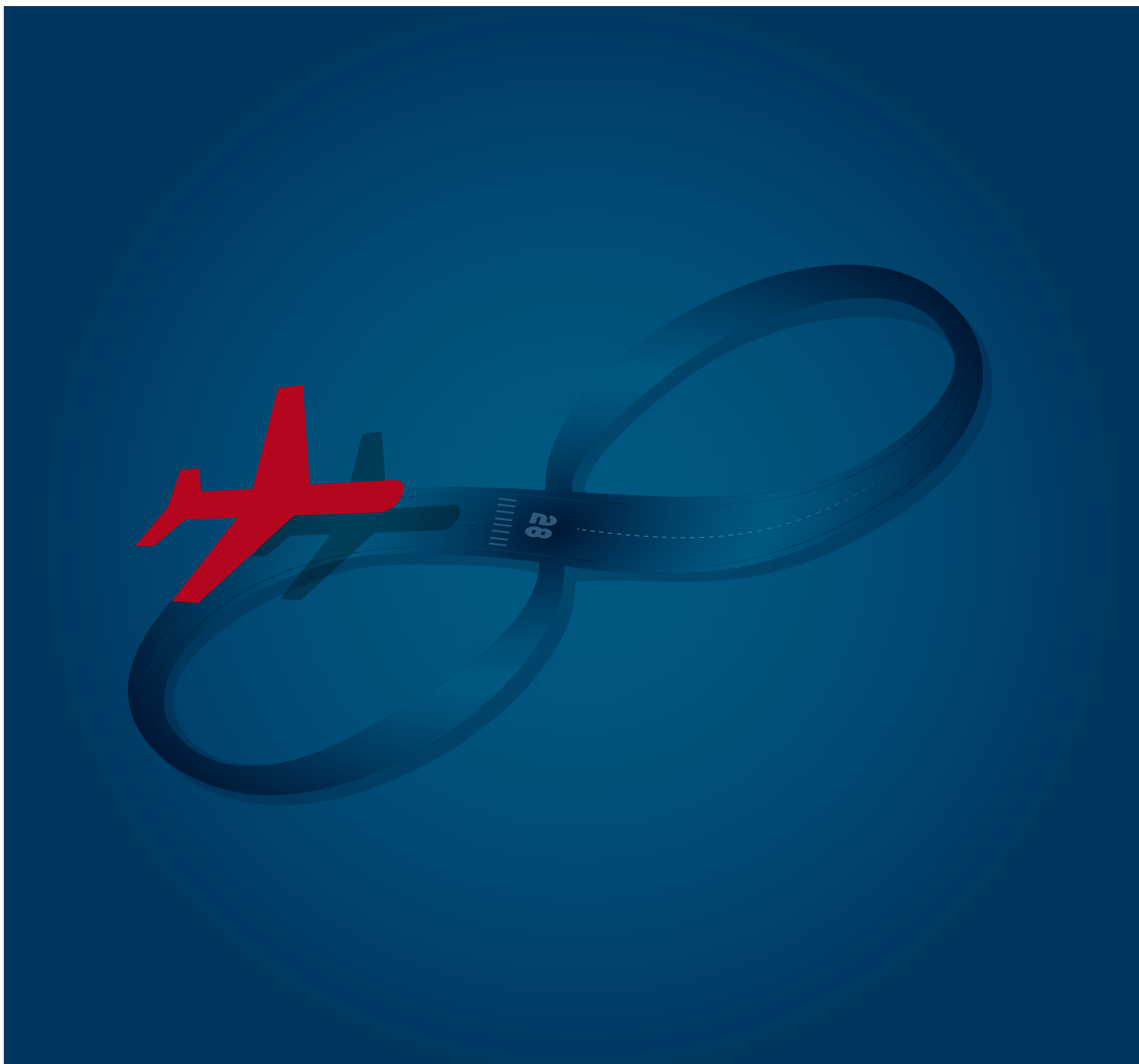

total control™ overview

ATC simulator with infinite flexibility



Four reasons to consider Total Control™ for your ATC training

✈️ Unparalleled functionality and features

Total Control™ introduces features no other ATC simulator can offer at reasonable cost: features such as artificial intelligence, instant rewind/replay and exercise variation, stunningly realistic 3D terrain and weather, unparalleled functionality, and an intuitive user-interface mimicking actual tower and radar consoles. It's as close as you can get to the real thing in a simulator.

✈️ Designed by people who think like you

Total Control™ has been designed and engineered by ATC training specialists *specifically* for air traffic control training, delivering total functionality and flexibility back to the trainer's fingertips, with a lower cost of ownership than any other ATC simulator on the market.

✈️ Better training at lower cost

With Total Control™ it's easier to identify trainee skill deficiency early on and instantly implement online exercise variations to maximise your training outcomes, speed up the training process, and reduce training costs.

✈️ Total fingertip control

Experience the technology breakthrough of Total Control™ to simulate any or all of your air traffic environments – aerodrome, radar and procedural – either separately or combined. Total Control™ can be just as effective as a part-task trainer in a tower or classroom. Total Control™ will change the way you use an ATC simulator because the trainer now has total fingertip control.



Total Control™

About Total Control™

Total Control™ is more than just an ATC aerodrome and tower simulator, it is a total simulated Air Navigation Services *environment*, specifically designed as a teaching tool, to bring fingertip functionality and control to your training regime.

