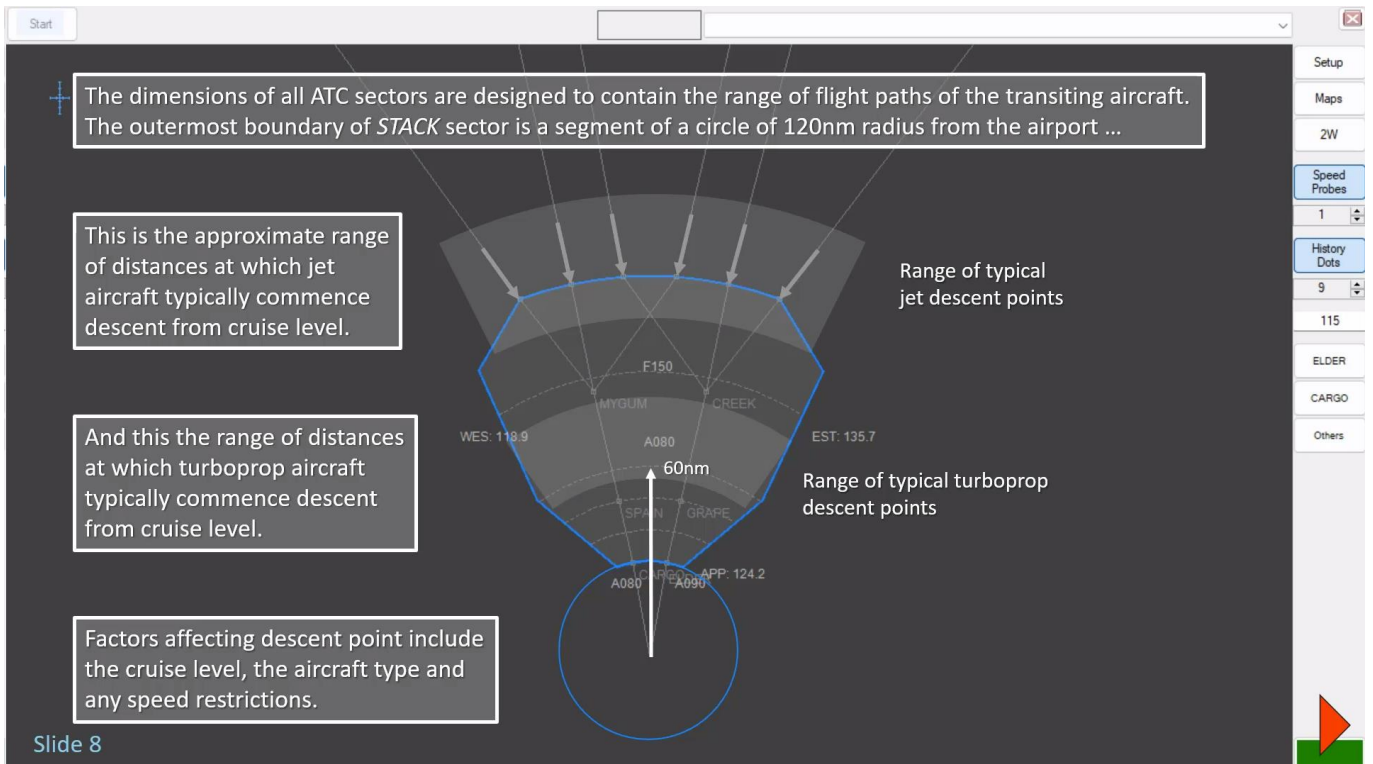
YVWV Q 11:56  
APP: EXPECT ILS APP  
RWY: 27  
WIND: 100/5-15  
VIS: 9999  
CLD: SCT050  
\* TMP: 13  
\* QNH: 1012

LOWER

Stack: BAW10 QNH 1012  
BAW10: 1012, BAW10

If the QNH has changed, immediately remove the X Prompts from every aircraft you have given descent to an altitude, to remind yourself to give each the new QNH.  
In simulation, issue the new QNH to each aircraft in turn ...

