



Accelerating
the future
of aerospace



NARSIM

One simulator for ATC Radar and Tower simulations





One simulator for ATC tower and radar simulations

The air traffic control environment requires frequent updates and modifications in order to comply with the newest regulations, address capacity and operational issues or improve the operational performance. Requirements for the new or modified procedures and systems can be tested and validated with a real time ATC simulator. This minimizes the risk during the implementation and increases the predictability of the actual operational performance.

NARSIM is a real-time, human in the loop (HITL) Air Traffic Control (ATC) simulator capable of simulating the full working environment and working conditions of air traffic controllers in detail. As such, it provides a platform for training, validation and conducting research in a controlled environment on all aspects of air traffic control and the air traffic controller. These facilities are used for research and development of new user-interfaces, user-interaction, ATC system support, new and revised concepts of operation and development & assessment of ATC training and its effectiveness.

The experimentation facilities at NLR are equipped with realistic Air Traffic Controller Working Positions (CWP), simulator (pseudo) pilot and supervision positions and support more than 50 actors to participate simultaneously in one large simulation spanning multiple centres. On the other side of the spectrum, NARSIM's scalability also allows for small-scale prototyping with one working position for detailed analysis and interaction.

NARSIM is developed in-house by NLR and therefore has a high degree in configurability, flexibility, interoperability and adaptability. NARSIM simulates air traffic control platforms of all major manufacturers (also concurrently in one simulation). Connections to a range of external systems, such as flight simulators, are also supported.



NARSIM

Research, training, concept validation

NARSIM is NLR's Air Traffic Management Real-time Simulator. It is a high fidelity human-in-the-loop simulator that is used by research centres, ANSPs and universities. The NARSIM software can be used in both Radar, Tower and Remote Tower simulators. The main application areas of NARSIM comprise:

- Concept development and validation
- Prototyping of new ATC systems
- Training

The in-house developed NARSIM simulator makes use of highly realistic aircraft performance models, validated by numerous ANSPs. NARSIM Tower, Radar and Remote Tower have a proven track record and have been used as validation platform in European ATM research (SESAR).

NARSIM COMPONENTS:

NARSIM radar

An environment with 50+ radar controller working positions.

NARSIM tower

A 360° projection system with 9 tower controller working positions.

NARSIM remote tower

A research set-up for remote tower concepts with 2 controller working positions.



NARSIM Tower

Real-time ATC simulator for training and research into HMI aspects, tools and concepts of tower air traffic controllers

NARSIM Tower can be configured from a single screen setup to a 360 degree tower setup using a projection system. The type and number of working positions is fully flexible and can be reconfigured at any time.

The tower simulator can simulate realistic weather conditions, such as bad visibility, snow and rain and also supports day and night view. Also Electronic Flight Strips are

available. NARSIM Tower has a proven track record and has been used as validation platform in European ATM research (SESAR) by research centres and ANSPs. The pseudo pilot positions are uniform for NARSIM Radar and Tower and can be used for both simulators.

CAPABILITIES

- Validation of (Advanced) Surface Movement Guidance and Control Systems (A-SMGCS)
- Validation of Human Machine Interfaces for controller working positions
- Studies of airport capacity, safety and efficiency under dense traffic and marginal visibility
- Testing and optimisation of future tower procedures and airport infrastructures, including legislation and safety assessment
- Development and validation of ATM automation tools, including data link applications, by Collaborative Decision Making (CDM) and Gate-to-Gate operations;
- Remote Tower operations, including video surveillance support



NARSIM Radar

Real-time ATC simulator for training and research into HMI aspects, tools and concepts of Radar air traffic controllers

NARSIM Radar can be configured to the desired number of working positions. Each working position can act as a tactical, planner or feeder position for either controlling en-route, area or approach (terminal area) traffic.

An integrated radio/telephony systems allows the controller to contact pilots, other controllers or neighbouring sectors or centres. A separate pseudo pilot area allow pseudo pilots to control the aircraft.

