

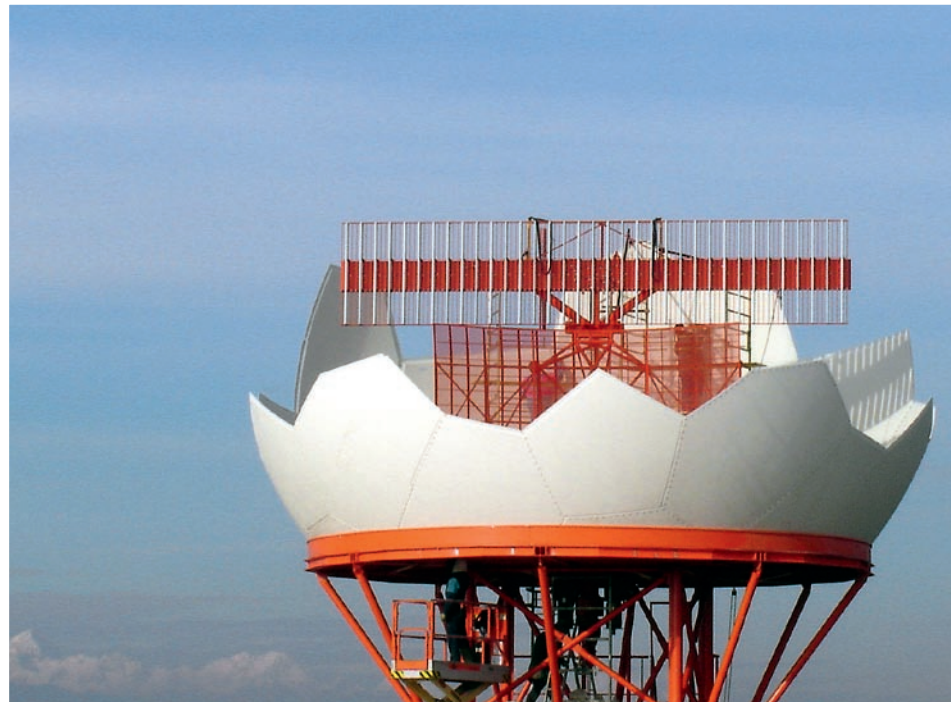
# New Terminal Radar at Jože Pučnik Airport

Rado Križ

The public company Slovenia Control, Slovenian Air Navigation Services Ltd. provides safe and effective air navigation services in Slovenian airspace. Air navigation services include air traffic management, air traffic control, publications, and collection of relevant information and technical maintenance of communication, surveillance and navigational equipment. Slovenia Control provides control of traffic arriving, departing and en-route in Slovenian airspace from the Area Control Centre in Ljubljana and Aerodrome Control Towers in Brnik, Portorož and Maribor.