Total Control™ is able to create a total immersion experience for ATC trainees while providing a fully-featured training tool that gives the trainer full control of their students' training outcomes.



Total Control™ for ATC trainers

ATC Trainers will welcome Total Controls' dynamic 'online' automated tools to provide easy exercise creation in 10 minutes or less.

Tools include automated conflict calculation, saving hours of calculation and exercise testing time; dynamic tools for the selection and creation of aerodrome, airspace, aircraft, tracks, approach types, navigation aids, and flight plans; and instantaneous exercise testing and review.

Total Control™ also provides trainers with dynamic instantaneous 'online' exercise manipulation, including rewind and comparative analysis functions and random VFR track creation. And not only does Total Control™ allow trainers a 3D view of aircraft and terrain from any angle, trainers can now view a representation of a 3D view of aircraft under procedural control (i.e. ability to visually zoom to any point (in time and space) to view aircraft in relation to each other and geographical features). Total Control™ is able to provide instantaneous

variations to weather conditions and dynamic manipulation of aircraft performance to simulate emergency conditions.

Training session review for skill deficiency diagnosis and skill enhancement is a key feature of Total Control™. Training sessions (both aerodrome with fully visual graphics and radar) are recorded on CDROM for students to review learning points, and the instructor has online tools for rewind and resume, and dynamic manipulation of variable inputs (e.g. weather, creation of random VFR aircraft and tracks). Computer based training suites (with full simulation/emulation) allow students to run exercises independently to consolidate learning, and procedures can be demonstrated using full simulation in a classroom environment.



Total Control™ for ATC training managers

Total Control™ offers Training Centre Managers the ability to reduce training costs and improve the quality of existing training programs, due to its significantly lower total cost of ownership, low technical maintenance requirements, and reduced on-job training time for trainees.

There is no requirement for professional pseudo pilots or Simulator Co-ordinator, and because Total Control™ allows for reduced instructor to student ratios the efficiency and quality of training is increased. New aerodrome visuals can be developed and introduced within ten days, and exercise/world creation and installation can be achieved in as little as one hour.

Total Control™ for ATC students

ATC students also benefit from Total Control's student-friendly functionality.

The artificial intelligence allows students to practice without the aid of a pseudo pilot, and full rewind and replay functionality allows students to rewind a simulation and resume the exercise from any point. Better still, Total Control's photo-realistic 3D aircraft, terrain and weather modelling is all totally configurable, and highly realistic.

Total Control™ produces better ATC's, faster, and at less cost

Total Control's total-immersion experience enables Trainees and Training Managers to focus upon specific training outcomes, and provide a higher transfer of skills to the operational environment.

Exercise creation no longer requires trained technical specialists – exercises can be created in minutes by ATC trainers using a set of simple ATC-based scenario generation tools. Photorealistic weather, birds, ground vehicles and even ground crews are easily introduced to create a simulated environment that surpasses anything seen before. Even sun-strike and raindrops on the cab windows are replicated with incredible realism.

Trainees can easily perform the function of a pseudo-pilot, removing the need for trained specialists. Online dynamic 'real-time' tools enable Trainers to instantly rewind, overwrite and restart training scenarios, and trainees can even record them to CDROM and replay them. Total Control™ also accurately replicates the ATC environment within

the cab, including communications system interfaces, messaging, runway lighting, clocks, weather and flight-planning information.

Total Control™ is fully configurable to meet any individual training requirements – from a fully simulated 360 degree tower simulator to a simple classroom computer-based teaching tool – to a comprehensive radar simulator. Whatever your training needs, Total Control™ offers unrivalled realism with cutting-edge 3D animated terrain and weather simulation. And Total Control™ can reproduce any training environment faster than any other simulator on the market at significantly less cost. And Total Control's low operating costs make it a highly competitive alternative to any other training simulator currently available.



How does Total Control™ work?

