

SiATM TSim

”3-D Tower Simulator System”

TSim is a 3-D Tower simulator that provides an integrated and realistic training environment for aerodrome and approach controllers. It features four main elements:

- the simulator element;
- the visualization element;
- the operational element; and
- the voice communication element.



Simulator element

The simulator element drives the exercise and generates the input to the visualization and the operational elements. The main simulator functions are the:

- Production of surveillance data in various forms (PSR/SSR/MSSR, MLAT, ADS-B/ADS-C, SMR)
- Production of aircraft and vehicle data for visualization which includes not only the position but also realistic pitch, roll and yaw movements;
- Production of flight plan data;
- Processing of meteorological data by means of predefined meteorological scenarios with the possibility of online modification. It is used for the presentation of:
 - weather situations in the visualization element;
 - the production of ATIS/METAR/AWOS-messages;
 - and the presentation on meteorological displays.
- Provision of support for pre-departure clearance via data link;
- Provision of support for automatic and manual routing of aircraft and vehicles on the ground;
- Automatic and manual handling of aircraft attributes such as lights (landing, taxi cabin, navigation lights), engines and landing gear;
- Manual and automatic navigation of aircraft on the ground. The automatic navigation is supported by a collision avoidance function based on the concept of safety bubbles.
- Collision simulation on runways and taxiways;
- Handling of:-
 - Push-back and towing aircraft;
 - Follow-me cars;
 - Helicopters.
- User-friendly HMI for the creation of exercises including meteorological scenarios;
- Ability to manipulate the timing of aircraft during an exercise using an air situation window and relocate aircraft at any time to create the desired situation;
- Quick exercise creation option for random selection of flights to simulate;
- Multiple airport scenarios.

The simulator element generates movements based on realistic manoeuvring characteristics for each aircraft type and vehicle. It handles a full set of navigational commands to support movements and route handling on the ground and in the air. These commands take into account automatic procedures such as SIDs; STARs; landing; holding and missed approaches; and on the ground, push-back; taxi to gate; taxi to holding point; line-up; and take-off etc.

Individual procedures may be combined to form intuitive or automatic pseudo-pilot manoeuvres. Typically these manoeuvres include, but are not limited to: turn to a direction or a point; to an intercept line; to accelerate/decelerate or climb/descend. Others include restrictions in speed and/or level or runway assignment.

Aircraft and vehicles can either be automatically simulated or navigated by a pseudo-pilot. Much effort has been spent on making the pseudo-pilots HMI intuitive and easy to operate.

Visualization element

The visualization element creates the “Out-Of-The-Window” view for the Aerodrome Controller based upon the data provided from the simulator element. Its primary characteristics are:

- It is based upon Presagis’ Vega Prime version 2.2.1
- It produces highly detailed airport, aircraft and vehicle models.
- It provides realistic weather scenarios, e.g. fog, rain, snow, in various wind directions and speeds driven by the simulation element and coordinated with other presented meteorological data.
- It has the ability to control cloud types, the amount of coverage, their direction of movement and speed;
- It illustrates different ground conditions based upon the seasonal characteristics of the airport model including levels of snow and water.
- It recreates the time of the day, to control the position of the sun, the moon and corresponding shadows.
- It has the ability to show realistic runway, taxiway and general lights on the aerodrome which are controlled from the tower/ground controller positions;
- It can create special effects such as explosions, smoke, and/or fire to support emergency exercises with accident scenarios.
- It can provide a cockpit view.

There is no limitation on the number of video channels the visualization system can support. It can be scaled down to smaller-sized TSim trainers with only 180-degree visualization or up to larger solutions simulating multiple 360-degree towers. Monitors/projectors, curved or flat screens, consoles etc are chosen individually for each customer to create the required environment.

Additional support system

TSim can also be equipped with the following additional simulated system functions:

- SMGCS or A-SMGCS
- Airfield lighting control
- ILS/VOR/DME remote control
- Meteorological display / Visual Display Unit
- Light signaling gun
- Crash button S

Operational element

- Si ATM provides operational elements on different functional levels in order to realistically provide training for airports with a variety of functional capabilities for:
- Training of aerodrome controllers (non-radar, SMGCS and A-SMGCS);
- Basic radar training for approach controllers in conjunction with the tower/ground controllers;
- Training in an environment that emulates an operational center including en-route sectors and associated functionality. The advanced functionality is inherited from Si ATM’s operational systems and has been well proven in operations. This level includes STCA, MTCO, MSAW, APW, and MONA, which have been developed through Eurocontrol specifications;
- A fully automated CNS/ATM environment for training;

The operational element could also consist of equipment provided by the customer or equipment supplied by other vendors. In this situation, Si ATMSim connects to the physical interfaces of that equipment to simulate its environment. This solution ensures that the operational element used is adaptable for the simulation, especially when it applies to the simulation of time.

Voice communication element

The simulator is equipped with integrated voice communication facilities that automatically adapt to the exercises being run. Each trainee and pseudo-pilot has access to radio frequencies and direct lines within the exercise. The HMI can either be controlled from a separate touch input display or be integrated into the controller and pseudo-pilots monitors.

Recording and playback

For each exercise, the system provides individual data and voice recording, which can be synchronously replayed.

Support

Should the user so require, Si ATM is prepared to support the user in all requirements.

Adaptation

The simulator relies on adaptation data for tuning its environment. This includes airport and airspace structures as well as the behavior of aircraft and vehicles. This approach makes the system behavior controllable by the user without changes to the software and without involving Si ATM.



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