Rado Križ,  
Head of the  
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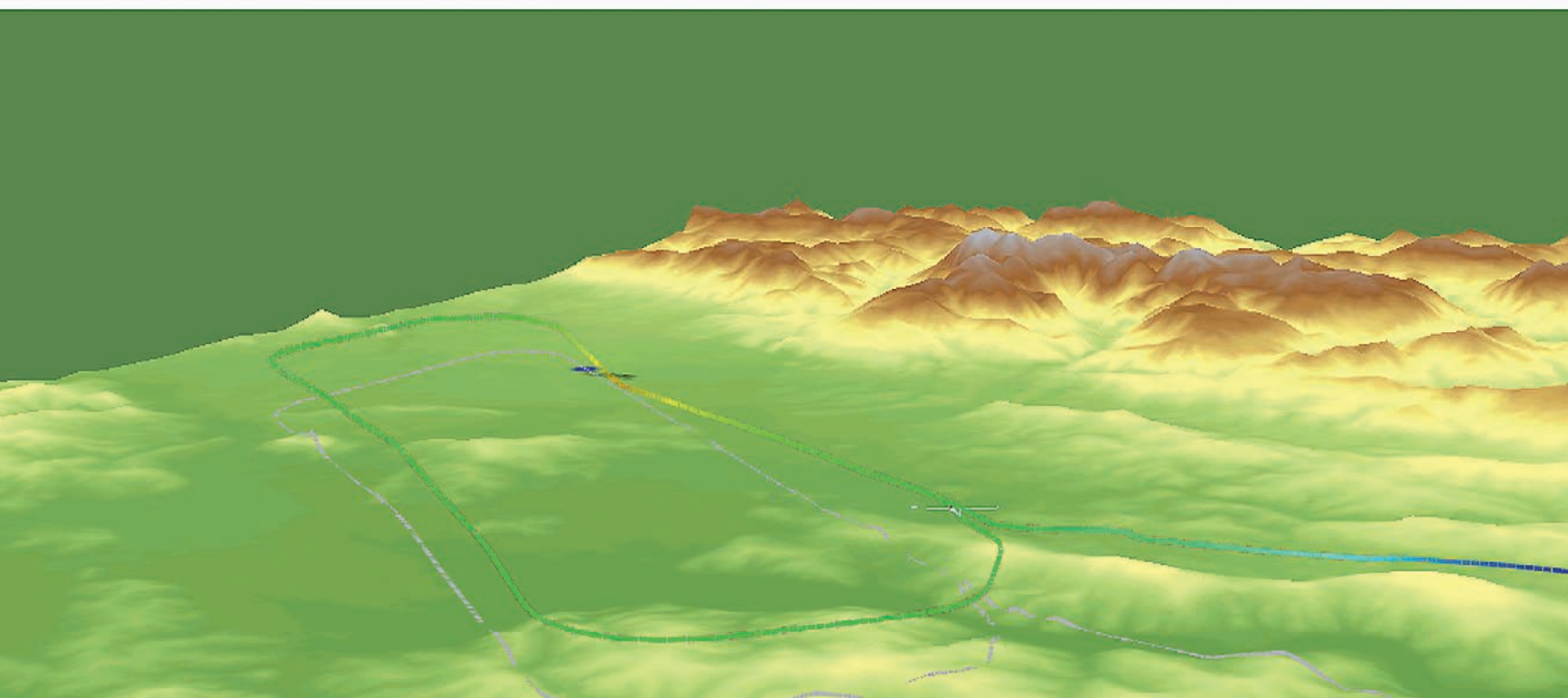
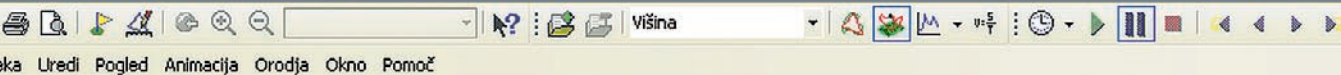


A radome protects two antennae of PSR and MODE-S radar at Jože Pučnik Airport.

To be able to successfully manage increasing number of overflights, and flights originating or arriving at Jože

Radar coverage diagrams

u - [FOX25-ILSAPP.IGC (Animacija)]



## Franc Željko Županic, MSc, director

Airline passengers, when flying to or from Slovenia, normally don't know much about what is happening around them in the air or who is taking care of their safety and the smooth operation of their flight. This is taken care of behind the scenes by a highly professional organization that provides air navigation services to all users of Slovene airspace. Slovenia Control provides safe, high-quality and cost-effective services to arriving, departing and transit traffic. This is done from the Area Control Centre in Ljubljana and aerodrome control towers at the airports of Ljubljana, Portorož, Maribor and Cerklje ob Krki.

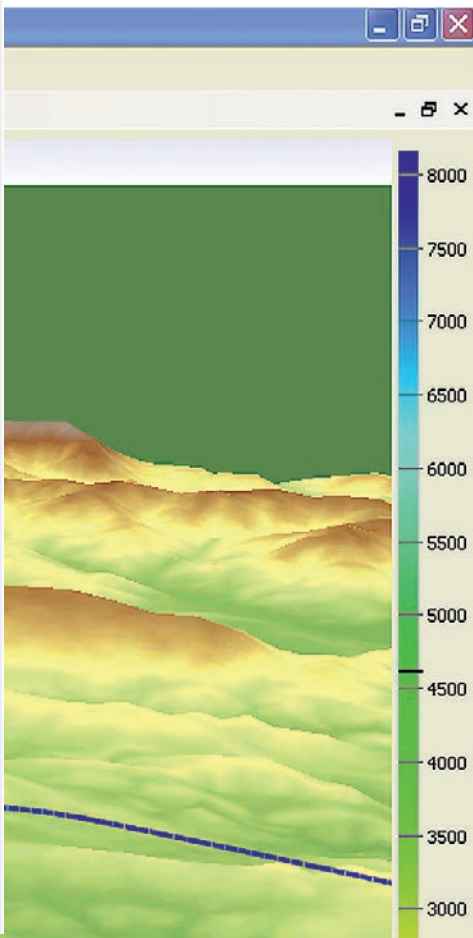
With expected annual traffic growth of over 15%, maintaining and improving the required performance is not an easy task. This can be achieved only through highly skilled and motivated personnel, and with continuous upgrades and modernization of technical equipment.