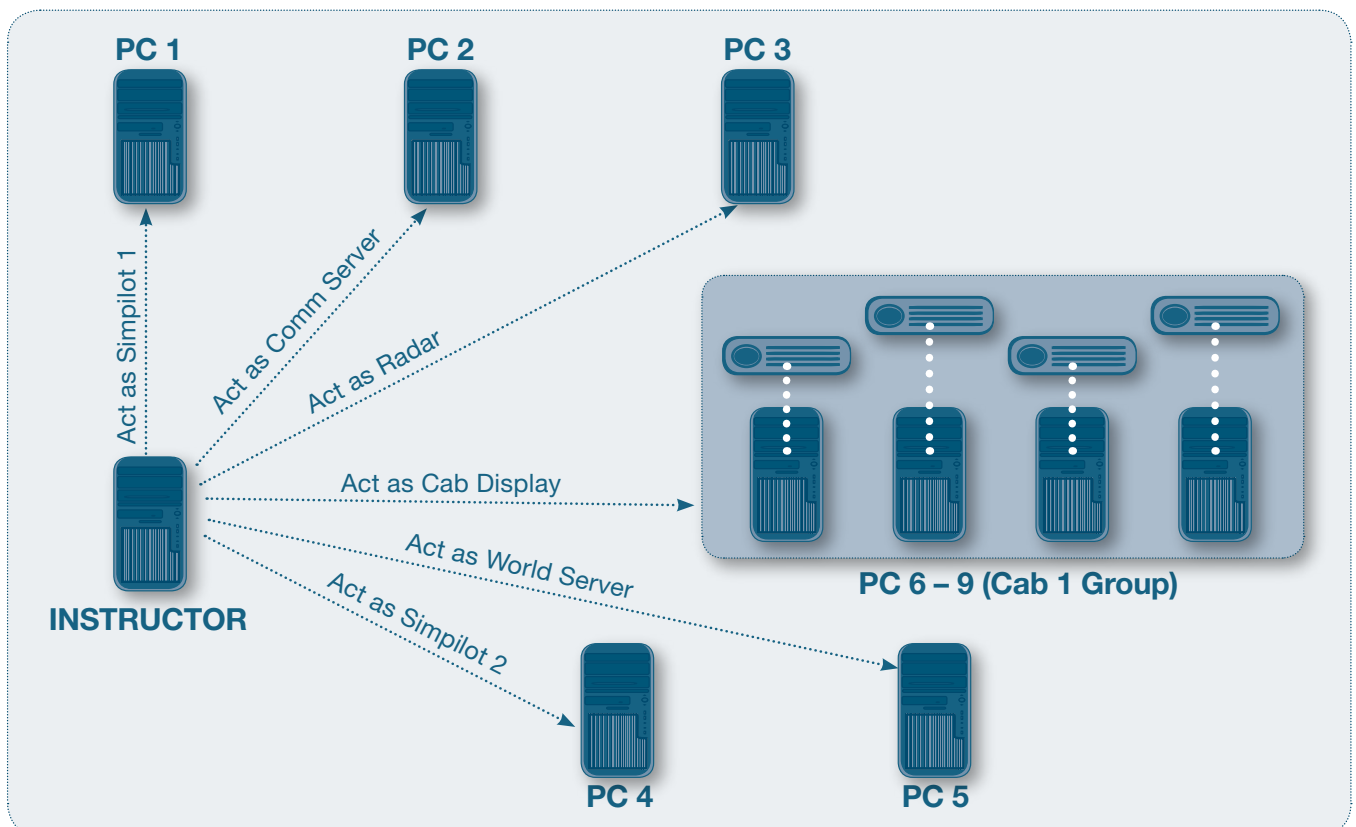
Total Control™ uses proven technology from Animation Research Limited, developed to bring animations of America's Cup Yachting, WRC Rallies, and PGA Golf tournaments to live television broadcasts combined with Airways New Zealand's 19 years of commercial experience in Air Traffic Management system development and Air Traffic Control training.

Simulator Morphing

Total Control™ is a complete training solution that is modular and highly configurable. The system is designed so that any computer can carry out any given task or be dynamically morphed to be any component of an exercise from a tower window view to a radar console.

The base simulator (specified previously) has five CBT classroom training units; they can be dynamically configured as five radar training suites or five communication training suites from the Instructor's console.

The Instructor's position has software that allows the user to dynamically select each computer in the suite, the application it will run and what exercise will be used.



Hardware specification

Total Control™ is designed to use standard off the shelf hardware. It is a graphics intensive application delivering a superior 3D Tower control environment. The hardware chosen affects performance and scalability and will dictate the total number of computers required in the system.

Airways International recommends using the following minimum computer hardware componentry:

Hewlett Packard xw4300 Graphics workstation

- Intel® Pentium® 4 Processor 521 with HT Technology and EM64T (2.8GHz, 1MB L2 cache, 800MHz FSB)
- Chipset Intel® 955X Express
- 1GB DDR-2 533MHz ECC Memory
- NVIDIA 6800 GT PCI-Express Graphics
- 80GB SATA Hard Drive
- Creative Labs Audigy 2 Sound card
- 1 x Serial port, Game port, 1 x Parallel port1, 8 x USB 2.0 ports
- Gigabit Ethernet Controller (PCI-Express)
- Operating system Microsoft® Windows® XP Professional SP2

Total Control™ is designed to run on the Windows operating system and uses both Directx and OpenGL technologies. Airways uses and recommends the NVIDIA 6800 GT PCI-Express Graphics or NVIDIA 7800 GT PCI-Express Graphics cards. These support all graphics ranges while delivering high performance to the simulator. These cards can be used in any computer that supports the 'PCI express 16' bus standard.

The specification for display system is guided by the size of the room that the simulator will be installed in and the lighting conditions. Display systems may be created through projection (front or rear), LCD panels or LED panels.

Projector requirements should also meet or exceed the following specifications:

DLP projection technology (recommended)

- XGA (1024x768) resolution
- 2000 ANSI lumens
- DVI input
- Zoom capability
- Digital keystone correction
- Maximum 35db operating noise
- Ceiling mount

Software

Total Control™ software is all designed to run on the recommended Workstation configuration on Windows XP (or above) operating systems. The software is distributed over many computers that are networked together to provide the complete simulator platform.



Wholeworld modelling

Total Control™ is built on the principle of ‘whole world’ flight path modelling. An aircraft flies from one geographic point in the world to another geographic point. The default fictitious training world is located in a real world geographic position and is located to the east of New Zealand in the Pacific Ocean.

Flights travel from or to known airports around the world into the terrain modelled world. The areas that have been terrain modelled can support 3D tower visuals and airports. Radar can track the flight anywhere in the terrain modelled world where radar coverage has been defined. The radar targets will still be visible in these defined areas even when visibility is lost from the towers.