CAPABILITIES

- Research into Human Machine Interfaces (HMI)
- Air traffic controller assistance tools
- Development, visualisation and validation of ATM concepts and procedures
- Support of qualitative and quantitative safety assessment
- Applications of data link and Air Ground integration in general
- Shadow mode validations in an operational environment
- ATC courses and controller training
- Demonstrations
- Prototyping



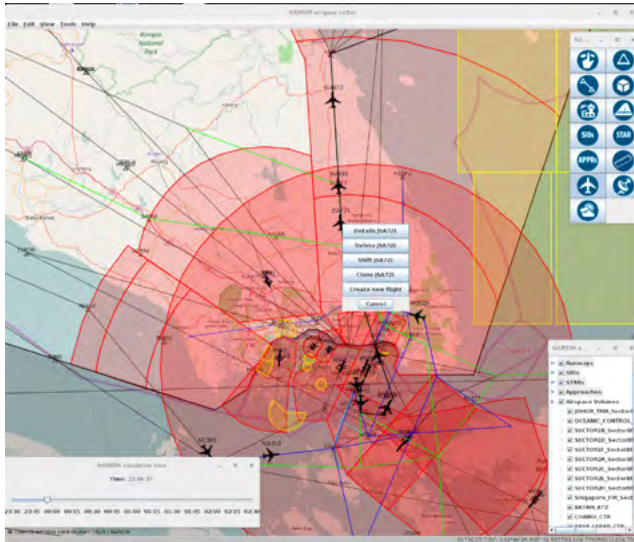
NARSIM Remote Tower

Real-time ATC simulator for training and research into HMI aspects, tools and concepts of tower air traffic controllers

NARSIM Remote Tower can be configured using any desired number of HD or 4K screens or projections system. Multiple Remote Tower is supported and can be configured to be shown vertically or horizontally using a curtain slider. The system includes a Pan Tilt Zoom camera function. This facility can be used both for research as well as for training purposes.

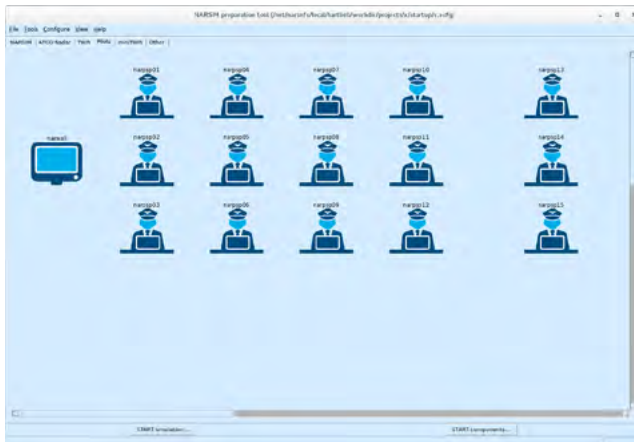
CAPABILITIES

- Validation of Multiple Remote Tower concepts
- Prototyping of Remote Tower systems
- Planning tools for Multiple Remote Tower operations



SOFTWARE

NARSIM is a software product that utilises commercial off-the-shelf hardware and consumer-grade hardware. The NARSIM software is scalable and can operate in a network comprising multiple desktop computers for large-scale simulations, as well as on a laptop for demonstration purposes. It interfaces with most simulator and industrial systems, enabling the integration of third-party systems, such as operational ATC systems, other simulators, CNS components, and even live aircraft.



CONCEPT DEVELOPMENT AND VALIDATION

NARSIM enables visualisation of new conceptual ideas at a very early stage. Ideas can be quickly evaluated towards operational feasibility and they can be communicated to users and stakeholders in a clear and unambiguous way. Early involvement of the user is generally accepted as the single most important factor for a successful introduction of new or changed ATC system or concept.

TRAINING

NARSIM simulates a realistic environment for the Controller and is used in the development of training as well as in providing of training itself. Training in NARSIM has been provided ranging from recurrency training of an operational Electronic Flight Strip System to large scale (50+ actors involved) collaborative decision making training for winter operations. Record and play-back is just one of the training features of NARSIM.