We are also highly involved in the implementation of Single European Sky regulations, which should enable further major improvements in safety, efficiency and capacity of air traffic by 2020. Technology is very important and this is why we are also participating in SESAR – the European air traffic control infrastructure modernisation programme. SESAR aims to develop the new generation of air traffic management system capable of ensuring the safety and capacity of air transport worldwide over the next 30 years.

One of the most important fields of air navigation technologies is surveillance. We are proud to introduce the most comprehensive surveillance technology, MODE-S radar, implemented recently at Jože Pučnik - Ljubljana Airport. This will make it possible for our air traffic controllers to get more detailed and reliable information about air traffic over Slovenia and will put us firmly on track towards the Single European Sky.



**MSc Franc Željko Županic, Director:**

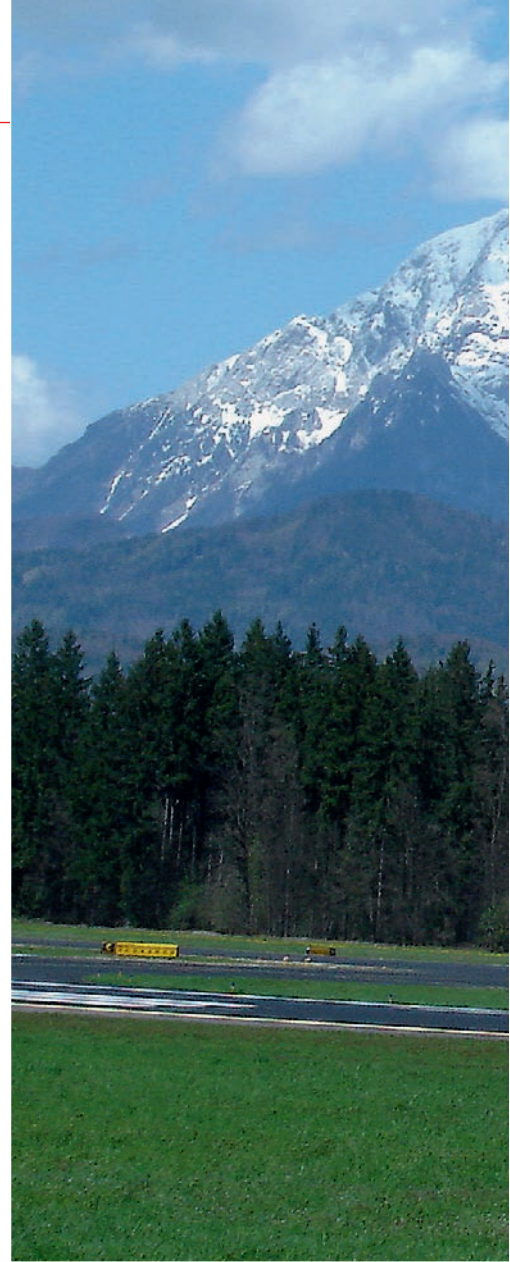
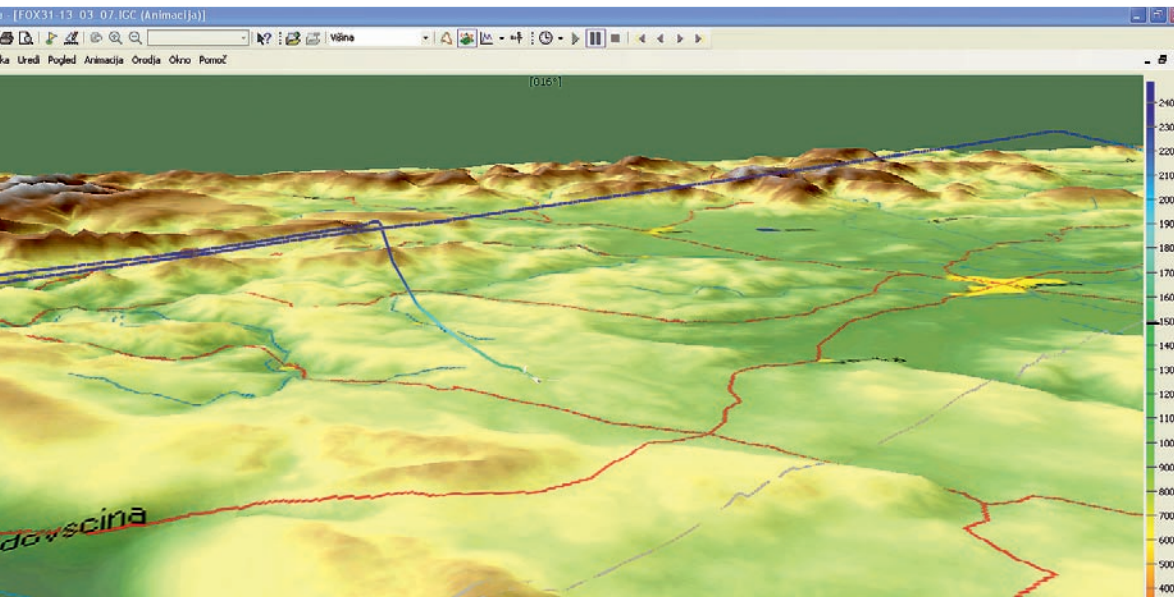