WorldServer

The WorldServer manages all objects in the world for any given time and provides updates to all the other applications running in an exercise. It controls the applications of functionality such as:

- ✈ **Rewind**
- ✈ **Pause**
- ✈ **Fast Forward**
- ✈ **Stop/Start**

Each simulated world, or exercise, has its own dedicated copy of the WorldServer. This allows the simulator to be configured in one or a mixture of the following modes:

The WorldServer is also responsible for managing recording and playback functions for online and offline replay. In every exercise each event is recorded. These events include:

- ✈ **Flight path changes**
- ✈ **Aircraft movements
(including flaps, wheels etc)**
- ✈ **Objects (vehicles, birds, dogs, lights etc)**
- ✈ **Weather**
- ✈ **Communications**
- ✈ **Exercise alterations**

Single Environment, Multiple Positions

All tower cabs, Simpilot positions, CBT suites run as a single exercise with different assigned positions.

For example; in a two tower cab system, each cab represents a different airport in the world and each CBT position represents a different radar sector.

Multiple Environments, Multiple Positions

Each tower cab runs its own independent exercise in its own dedicated environment simultaneously.

In this configuration the simulator pilot and Radar positions are dynamically assigned to one environment or the other at the beginning of the exercise.

Radar or SimPilot positions may be relocated between exercises dynamically.

Simultaneous Environments

Each tower and CBT runs its own environment and exercise simultaneously, independent of each other.

SimView

SimView is the software component that provides the 'out of the window' tower view. It can be run on a single computer as a window across dual screens (as used in CBT classroom training) or as a windowless tower view across multiple computers to form a realistic tower view from 30 degrees to 360 degrees (as used in a tower cab simulation).

The type of display and the resolution of SimView is dependant on the graphics card used and the projection or display system.



SimView allows the simulator to provide

- Realistic lighting conditions including shadow
- Realistic weather such as clouds, rain, hail, fog and sun glare
- Environmental sound effects such as wind, rain, thunder, aircraft noise, vehicles
- Smoke effects
- Accurate time of day or night simulation
- Realistic Airfield lighting systems.

SimView includes additional tools to allow users to calibrate the projection systems that include:

- Anti-aliasing
- Projector calibration
- Timing calibration



SimPilot

SimPilot provides the simulator pilot with a 3D view of the terrain mapped world and the tools to control all moveable simulated objects such as:

- ✈ Aircraft
- ✈ Vehicles
- ✈ Groups of people
- ✈ Flocks of birds
- ✈ Packs of animals

Objects such as Aircraft can be dynamically created or deleted during an exercise to increase or decrease a trainee controller's workload.

The 3D WorldView window can be run as part of the SimPilot application or dragged to and separated onto a separate screen to improve the visibility for larger exercises.

The SimPilot 3D view can be:

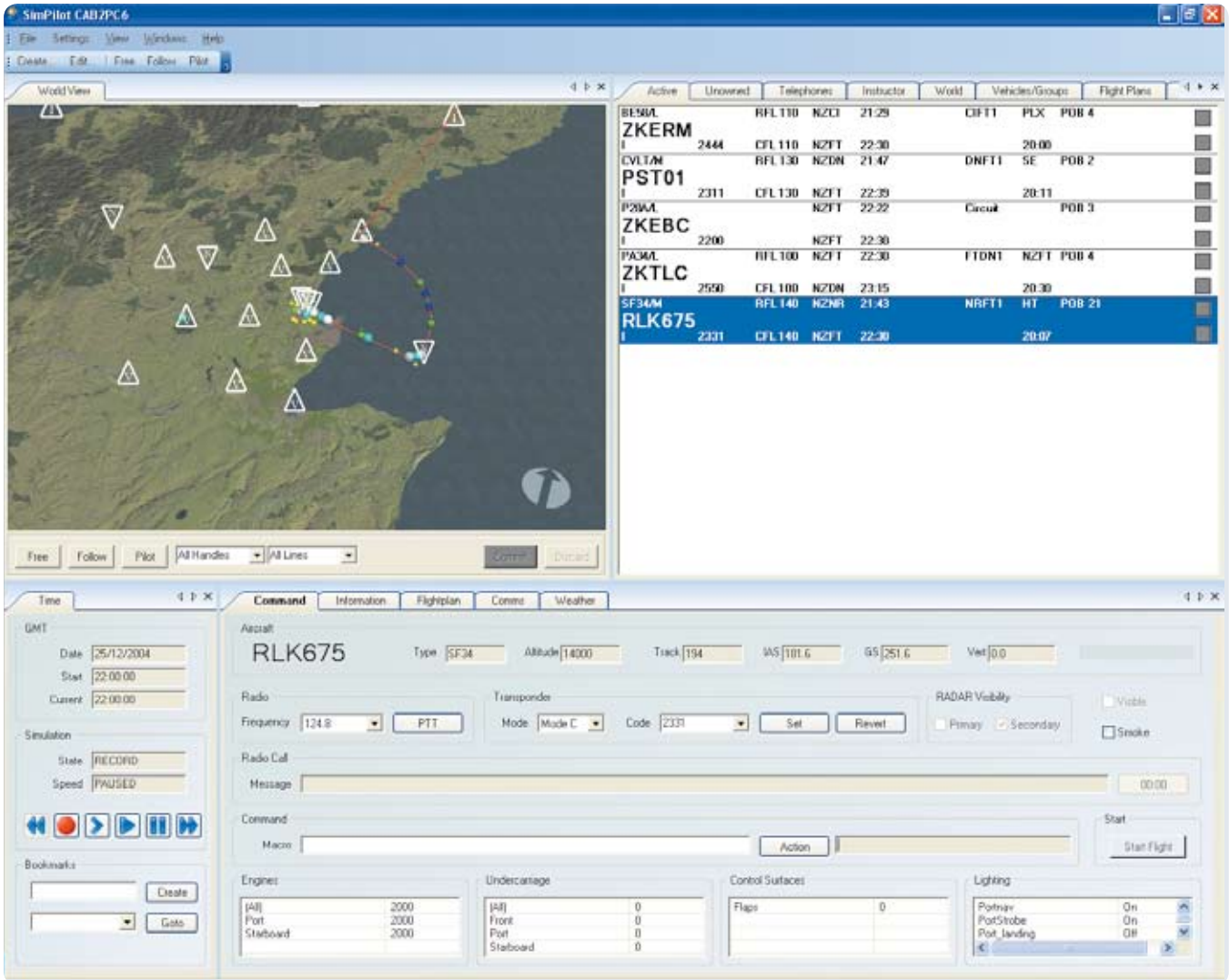
- Rotated to change the viewing angle.
- Zoomed in and out anywhere in the terrain map.
- Free roamed anywhere in the terrain world.
- Set to track an aircraft through the terrain world.
- Set to show the pilot view.

