CSim – Combined Radar and Tower Simulator

CSim is a combined radar and tower simulator that supports an integrated and realistic training environment for en-route, approach, and tower controllers for civil and military operations.

BENEFITS

- Training facility that could be used as redundant contingency system, test and development system
- Low-cost and high-quality facility with functions and HMI identical to those of the main system
- Exclusion of pseudo pilot, resources optimisation with AI pilot

CSIM CONTAINS:

- Simulator segment,
- Visualization segment,
- Operational segment,
- Voice communication segment and
- Recording and playback segment.

SIMULATOR

This segment generates inputs to other segments. It handles navigational commands to generate realistic movements based on characteristics (performance parameters) for each aircraft type and vehicle which are following procedures such as SID, STAR, landing, holding, missed approach, push-back, taxing, line-up, take-off, as well as military procedures at airbases. Main functions are:

- surveillance data simulation
- aircraft and vehicle movement simulation including pitch, roll and yaw movements
- flight plan and 4D trajectory data provision
- meteorological data creation from scenarios with the possibility of online modification, used for production of ATIS/METAR/AWOS messages and visualization
- support for pre-departure clearance via data link
- support for datalink to aircraft via CPDLC application
- support for automatic and manual routing of aircraft and vehicles on the ground
- automatic and manual handling of aircraft attributes such as lights, engines and landing gear
- automatic and manual navigation of aircraft
- simulation of collisions on runways and taxiways
- handling of push-back, follow-me and helicopters
- user-friendly HMI for the creation of exercises including meteorological scenarios
- tuning the timing of aircraft during an exercise using an air situation window and relocating an aircraft at any time to create desired traffic situations
- quick exercise creation
- multiple airport scenarios.

Aircraft and vehicles can either be automatically simulated or navigated by a pseudo-pilot. Individual procedures may be combined to form automatic pseudo-pilot manoeuvres such as turn to a direction or a point, intercept line, accelerate/decelerate, climb/descend, restrictions in speed, level or runway assignment.

VISUALISATION

This segment creates the "out-of-the-window" view. Its primary characteristic is detailed visualisation of:

- airport, aircraft, and vehicle models
- meteorological scenarios (fog, rain, snow, sandstorms, in various wind directions and speeds)
- cloud type, coverage, movement direction and speed
- ground conditions based on seasonal characteristics of the airport model including levels of snow and water,
- time of the day, position of the sun, the moon, and corresponding shadows
- runway, taxiway, and general lights controlled by tower
- emergency exercises including explosion, smoke, and fire
- cockpit view.

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The visualisation segment is scalable from 180 degrees to solutions simulating 360-degree towers. Projectors, curved or flat screens, consoles etc., are selected to match the customer's budget and need for realistic environment.

OPERATIONAL SEGMENT

CSim comprises operational segments on different functional levels in order to provide realistic training for ATM environments with various functional capabilities:

- training of tower controllers with/without radar and advanced surface movement guidance control system
- training of approach controllers in conjunction with the tower controllers
- training within a setup that emulates an operational centre including en-route, approach, tower and associated ATM functionality (like MONA, MTCD, STCA, MSAW, APW, APM, AMAN, DMAN etc.)
- gate-to-gate training environment including two or more visualisation segments for different airports within the same airspace.

Various changes in ATC infrastructure (FIR or airport) or procedures may be incorporated in operational environment for evaluation and experimentation.
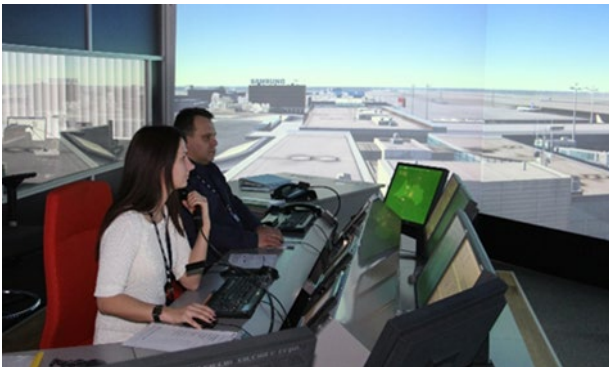
VOICE COMMUNICATION SEGMENT

The simulator is equipped with integrated voice communication facilities. Trainee and pseudo-pilot have access to radio frequencies and direct lines either from a separate touch input display or on monitors.

A functional asset to the simulator is the AI pilot. **Voice recognition and response system** can understand given commands, respond appropriately, and execute requested command with no pseudo-pilot action required.

RECORDING, PLAYBACK AND STATISTICS

An exercise can be executed with recording of trainee monitors, voice exchange on frequencies and direct lines, the presentation of the visualisation segment and significant events related to trainee performance. At playback, the monitor presentation, voice exchange and visualisation presentation are replayed synchronously.

Statistics are conveniently provided for any key performance indicators analysis.

ADAPTATION

CSim uses system parameters for adaptation and tuning to its environment. This includes surveillance sensors, airports and airspace structures, procedures, timing and controller tools as well as the behaviour of aircraft and vehicles. This approach enables the creation and maintenance of several completely different ATM environments/airspaces. Parts of the airport and airspace definitions can be created automatically from AIXM data.

CSim allows the simultaneous running of exercises in separate sessions, e.g. radar training in one airspace and tower/approach training in another.

ADDITIONAL SUPPORT SYSTEM

CSim can be equipped with the following additional simulated system functions:

- ASMGCS - advanced surface movement guidance control system
- speech recognition and response system for AI pilot
- airfield lighting control on touch input display
- ILS/VOR/DME remote control
- meteorological display / visual display unit
- light signalling gun
- crash button, etc.

Military aircraft and realistic local military procedures, including formation flights at takeoffs and in air