Pučnik Airport, while maintaining a high level of safety, the company must continually introduce new technical solutions, procure new equipment, and educate technical and other operational users. And this is exactly what Slovenia Control does. It is committed to providing the best service possible to pilots and indirectly to every passenger who uses Jože Pučnik Airport, or crosses Slovenian airspace.

Being dedicated to maintaining at least the same level of safety while air traffic increases by roughly 13% per year and is projected to more than double by 2025, Slovenia Control decided to procure a new PSR/MODE-S (Primary Surveillance Radar) terminal radar. The new terminal radar was delivered and installed in November 2007 at Jože Pučnik Airport. The main reason for procuring additional radar was in fulfilling the Eurocontrol requirement to provide duplicate radar coverage for arriving and departing traffic, and also the wish to be among the first to start

introducing new, advanced technologies. Duplicated coverage means that radar data is available from two independent sources. In case one of the radar systems fails, air traffic controllers would still be able to issue directions and vectors to the aircraft using data from the other radar.

As far as new technologies are concerned, with this new terminal radar, air traffic controllers have received a whole new range of data to work with. When radar was first introduced during World War II it was able to detect aircraft and only give their 2D position – range and azimuth, and later on it was enhanced with added IFF (Identification Friend or Foe) capability. During the Cold War era, radar technology improved dramatically. As a result of that, by the 1970s, radar systems were available that were capable of detecting aircraft and giving their range, azimuth, speed, altitude and IFF/SSR (Identification Friend or Foe/Secondary Surveillance radar) data.



Since the 1980s, radar systems have improved in accuracy and reliability, yet have still been limited to the same amount of derived data as their predecessors. A significant breakthrough came with the introduction of MODE-S radar systems. MODE-S stands for Mode Selective, and brings us selective interrogation capability. This means that we can now selectively interrogate each properly equipped aircraft and download a pre-set number of aircraft transponder parameters. These parameters can be:



**Matej Eljon, MSc, head of CNS/ATM**

With deployment of the new MODE-S radar at Jože Pučnik Airport we reached a new milestone in radar surveillance technology, bringing higher-quality tracking on air traffic controller displays. Mode S technology also helps overcome the radio frequency congestion problems experienced with conventional radars in high-density airspace. It reduces the risk of confusion or misidentification due to overlapping signals and can therefore support substantially higher air traffic levels.