The SimPilot position has full control of exercise functionality including:

- Record
- Fast Forward
- Rewind
- Pause
- Stop
- Set bookmarks
- Play

The SimPilot application provides complete control for:

- Procedural movements
- Circuits
- Arcs
- Orbits
- SIDs and STARs
- Routes
- Standard route clearances
- Touch and Goes
- Instrument approaches
- Missed approaches
- Holding patterns





CommunicationServer

The CommunicationServer provides the communication layer between the controller and SimPilot. It is a Windows based software application server that provides communication over a standard TCPIP network to connect computers supporting Tower communications, Radar communications, SimPilot communications and other communication control panels.

Touch screens are used to emulate any type of communications panel for any control tower. This allows the tower cab to be dynamically configured to match any real tower layout at the start of an exercise.

The CommunicationServer integrates with WorldServer to allow WorldServer to provide recording and playback of all conversations.

The CommunicationServer provides both telephony and radiocommunications with:

- Realistic radio range based on distance and terrain
- Perfect reception or simulated noise affected reception

The instructor position can:

- Listen simultaneously to all conversations
- Listen to selected conversations
- Talk or whisper to all involved in the exercise
- Talk or whisper to selected individuals in the exercise

The communication system supports the use of:

- Real ATC headsets
- Foot switches
- Hand switches
- Integration with standby radios

RadarServer

The RadarServer integrates with the WorldServer and CommunicationServer to provide the radar functionality for the radar client.

RadarView emulates the visually displayed radar windows on a real Air Traffic management system, while the server provides the functionality found in a Radar Flight Data Processing System (RFDPS).

The RadarServer also supports additional intelligent sector control capabilities. If a known sector has not been designated, control is managed through either a Radar Controller position or the SimPilot position.

RadarServer will provide:

- Automated handoffs
- Air Traffic Control coordination of the sector

The RadarServer also provides the following functionality:

- Flight plan processing, including validation and dynamic squawk codes.
 - Radar data Processing:
 - Primary and secondary radar emulation
 - CNS/ATM emulation
 - Squawk code ID and hijack processing
 - Flight plan correlation
 - Trajectory modelling
 - Sectorisation processing:
 - Hand offs
 - Sector coordination
 - Flight Strip processing
 - Abbreviated flight plan processing
- Communication coordination:
- Aeronautical Fixed Telecommunication Network (AFTN)
 - Aeronautical Information Service (AIS)



RadarView

RadarView integrates with the RadarServer to provide the visual radar control position symbology and functions.

The RadarView is a Windows based application that emulates real X-Windows based radar systems.

The RadarView supports:

- Multiple situation displays
- User definable Map overlays including:
 - Coast line
 - Navigation aids
 - Reporting points
 - Airspace
 - Radar heads
 - Approach ladders
- Bearing and Distance lines
- Correlated target information tags
- User Filters
- Flight Data lists (electronic strips)
- Parent sector coordination
- Flight Plan support including:
 - Creation
 - Editing
 - Deletions
 - Activations
 - Terminations

Software maintenance tools

Software tools for the continuing daily administration and the maintenance of the system are provided with Total Control™ in the WorldEdit software suite. These tools are designed to be used by Air Traffic Control Instructors or support staff.

The software is based on industry standards and stored in standard formats. The objects in the simulated world use XML to define configurations.

WorldEdit

WorldEdit is the software tool used by instructors and support staff to create and maintain the objects and worlds that are used to create training exercises. Airport Builder, Weather Builder, Object Manager, and Class Manager are all integrated into WorldEdit.

In Total Control™, every aspect of a world is represented as an object.

This includes physical objects such as:

- ✈ **Vehicles**
- ✈ **Navigation aids**
- ✈ **Aircraft**

and spatial objects such as:

- ✈ **Weather cells**
- ✈ **Control zones**
- ✈ **Holding patterns**
- ✈ **Flight regions**
- ✈ **Airspace.**

Total Control™ provides the tools to manage and maintain these objects.



WeatherBuilder

WeatherBuilder is the tool used to create weather patterns. Weather patterns such as frontal depressions are created using Weather Cells.

