



# Step by step, our

*Turkish Technic was challenged with the task of installing systems that would enable Turkish Airlines' passengers to be connected around the world. Avionics engineer **Recep Uslu** shares the process that the Istanbul-based MRO company used, to deliver the right product.*

**T**oday there are several passenger communication systems that can be installed onto modern trans-continental aircraft. These can supply Wi-Fi, GSM and live TV separately, or all together.

Well-known systems include the Panasonic global communications suite (GCS) and Row 44, which use Ku-band satellites, and GoGo, Live TV, and OnAir, which use Ka-band satellites (like ViaSat and Inmarsat's Global Xpress).

The Ku-band satellites currently used by Panasonic cover most of the world but there are still a few gaps. It is planned to increase the capacity and the coverage with the new Intelsat Epic spot beam satellites that will be launched in 2015 and 2016. A significant amount of capacity of these satellites will be dedicated for Panasonic GCS system. All GCS-equipped aircraft under the same coverage will share this capacity, so each will have the maximum available.

Currently there are Viasat Ka-band satellites that cover North America and Eutelsat Ka-band satellites, which cover Europe.

Inmarsat is planning to launch three satellites (I-5) in 2015, which will cover the world. Each will have 12Gbps capacity, which will be shared with all users (aviation and non-aviation alike).

Each I-5 satellite will have 89 spot beams but only 72 will be active at the same time. Each spot beam will have a 40-80Mbps capacity, depending on the user quantity.

Turkish Airlines selected the Panasonic GCS system on its wide-body aircraft and became the launch customer for GCS on the B777-300ER. Each aircraft provides Wi-Fi internet access to all passengers, four-channel live TV and global system for mobile communications (GSM) capability (eXPhone).

#### **Voice calls**

On the Turkish aircraft, GSM functionality enables up to seven simultaneous voice calls and short message service (SMS) operations, as well as general packet radio service (GPRS) data. Currently broadcasting TV channels are BBC, BBC Arabic, Euronews and Sport 24.

The target was to install the GCS system as line-fit for B777-300ER aircraft. Engineers from Turkish Technic's engineering directorate attended all certification tests (which were performed in Panasonic's Lake Forest facility) and water proofing tests (which were performed at the EMS Atlanta facility) and had weekly teleconferences in order to make line-fit



From left: Engineers from Turkish Technic were involved throughout the STC process; Centre: After the installation of external fittings and doublers, the adapter plate and the adapter plate skirt installed. After the application of required preventive compounds the antenna installed on the adapter plate. Right: Leaky feeder cables and data cables were installed for the GSM system through the cabin.

# technical triumph

installation possible beginning from the first aircraft.

However, it was not possible to install the GCS system as line-fit for the first 11 B777-300ER aircraft because of some certification and OEM offerability delays.

Turkish Airlines had to carry out the installation with a supplemental type certificate (STC) for these 11 aircraft. Before starting the installation STC, a prerequisite for system activation on transmitting portable electronic devices (T-PED), tests had to be done in order to make sure that system did not affect any aircraft component. All frequencies radiated by the GCS system were swiped all over the aircraft using signal generators, and aircraft systems were observed. Turkish Technic engineers coordinated with Armstrong and completed the T-PED test process successfully for both B777-300ER and A330-300 aircraft.

After completion of the T-PED test, STC installations for both B777-300ER and A330-300 aircraft were prepared by TIMCO and Delta Engineering. However, Turkish Technic engineers participated in all phases of the STC development process and made some contributions, like having the GCS components

installed in the avionics bay instead of the aft cargo compartment so as to make the maintenance easier, to protect the components from being damaged by cargo loads, and to keep the cargo volume unchanged.

After the STC development process was completed, Turkish Technic successfully carried out the GCS installation on both A330-300 and B777-300ER aircraft of Turkish Airlines.

#### Planned workload

Installation of the GCS system took approximately 10 days for A330-300 and less than five days for B777-300ER, which had some provisions already installed. The planned workload for A330-300 was 1,500 man-hours, most of which were structural work. The engineering order was based on the sequenced work steps prepared by TIMCO & Panasonic.

The planning and engineering departments in Turkish Technic created the work steps for the project according to TIMCO and Panasonic instructions as well as their own experience.

The most important part of this installation was the radome for the Ku-band antenna. A special alignment tool was used to determine the exact location of external fittings and doublers.

After the installation of external fittings and doublers, the adapter plate and the adapter plate skirt were installed.

In parallel with the structural work on the aircraft, there were several works performed inside the cabin and avionics bay. Five wireless access points were installed in the different locations of the cabin for internet access. Leaky feeder cables and data cables were installed for the GSM system through the cabin and video control centre (VCC) and the circuit breaker panels were modified to install the GCS system switch and circuit breakers.

After the installation, all tests (ground and electromagnetic interference) were performed without any problem under the supervision of an FAA representative. Turkish Airlines had both FAA and EASA STC, which was not only valid for this installation but also allows future installations.

Turkish Technic has modified 10 B777-300ERs and one A330-300 aircraft of Turkish Airlines and there are two B777-300ERs and nine A330-300 aircraft waiting to be modified.

Now, with its experience, Turkish Technic has set itself a target to complete future installations in less than 10 days for A330-300 aircraft.