PROTOTYPING

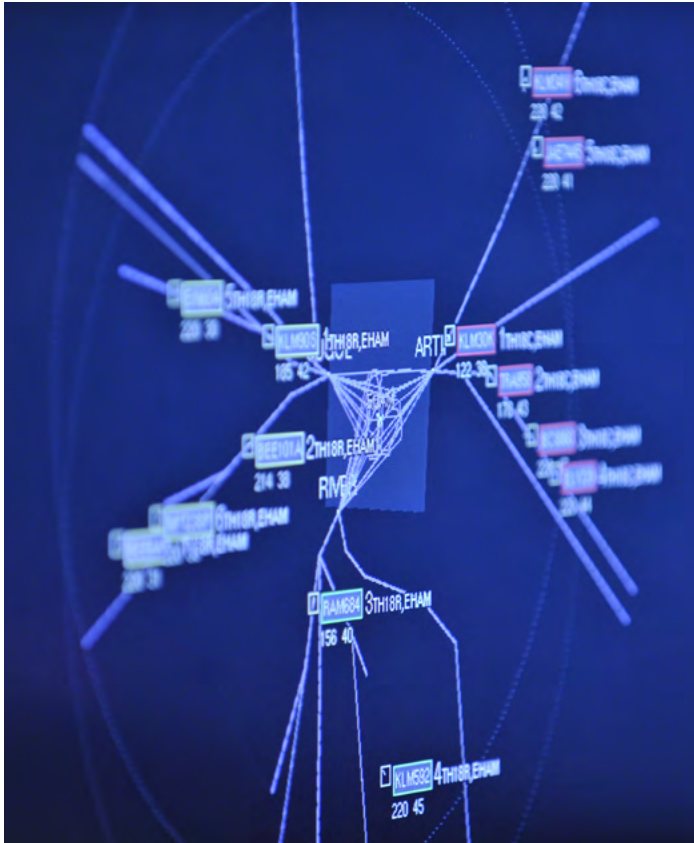
NARSIM is highly configurable and well suited for applications where the human aspect plays an essential role, such as development of the Human Machine Interface (HMI).

Rapid prototyping allows for fast experimental or pre-operational evaluation of new HMI specifications.

VISUAL SYSTEM – NARSIM TOWER

The visual system of the NARSIM Tower facility consists of a 360° projection screen with a diameter of 11 meters and a height of 4.5m. The projection system has a high resolution, luminance and contrast ratio. A variety of meteorological phenomena such as rain, snow, fog and clouds can be simulated in different seasons and under daylight and night-time conditions. Detailed databases of many European airports are available and can be imported or even created in-house.

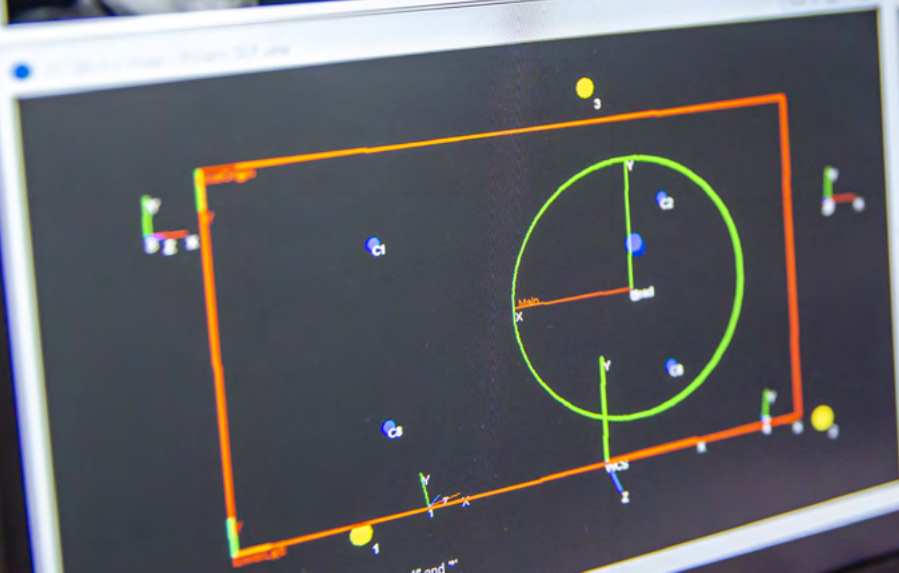




SOFTWARE - NARSIM RADAR

Radar software is designed around advanced object-based client/server architecture and is inherently scalable. Its modular design allows running the entire simulation distributed among several independent platforms on a local network or internet in fast-time or real-time. It supports logging and playback on several levels (network messaging, operational parameters, events, audio and video). Multiple instances of the same module can be easily monitored, started, restarted, or relocated whilst running the simulation.

File Edit View Windows Help
gain focus verify define logfile log merge + save + work
Automatically Work
Settings Window Help



Ctrl - Left Mouse Button or NumPad
Left Mouse Button - Shift + Left Mouse Button or ' and ~
Right Mouse Button - Button of Arrow Keys

Dell

HUMAN FACTORS

Human Factors assessment for Air Traffic Control is important when new concepts, systems, devices and technologies are introduced.