Weather Cells are described in terms of:

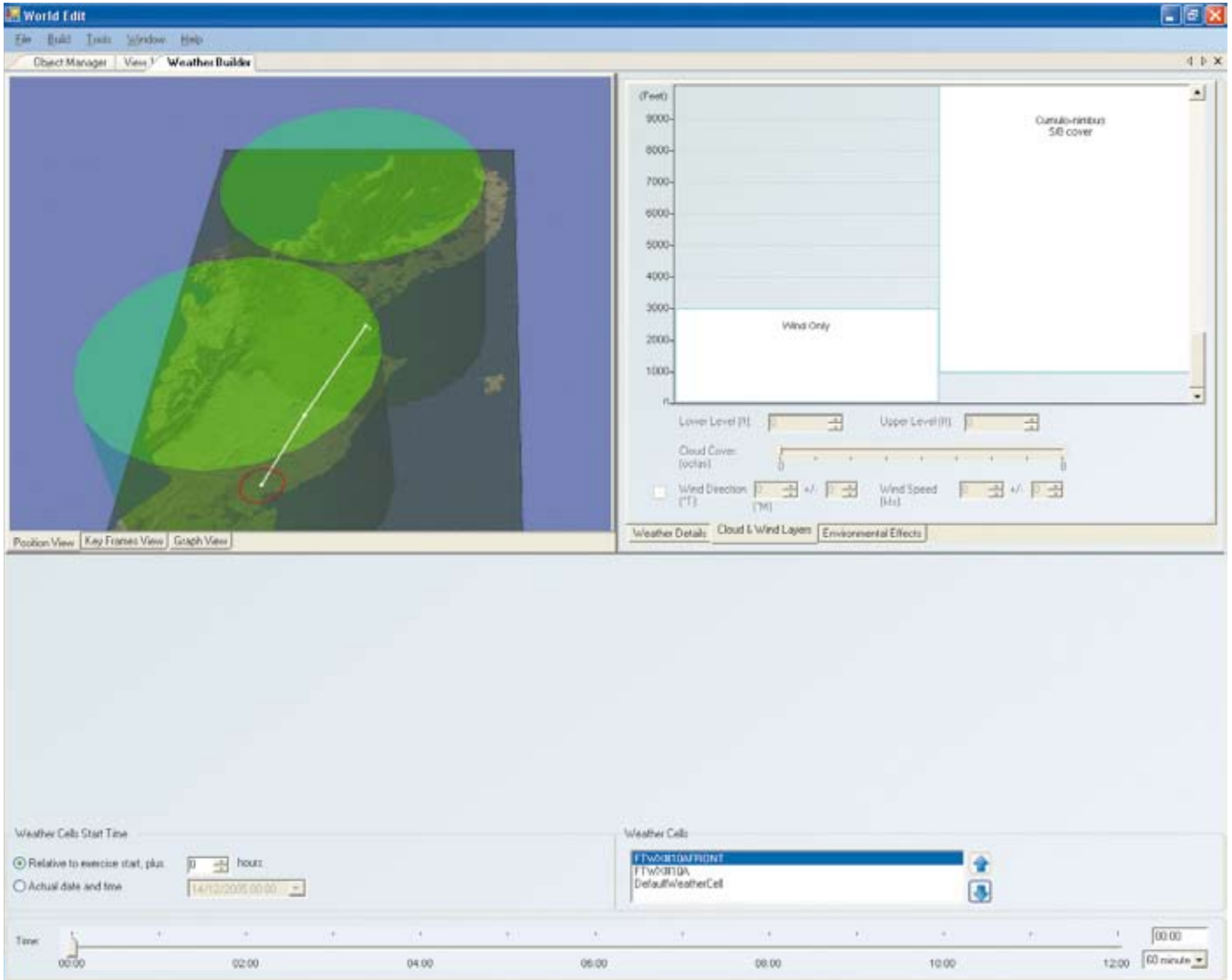
- Geographic centre and radius
- Upper and lower bounds
- Wind speed , direction and variability
- Visibility
- Cloud type and cover
- Snow
- Haze
- Fog
- Rain
- Smoke
- Lightning
- QNH (base cell)

