

The large number of 747-400 freighters in service, their age and their cash operating costs mean that an alternative aircraft will be needed within five years. The only aircraft that can possibly fill this role is the 777-300ER. Only the 777-200 series is built as a factory freighter, so a passenger-to-freighter conversion programme will be required for the longer 777-300ER.

### 777-300ER characteristics

The 777-300ER has several features in its favour. The first features to consider are the probable gross structural payload and the available volume that a converted aircraft would offer.

Provided this was similar or close to the 747-400, the 777-300ER's likely cash operating costs, financing or lease rates, operating performance, number available would then also have to be considered.

The 777-300ER entered service in 2003, and to date more than 800 have been delivered to airlines in passenger configuration. A further 33 are on order. The 777-300ER is operated in large fleets by many of the world's major intercontinental carriers, so there will be no issues over quantities or limitations in appropriate feedstock. Aircraft production had increased to 46 units by 2008.

The issue of payload capacity concerns provision of an aircraft that is close to the 747-400F, and larger than the 777-200F. The 777-200F has a gross structural payload of 228,700lbs and total containerised volume of 22,371 cubic feet (cu.ft). The 777-400BCF, the converted freighter, has a gross payload of 254,825lbs and containerised volume of 27,012 cu ft.

Once converted to freighter, the 777-300ER is likely to fall between these two, and would preferably be closer to the 747-400BCF. The main issue affecting the 777-300ER's gross structural payload is the maximum zero fuel weight (MZFW) and operating empty weight (OEW) following conversion. Rafi Matalon, aviation group marketing director at IAI says that it is heading towards launching the programme, and needs a launch customer. "It takes about three years to develop the supplemental type certificate (STC) for a conversion, and we have made some studies. We perform our own reverse engineering to develop the STC. We have also made an agreement with Boeing to be licensed so that passenger aircraft converted by us continue to get technical support from Boeing for the entire aircraft."

The MZFW for the 777-300ER is expected to increase from its current level of 524,000lbs by 45,000lbs to 569,000lbs. Bedek has a track record of getting good increases in MZFW when converting

A passenger-to-freighter programme is required for the 777-300ER to provide a replacement for 747-400 freighters. IAI has made a three-year study into such a project.

# IAI considers 777-300ER P-to-F programme

aircraft. The OEW of the converted aircraft is a particular concern for the 777-300ER. The passenger variants of the 777 were built with carbon fibre reinforced plastic (CFRP) floorbeams to save weight. While these floorbeams will contribute to a relatively low OEW, they will also place limits on the running loads and therefore payload permitted in the main-deck floor. This could be alleviated by replacing the CFRP floorbeams with aluminium beams, but it is thought this would excessively increase the cost of conversion. Leaving the CFRP floorbeams unchanged would result in a net reduction in OEW of about 27,000lbs, which would be achieved by removing the passenger interior. The OEW would be reduced to about 343,000lbs, and the aircraft would therefore have an overall increase in gross structural payload of 72,000lbs up to about 226,000lbs. This would be about 2,700lbs less than the 777-200F. The 777-300ER freighter would nevertheless have a containerised volume of 28,139 cu ft, 5,768 cu ft more than the 777-200F.

When compared with the 747-400BCF, the 777-300ER freighter's gross payload would be 28,285lbs less, while the 777-300ER's volume would actually be 1,127 cu ft more than the 747-400BCF's.

The overall implications are that the 777-300ER freighter would have a maximum packing density of about 7.56lbs per cu ft, about 1.30lbs per cu ft lower than the 747-400BCF's because of the difference in gross structural payload between the two types.

Other considerations are the cost of conversion and overall cost of build and making an aircraft available for service. "You have to remember that the list price of a 777-200F is \$150-160 million. The converted 777-300ER will provide about 25% more containerised volume, and its acquisition cost will depend on the cost of

the feedstock passenger aircraft, cost of conversion, and cost of any maintenance required," says Matalon. "The cost of the 777-300ER is estimated at \$30 million, and to make conversion feasible, the combined cost of a feedstock aircraft and modification needs to be about \$60 million. Additional costs cannot be much higher, since the total cost has to be reasonable in relation to a likely market lease rate that is no higher than \$700,000-750,000 per month. The implications of this are that little additional maintenance must be required on the aircraft. This means that no large airframe checks or engine shop visits and life-limited parts replacement would be required. The feedstock cost of \$30 million would therefore be for an aircraft in a relatively high maintenance status, especially with respect to its engines.

"The option of selling a used passenger aircraft, returned from lease and in a good maintenance condition at this level has to be considered in relation to the cost of \$15-25 million to reconfigure the aircraft's interior for a new lessee," continues Matalon. "There is also the issue that it takes 18-24 months to do the engineering for such a reconfiguration."

The oldest aircraft are now 15 years old, so the first aircraft could come available at the right market value within the next three years. Analysis of the fleet shows that aircraft built from 2003 to 2006 have operated at 5.0-11.0 flight hours per flight cycle (FC). The highest number of accumulated FCs is about 12,500, while most aircraft accumulate fewer than 10,000FC. Matalon says that Bedek Aviation is hopeful of a launch later in 2019. [AC](#)

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