Introduction of significant operational changes, such as remote tower operations, requires ATCos to be able to handle these changes. In order to ensure that ATCos will indeed be able to operate efficiently, in a safe manner and in a comfortable way many questions need to be answered.

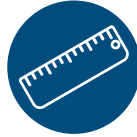
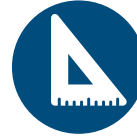
Human Factors research can contribute to answering such questions. To name a few:

- Do ATCos have the same situational awareness as in the conventional tower?
- Do ATCos have an accurate out-of-the-window view in the remote tower?
- Do ATCos become confused by the “artificial” way of offering information?
- Does the new operational environment lead to more fatigue?
- Do ATCos experience more workload?
- Will the likelihood that ATCos make a human error change?

narsim.org



APPRs



SIDs

STAR



NARSIM features

HIGH RELIABILITY

- NARSIM has over 30 years of experience
- High fidelity
- Based on COTS hardware

HIGHLY REALISTIC

- Used for training of operational Air Traffic Controllers
- Highly realistic BADA based aircraft performance model

INTEROPERABILITY

- Ability to integrate third party systems whilst maintaining scalability and performance
- Ability to integrate Radar simulator with Tower simulator
- Adherence to industrial interoperability standards

FLEXIBILITY & MODULARITY

- Short lead-times for changes/modifications
- Fully customisable displays
- Ability to simulate future

airport operations and controller working positions

- Everything is customisable; from the controller HMI to the arrival management concept
- Developed fully in-house with a focus on modularity and configuration
- Flexibility and modularity due to its open architecture;

SCALABILITY

- From large scale validation trials to mobile small scale (even laptop based) prototyping and visualisation

BUILT FOR THE FUTURE

- AR/VR implementations
- Head and eye tracking

SCENARIO PREPARATION TOOL

- Set-up your airport, airspace and traffic scenario within an hour
- Stand-alone tool, works on any laptop or computer

- Automatic AIP read-in for defining waypoints and sectors
- Easy to use HMI
- Increase/decrease traffic density
- Preview of sector loads and runway loads presented in clear graphs

DATA POST-PROCESSING

- Generate Google Earth images including indication of instructions
- Determine taxi-times
- Analyse R/T load and sector load
- Analyse number of aircraft in area
- Analyse controller workload using standard questionnaires

PREPAIR

- PREPARation tool for AIRspace and Traffic (PREPAIR)
- Set-up your airport, airspace and traffic scenario within an hour
- Etc.





About NLR

Royal Netherlands Aerospace Centre



POLICY SUPPORT



INDUSTRIAL
DEVELOPMENT



APPLIED RESEARCH

NLR is a leading international research centre for aerospace. Its mission is to make air transport safer, more efficient, more effective and more sustainable. Bolstered by its multidisciplinary expertise and unrivalled research facilities, NLR provides innovative and comprehensive solutions to the complex challenges of the aerospace sector.

NLR's activities span the full spectrum of Research, Development, Testing & Evaluation (RDT & E). Given NLR's specialist knowledge and state-of-the-art facilities, companies turn to NLR for validation, verification, qualification, simulation and evaluation. They also turn to NLR because of its deep engagement with the challenges facing our clients. In this way, NLR bridges the gap between research and practical applications, while working for both government and industry at home and abroad.

Royal NLR stands for practical and innovative solutions, technical expertise and a long-term design vision, regarding their fixed wing aircraft, helicopter, drones and space exploration projects. This allows NLR's cutting-edge technology to also find its way into successful aerospace programmes of OEMs like Airbus, Boeing and Embraer.

NLR in brief



AMSTERDAM,
MARKNESSE,
ROTTERDAM,
BRUSSELS



1000+
STAFF

144M
TURNOVER



78% DUTCH,
17% EU & 5%
WORLDWIDE



SINCE
1919



**FOR INDUSTRY,
GOVERNMENT, CIVIL,
DEFENCE AND SPACE**



**GLOBAL PLAYER
WITH DUTCH ROOTS
ACTIVE IN 24 COUNTRIES**

**VERY HIGH
CUSTOMER
SATISFACTION**





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E1484-07 - April 2026