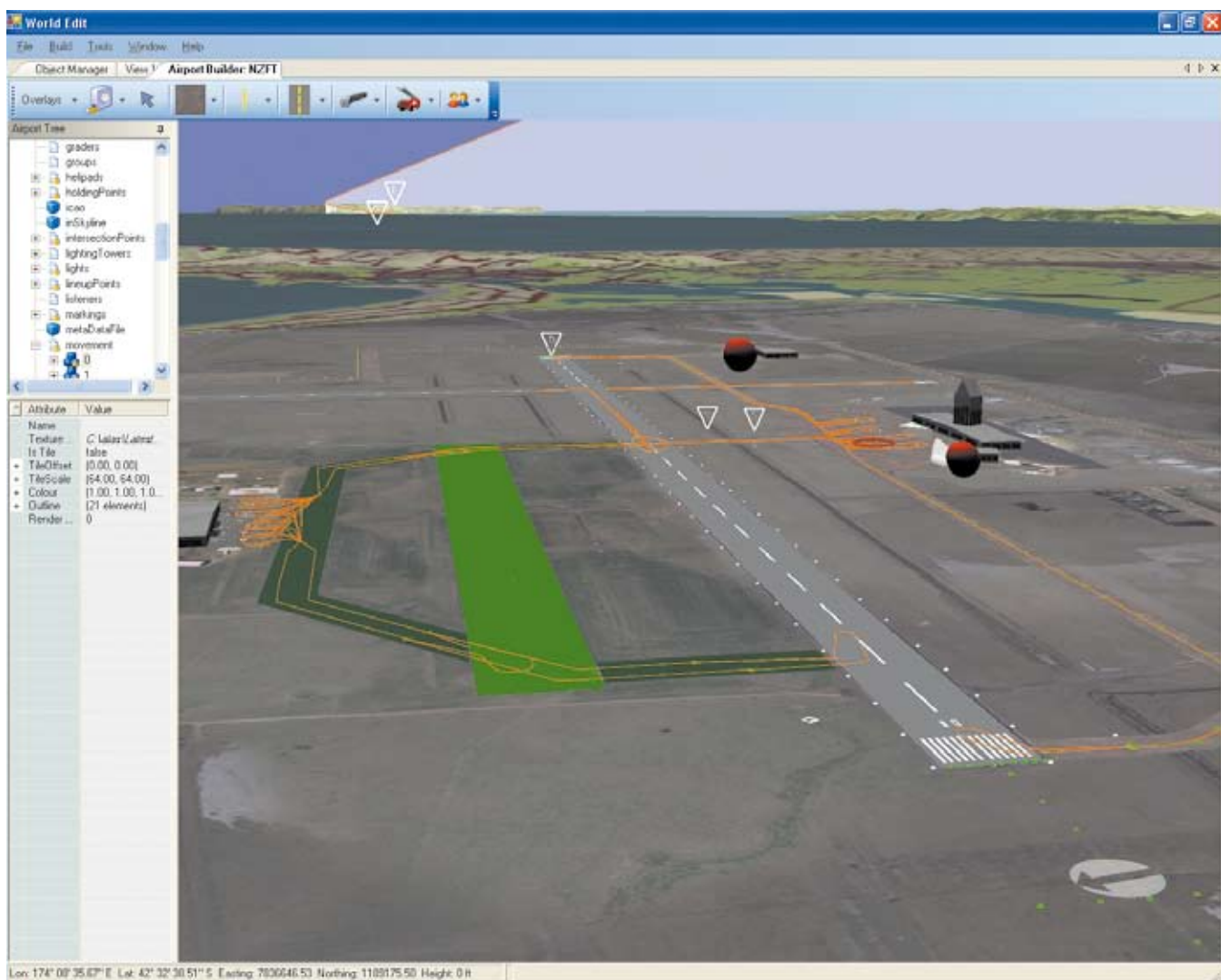
Multiple weather cells can be attached to specific locations. Multiple stacked weather cells above an airfield allows the definition of multiple cloud layers of varying types and wind shear. Individual weather cells can be placed around wind socks and weather stations to model local specific conditions, while a large nationwide cell can be used to define predominant weather conditions for the current world.

As a “physical” object with a geographic position, weather cells can move as required during the exercise allowing the simulation of frontal weather patterns.

Total Control™ includes the following cloud types.

- ✈ **Cirrus**
- ✈ **Cirrocumulus**
- ✈ **Cirrostratus**
- ✈ **Altostratus**
- ✈ **Altostratus**
- ✈ **Nimbostratus**
- ✈ **Stratocumulus**
- ✈ **Stratus**
- ✈ **Cumulus**
- ✈ **Towering Cumulus**
- ✈ **Cumulonimbus**





AirportBuilder

AirportBuilder is the tool used to create and maintain airports in any existing world.

It allows creation of detailed:

- ✈ **Aerodromes**
- ✈ **Buildings**
- ✈ **Runways**
- ✈ **Aircraft stands**
- ✈ **Vehicles**
- ✈ **Ground paths**
- ✈ **Lights**
- ✈ **Movement areas**
- ✈ **Airfield markings**
- ✈ **Other airport-related objects**

ModelBuilder

ModelBuilder is a tool for entering information necessary to render and control models within Total Control™. The actual 3D models are created using industry standard methods and software packages in common use.

Modelling tools for creating new aircraft are available through established software resellers. All models are built using the following industry standard software:

- 3D Studio Max (.3ds format)
- Adobe Photoshop (Liveries use TIFF format)

ModelBuilder allows the standard models to be linked into and manipulated by Total Control™ so that it can control the model's components.

An Aircraft has components such as the livery, wheels, flaps, propellers and lights. Other items may also be used.

A single model can be used to create many versions of the same model. For example, a B737 generic model can be used to create a fleet of aircraft for many airlines.