## Airspace Lesson



START

The dimensions of all ATC sectors are designed to contain the range of flight paths of the transiting aircraft. The outermost boundary of STACK sector is a segment of a circle of 120nm radius from the airport ...

This is the approximate range of distances at which jet aircraft typically commence descent from cruise level.

Range of typical jet descent points

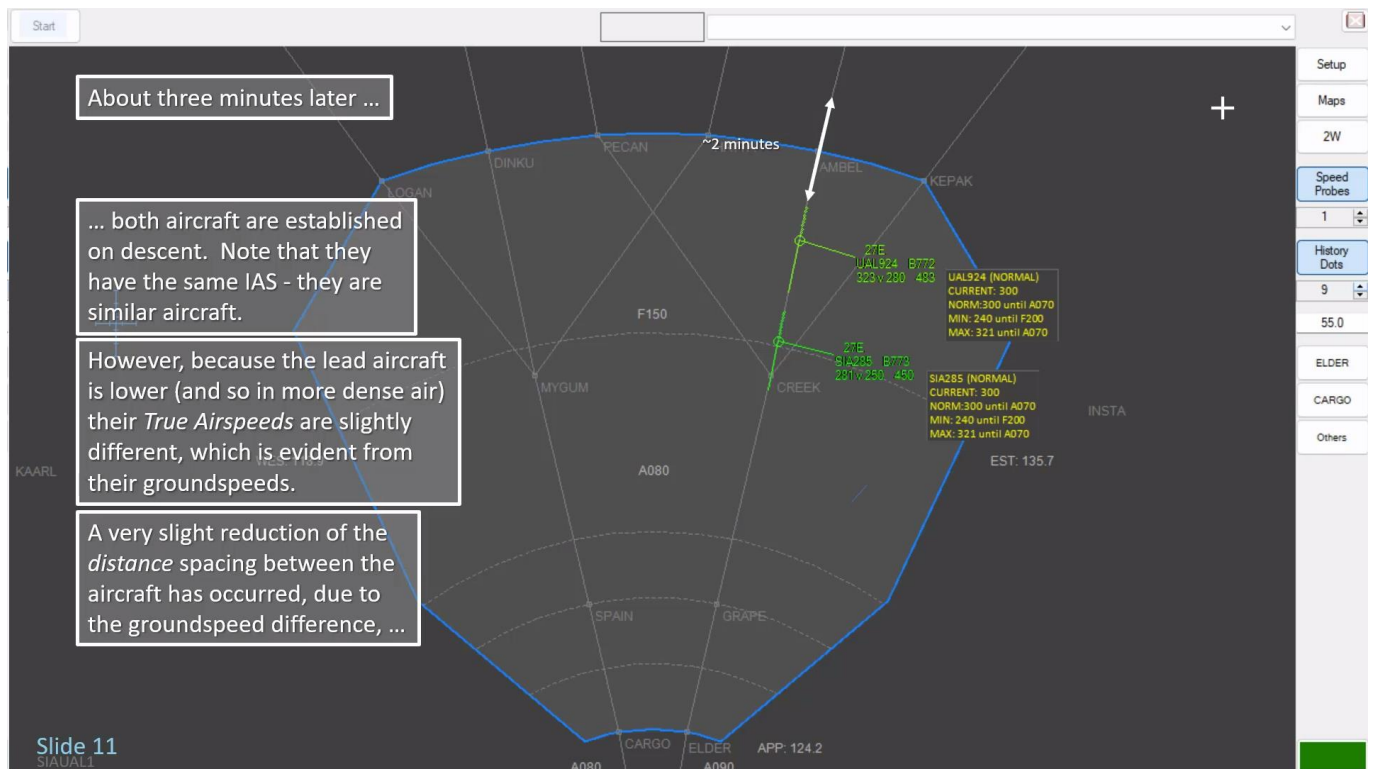

And this the range of distances at which turboprop aircraft typically commence descent from cruise level.

Range of typical turboprop descent points

Factors affecting descent point include the cruise level, the aircraft type and any speed restrictions.