- Selected Altitude – the altitude that pilots set as their level-off altitude
- ROC/ROD – rate of climb/rate of descend in feet per minute tells us how fast aircraft is climbing or descending
- TAS, IAS, Mach number – True air speed, Indicated air speed, Mach number
- Next waypoint– sends the next three waypoints selected in the aircraft’s flight management system
- TCAS RA – traffic collision and avoidance system/resolution advisory will send an alert to air traffic controllers that a TCAS warning has been issued to the aircraft crew
- ModeS address – unique ICAO number
- Flight ID – call sign or registration number
- Flight status – on ground/airborne, tells us if the aircraft is flying or is on the ground
- PSR – primary surveillance radar provides position of non-cooperative targets (aircraft which do not have a transponder, or have

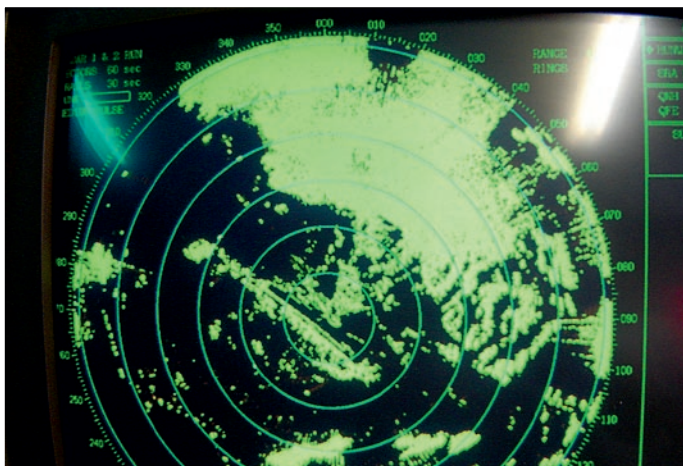
switched transponder off) and provides weather pictures which can be used to warn pilots of heavy storms in their flight path

... and much more.

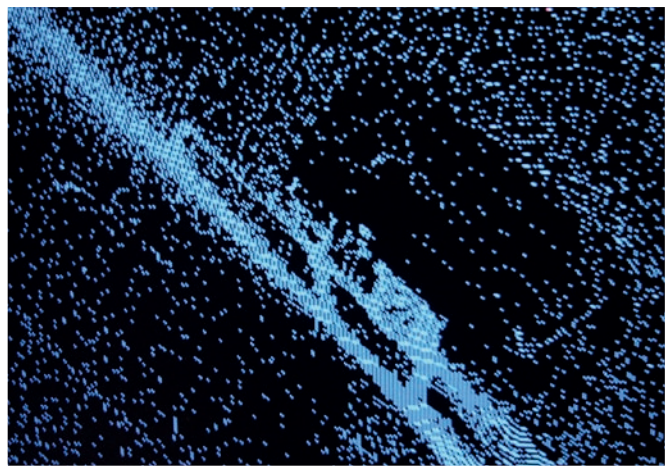
All this data is now available at the output of our new terminal radar. The radar was produced in France by Thales Air Systems; training for technical personnel was also conducted in the Thales factory in Rouen, France. All of this new technology requires a well-trained and capable technical crew which is ready to give up free time to be able to follow and adopt all of the challenges that new technology brings.

However, all this additional data would mean little if it was not implemented operationally. Therefore, we are planning to use it as part of our new Safety Nets tool and in the new Arats tracker system. The Safety Nets tool has several sub-functionalities:

- STCA (Short Term Conflict Alert),



Displays of the new PSR radar.



which offers similar functionality for the air traffic controller functionality to that offered to pilots by ACAS/TCAS. STCA issues an alarm if there is the possibility of loss of separation, and therefore indirectly prevent two aircraft coming too close together.

- MSAW (Minimum Safe Altitude Warning), which issues an alarm if an aircraft is too close to terrain.

- APM (Area Proximity Monitoring) sets off an alarm if an aircraft is about to unintentionally enter a prohibited zone, for example, a military exercise zone.

All these extra features in air traffic control are not directly visible to the passengers and yet are there to aid them to travel more safely and quickly. Being part of the air transportation

community, Slovenia Control is ever more committed to be a leader in implementing new technologies that are now available on the market. Among these developments are a new analytical tool for radar data quality assessment, the automatic dependent system (ADS-B) and multilateration system, which are all to be used in the future to additionally enhance safety at Slovenia's main airport.