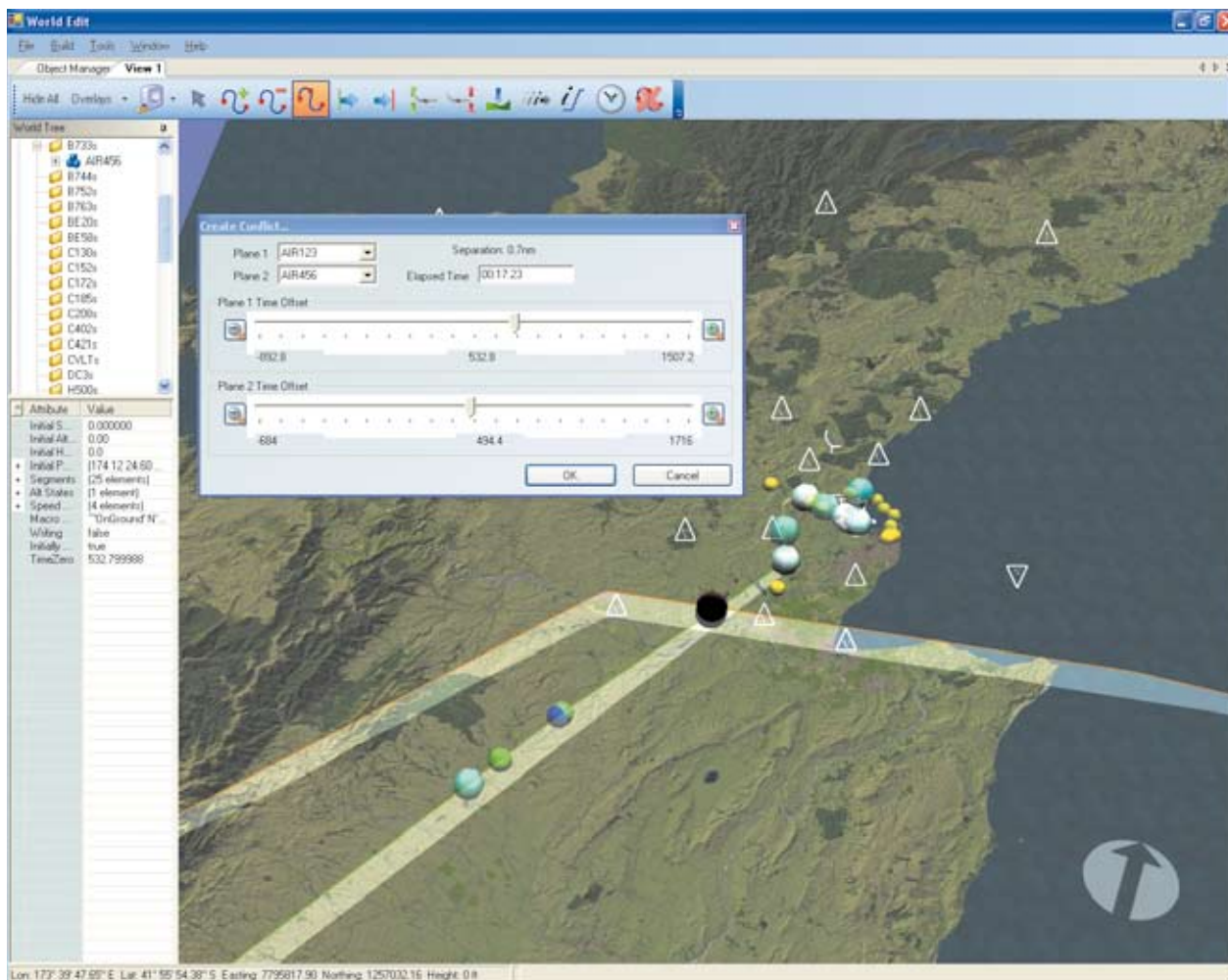
ExerciseBuilder

ExerciseBuilder is the tool used to create exercises. Exercises are the template of the intended default actions of all objects during a training session against time. Time can be based on fixed time of day or based on the time from the start of an exercise.

Exercises are based on planned flight plans or ground movement plans. Any moveable object can have a timed plan of action. Any moveable object can have its paths or plans modified at any point prior to or during an exercise.

Exercises are saved to files in XML format and are loaded at the start of a simulation. They can be used in any simulated environment; in a 3D tower cab or Computer Based Training lesson. The time it takes to build an exercise is dependent on the complexity of the exercise. Typical exercises built by instructors for training new students have taken between five and ten minutes to build.

A conflict tool is included to ensure that conflicts can be easily created in the flight paths or ground paths of an exercise.



Total Control™ Solutions

Total Control™ is currently available in the two following formats.

The Base Training Solution

This comprises a generic trainer in a fictitious world used for the training of new Air Traffic Control students. The base package includes software for:

- Two 180 degree towers (or one 360 degree tower) with Radar
- Six simulator pilot positions
- Two instructor positions.
- Communications Server.
- World Server.
- Five Computer Based Training positions (3D Tower view, Simpilot, Communications panel).

The Real World Training Solution

This solution is designed as a complete training tool for both new and experienced Air Traffic Controllers. It comes with everything in the base solution plus:

- Real geographic world of the country it is installed in.
- Photo realistic Control Tower or Towers.
- Emulation of Tower Communication Panels.
- Emulation of in country radar solution.



→ **Winner 2006**

ComputerWorld Magazine Excellence in the Use of IT in Education

→ **Winner 2006**

ComputerWorld Magazine Innovative Use of Technology

→ **Winner 2006**

ComputerWorld Magazine Overall Excellence in the Use of IT

For more information about Total Control™:

Airways International Limited
Airways House
44-48 Willis St
PO Box 294
Wellington
New Zealand
Tel: +64 4 471 4752
Mob: +64 4 471 4712
Email: international@airways.co.nz
Web: www.airways.co.nz

COMMERCIAL IN CONFIDENCE

This document is the property of Airways Corporation of New Zealand Limited and must not be disclosed to anyone other than staff of Airways International Limited, Airways Corporation of New Zealand Limited and others authorised to receive it.

Copyright © 2004 – 2005 Airways Corporation of New Zealand Limited. All rights reserved.