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## Sequencing Lesson

## Sequencing Non-Jet Aircraft

Propellor-driven aircraft have very different flying characteristics to jets on descent. Jets do a power-off descent - they are virtual gliders. That means they are slowly reducing groundspeed as they descend. turboprop aircraft do a (reduced) power-on descent, so their groundspeed on descent is, in general, higher than it was at cruise.


Also, descent for non-jets (typically turboprops) commences later than for jets in terms of distance from the runway. Descent *times*, however, are similar; both are limited by the time it takes to de-pressurise the cabin at a rate acceptable to passenger comfort.

We now move on to examine the processing of non-jet aircraft. Specifically, we will be using turboprop aircraft, that is, types powered by turbine-driven propellers. Slower types, those employing piston engine-driven propellers are not considered, because they are not commonly used in services to and from major airports. Techniques used for managing turboprops are easily adapted to slower aircraft in local training.

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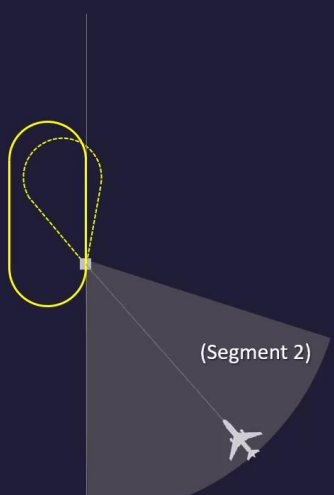


Holding Lesson

 Press **Esc** to exit full screen

## Entry to a Holding Pattern *Continued*

Aircraft approaching the Fix from other directions need to carry out a more complex entry procedure. There are two further segments, first the **Teardrop Entry**:



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Stop

Removing #1 from the hold:

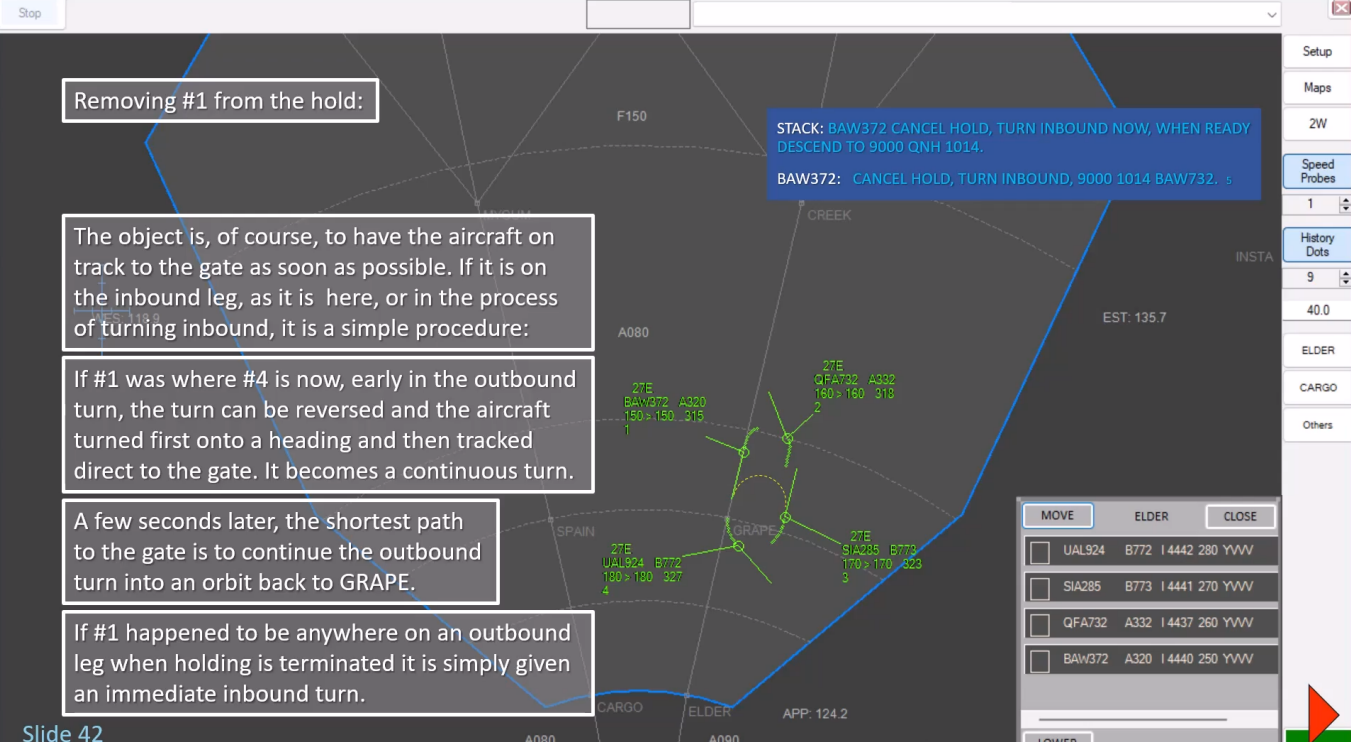
The object is, of course, to have the aircraft on track to the gate as soon as possible. If it is on the inbound leg, as it is here, or in the process of turning inbound, it is a simple procedure:

