It has always been busy in Tokyo. Its two airports – Narita and Haneda – are among the world’s largest and together account for 747,000 aircraft movements per year.

Recent expansion at both airports only served to increase the pressure on airspace capacity. Haneda, which has a downtown location, was once used exclusively for domestic flights but in summer 2014 opened up to international traffic.

Together with some domestic increases, this added 30,000 frequencies to the mix. By 2020, Haneda will increase its capacity further – the current 447,000 aircraft movements per year supplemented by an additional 40,000 movements.

Narita, meanwhile, is in the midst of a $1.3 billion expansion programme that has delivered a new low cost terminal. It, too, will seek to improve capacity by 40,000 movements per year by 2020.

Japan’s mature and growing air travel market is not the only consideration for these developments. In 2020, Tokyo will host the Olympic Games, inevitably the source of a huge influx of visitors and a demand for more air services.

Already, the airlines are crying for more capacity. Yoshiharu Ueki, President, Japan Airlines, has said that “in the long-term, Tokyo will need more runways – a fifth at Haneda or a third at Narita”. In the short term, however, it is the airspace that must be adapted to accommodate the increase in traffic.

Haneda flights
The problem is most acute at Haneda. The airport is sandwiched by Narita to the east and military air bases to the west, leaving Haneda flights with only a narrow corridor in which to operate.
Innovative solutions being considered by Japan’s ANSP, Japan Air Navigation Service (JANS) could overcome that limitation, however. JANS is the service provider for the Civil Aviation Bureau of Japan (JCAB), part of the Ministry of Land, Infrastructure, Transport and Tourism, and provides air navigation services within the Fukuoka Flight Information Region (FIR).

One option being reviewed by JANS is the introduction of independent simultaneous parallel approaches to Haneda runways 16L and 16R, which would improve aircraft movements from 80 to 90 per hour – a significant percentage increase – in south wind conditions.

These parallel approaches have already been implemented for runways 34L and 34R in north wind conditions but an identical solution for runways 16L and 16R would necessitate flight paths through Yokota Approach airspace to the west.

The US Yokota Air Base, about 60km northwest of Haneda, provides approach control service in the skies to the west of Haneda up to 23,000 feet (7,000m). There are multiple air bases in Yokota Approach airspace and the new Haneda routes would therefore conflict with aircraft operating in and out of these air bases.

JANS is working closely with the military authorities to find ways to implement the new Haneda routes without affecting safety. Any resolution will also assist Haneda departures, which are forced out over Tokyo Bay to gain the altitude necessary to fly over densely populated metropolitan areas and Yokota Approach airspace.

While the implementation of the new routes is a major technical challenge for pilots and controllers, there is also a noise issue to combat as the proposed new flight paths would overfly densely populated downtown residential areas that have previously been unaffected by aircraft noise.

To resolve this problem, JCAB has been heavily involved in liaising with the local communities to mitigate the impact of noise. “JANS has implemented a range of measures to assure not only safety but also environmental protection for our airport projects in Japan,” says Hitoshi Ishizaki, Director General, Japan Air Navigation Service.

“In the past five years, we have increased the total amount of movements at Haneda and Narita from 523,000 to 747,000 and safety and environmental protection have not been compromised.

“JANS is committed to continuing this stance with the airport expansion projects in Tokyo,” he adds. “We will continue to provide safe, smooth and efficient ATC service, with an appropriate number of ATC personnel, harmonising with environmental protection for the community around the airports.”

CARATS

All work undertaken by JANS aligns closely with the Collaborative Actions for Renovation of Air Traffic Systems (CARATS) programme. CARATS is a major Japanese ATM project, along the lines of SESAR and NextGen, and aims to deliver new technologies and procedures throughout Japan by 2025.

It is hoped CARATS will ultimately double capacity in congested airspace, reduce fuel consumption and cut emissions 10% per flight. At the same time, airspace safety will be dramatically improved.

The implementation of trajectory-based operations (TBO) is a major element of CARATS. TBO covers an entire flight path and requires aircraft to cross certain points at precise times using their flight management systems. This will eventually lead to fully 4D trajectories, real-time flight-path changes when necessary and a smoother traffic flow.

Meanwhile, another solution to airspace congestion, multilateration, has also been deployed in Japan. Multilateration uses a triangulation method to determine an aircraft’s position rather than GPS. From an airline point of view, it does not require additional avionics while controllers benefit from greater situational awareness of airport runway and taxiway movements. Both Haneda and Narita are using multilateration.
In fact, at Narita, wide area multilateration (WAM) is being used for the terminal control area. Industry supplier ERA was responsible for the installation of the ground stations, working alongside Toshiba.

Each ground station can withstand a wide range of temperature (minus 40 to plus 60 degrees Celsius) as well as possible vibrations and movements caused by earthquakes.

ACC reorganisation

While new technologies are essential to operational improvements, in the coming decade JANS will also enhance airspace efficiency through a reorganisation programme.

The Fukuoka FIR comprises four area control centres (ACC) – Sapporo ACC, Tokyo ACC, Fukuoka ACC and Naha ACC – but this will change once a plan for the airspace to be split into upper and lower portions comes into effect.

New Fukuoka ACC will control the upper portion and the oceanic airspace, while new Tokyo and Kobe ACCs will control the lower portion. The adjustment will allow the new Fukuoka ACC to handle what is anticipated to be a significant increase in the number of overflights in the years ahead.

The ACC reorganisation is an ambitious project, particularly considering the challenges associated with the schedule and process management. For instance, for more than a decade, the growth in the number of air traffic controllers in Japan has fallen behind the increase in air traffic.

Recruiting an appropriate number of suitably trained air traffic controllers to ensure safe and efficient flight operations – during and after the reorganisation – is therefore a major challenge. JANS is closely working with various stakeholders to ensure the success of the project.

Money matters

Despite the constant innovation, other challenges remain. Missed approaches as well as general aviation and VIP helicopter flights all factor into an extremely complicated equation, for example.

And as a governmental agency, JANS has to request its budget on a yearly basis, meaning the Tokyo airspace projects as well as the wider Japanese airspace programme could be modified according to the economic situation.

The monetary aspect is already complicated. From a business perspective, it is difficult to be precise about the financial requirements of CARATS given the unknown of emerging technologies and projects that are a decade away from completion.

Moreover, JANS takes the view that all solutions that deploy new technology must undergo a continual review process under the CARATS programme to accommodate the future operational requirements of various airspace users.

Nevertheless, the Director General of JANS is confident that the various issues will be resolved. “The continued expansion of ATC capacity at Haneda and Narita is one of the main pillars of our government’s national growth strategy,” concludes Ishizaki, “JANS is proud to be a part of such a significant government programme and we will proactively implement technical innovations through the CARATS programme.”

“We are committed to continued efficiency in accommodating air traffic increases not only in the Tokyo metropolitan areas but also throughout Fukuoka FIR airspace to meet the expectations of the airspace users.”