If #1 was where #4 is now, early in the outbound turn, the turn can be reversed and the aircraft turned first onto a heading and then tracked direct to the gate. It becomes a continuous turn.

A few seconds later, the shortest path to the gate is to continue the outbound turn into an orbit back to GRAPE.

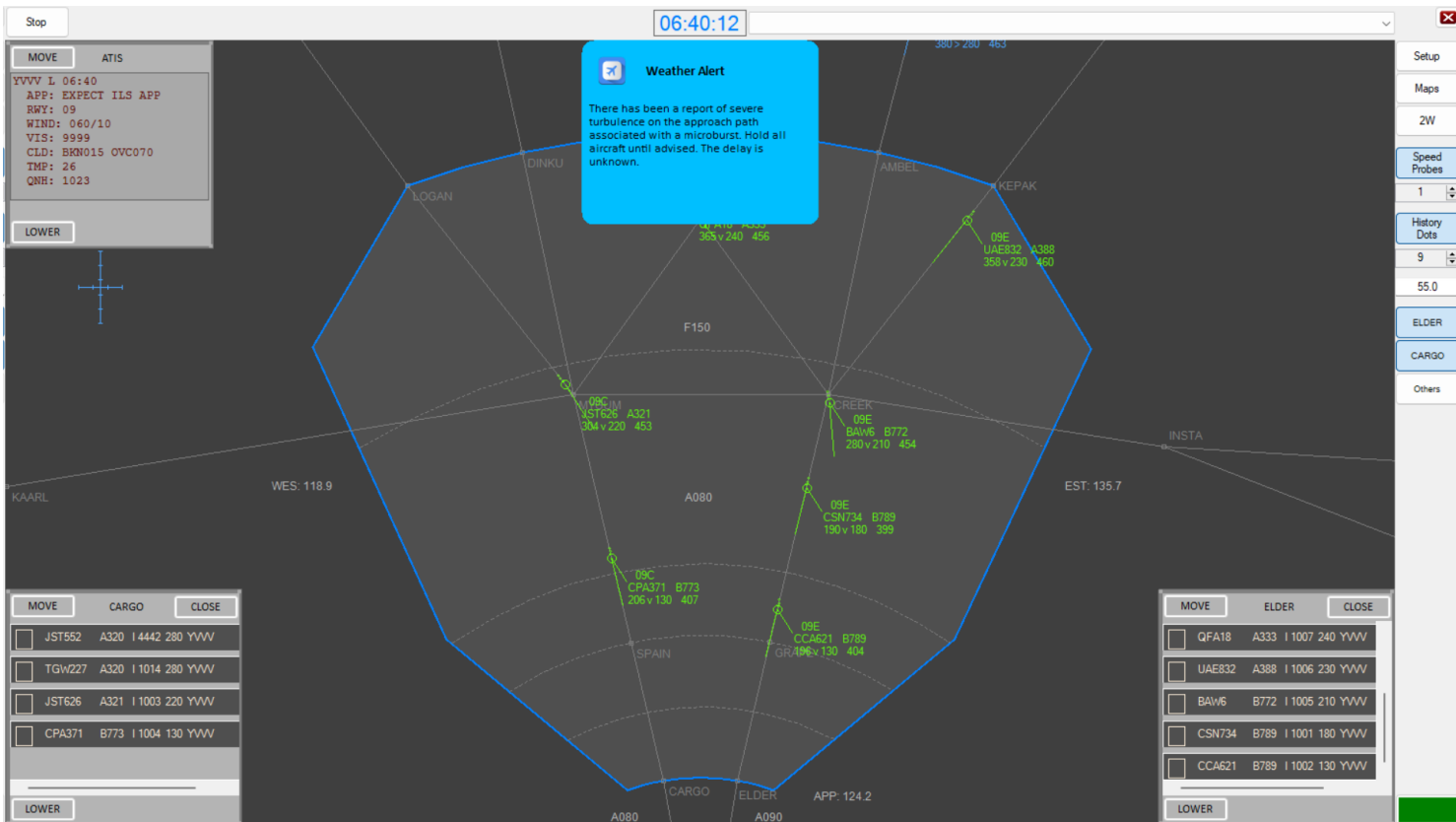
If #1 happened to be anywhere on an outbound leg when holding is terminated it is simply given an immediate inbound turn.

**STACK:** BAW372 CANCEL HOLD, TURN INBOUND NOW, WHEN READY DESCEND TO 9000 QNH 1014.  
**BAW372:** CANCEL HOLD, TURN INBOUND, 9000 1014 BAW732. 5



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## Holding Simulation Exercise



## Holding Simulation Feedback

Scenarios	
Scenario:	1
Trail:	VOZ833+ETD164
Outcome:	10.26 (Ideal)
Completed:	2023-11-28 11-37
Scenario:	3
Trail:	JST635+CSN602
Outcome:	11.03 (Ideal)
Completed:	2023-11-28 11-41
Scenario:	5
Trail:	CCA414+SIA428
Outcome:	10.76 (Ideal)
Completed:	2023-11-28 11-49

AMAN Lesson



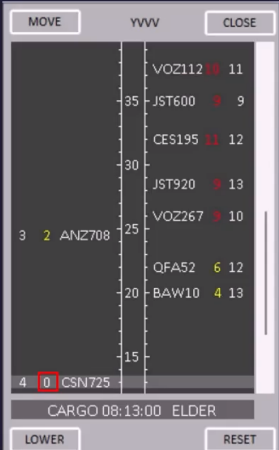
### The AMAN Display *Continued*

08:13:00

The outside number, called the **Initial Delay**, represents the original duration in minutes that the system has calculated for the aircraft's delay.

The **Initial Delay** does not change and has limited value to the processing of aircraft except, through a comparison of Current Delay, to indicate how much delay has been absorbed. For example, ANZ708 was initially subject to 3 minutes delay, based on the system calculations, one minute of delay has been absorbed.

All aircraft should have 0 at the gate:




Initial Delay	Current Delay	Aircraft
11	11	VOZ112
9	9	JST600
12	12	CES195
13	13	JST920
10	10	VOZ267
12	6	QFA52
13	4	BAW10
0	0	CSN725

The **Current Delay**, indicated by the inside numbers, shows the remaining minutes of delay, as determined by the system, required to reach the scheduled gate time. As delaying action is applied, the **Current Delay** should slowly decrease so that, if sequencing actions have been performed correctly, it displays 0 as the aircraft passes the gate.

Note that the system estimates the **Current Delay** based on the aircraft's progress to the gate, making use of standard performance profiles that do not account for any control actions that have been applied, such as vectoring or speed control.

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AMAN Demonstration



08:32:26 08:32:25 HVN725 (Acknowledgement)

ATIS: YVVV W 08:08  
APP: EXPECT ILS APP  
RWY: 09  
WIND: 100/10-20  
VIS: 9999  
CLD: SCT030 BNK060  
TMP: 37  
QNH: 1019

Initial Delay	Current Delay	Aircraft
14	14	RXA619
16	16	NWI
17	17	FD11
5	5	QLK434
11	11	VOZ112
9	9	JST600
12	12	CES195

08:32:15 ELDER  
CARGO 08:32:15 ELDER

