LCF Conversions is looking for launch customers for the A340 LCF passenger-to-freighter conversion. The A340-300 LCF does not use a conventional main deck cargo door, and so provides a low-cost alternative to other medium widebody freighters such as the A330-200F/-300F.

A340-300 LCF passenger-to-freighter conversion programme

The A340 has emerged as the prime candidate for an innovative new passenger-to-freighter conversion programme, launched by LCF Conversions. The programme would not install a conventional, large freight door on the aircraft's main deck, as is standard on many passenger-to-freighter conversion programmes. Instead it would use a pair of internal cargo lifts to raise freight pallets and unit load devices (ULDs) from the lower to the main deck.

These lifts would be installed near the forward and aft lower deck cargo doors. All cargo will be loaded through the lower deck cargo hold doors, and then be transferred to the main deck via the lifts. Once the cargo is on board either deck, it can be moved longitudinally along the deck.

By eliminating the need to install a large freight door, and thereby eliminating many other associated structural changes, the LCF conversion of A340s can be carried out at a much lower cost than a traditional freighter conversion. One potential downside is that the height of the main deck pallets and ULDs will be limited to the height of the lower deck. This will therefore limit the aircraft's total freight volume.

Given the low feedstock values of used A340s, and the fact that many of them are at the optimum age for conversion (15-20 years old), then the A340-300 makes the ideal platform for this conversion.

Although the LCF conversion could be applied to the A340-200 and -300, the A340-300 is the focus due to a higher number of airframes built and available, and the extra available volume that the -300 can provide because of its longer fuselage barrel.

Conversion process

In order to keep the cost of conversion low, the A340 LCF programme will make the minimal number of structural changes to the passenger aircraft for conversion to freighter. Andy Coupland, consultant at LCF performance and operating economics, explains: "First, the aircraft must be stripped, and this is conducted in two stages. The first stage is to remove all previous passenger operator items. The second stage is called the deep strip, which involves removing everything in the aircraft not relevant for a freighter. This includes removing weight from the doors."

Once the aircraft has been stripped, the forward and aft lifts must be installed. "This is the guts of the conversion," continues Coupland. "This involves the installation of two main components: the lifts themselves and the translating floors. To install the lifts, the floor beams are cut without disrupting the fly-by-wire system or other vital systems. The lifts are installed with load-bearing beams built into them, which are locked during flight. This maintains the load-bearing potential of the main deck floor.

"The lifts operate with dual motors on each one, with built-in redundancy, and are serviced from underneath" continues Coupland. The built-in redundancy feature with dual motors means that even if one motor fails, the lifts can still be operated as normal using just one motor, giving operators extra reliability and security, particularly if a motor fails away from the aircraft's home base. The fact the motors are serviced from underneath also helps with ease of maintenance.

Translating floors are the second main component of the conversion. Coupland explains: "The lift has a small amount of depth to it, so to ensure the lift is level with the lower deck floor when the lift is in the lower position, the lower deck floor must be modified. A mechanism is installed to allow the floor of the lower deck hold to drop down when the lift is in its lower position. This is called the translating floor."

The next part of the conversion is the installation of the cargo loading system (CLS). This will be a lightweight CLS developed by LCF with Ancra, so none of the floors will require any extra strengthening. This is where another large saving is made in comparison with conventional freighters.

Finally, at the forward end of the main deck a 9G barrier will be installed, and ahead of that will be the supernumerary area to accommodate any freight handlers. "Four business-class seats, with a toilet and galley, will be installed at the front of the aircraft just rear of the flightdeck," says Coupland.

Total conversion downtime for the A340-300LCF will be about six weeks from start to finish.

Aircraft specifications

The A340-300LCF will have similar weights and specifications to the passenger A340-300. "The LCF conversion does not touch the basic design weights of the aircraft," states Coupland. "Consequently, the maximum payload/range of the passenger versions of the aircraft is preserved, unlike a conventional freighter, whose range is cut in the process of having its operating empty weight (OEW) reduced and maximum zero fuel weight increased."

The aircraft specifications are listed *(see table, this page)*. There are two main weight variants of the A340-300 currently being considered for the LCF conversion: initial production models with a maximum take-off weight (MTOW) of 573,300lbs; and a higher gross weight version, which includes the majority of A340-300s, with a MTOW of 606,375lbs.

The lower weight, initial production models will have a maximum landing weight (MLW) of 414,540lbs, and a MZFW of 392,490lbs. OEW will be 248,345lbs. Finally, the gross structural payload of the lower weight A340-300LCF will be 144,145lbs *(see table, this page)*. This will give a range of 4,950 nautical miles (nm) at MZFW.

The higher weight A340-300s have a MLW of 423,360lbs, MZFW of 399,105lbs, and OEW of 250,839lbs, giving a gross structural payload of 148,266lbs *(see table, this page)*. This gives these aircraft a range of 5,400nm at MZFW. That is, when the aircraft is carrying its maximum structural payload.

In terms of container tare weights and volumes that can be transported, both variants of aircraft will have the same available cargo volume. The higher weight version will be able to transport slightly higher weights due to the higher gross structural payload available.

Both variants will carry 32 LD3 containers on the lower deck, which have a total combined volume of 5,056 cubic feet, and a tare weight of 4,928lbs *(see table, this page)*.

On the main deck, 25 PMC pallets can be carried with a combined volume of 10,225 cubic feet, and tare weight of 7,175lbs. These PMC pallets will have a 125-inch width, 96-inch depth and 64-inch height. They will have to be minimally contoured to be carried on the A340-300LCF main deck. This contouring amounts to a loss of six cubic feet per pallet.

The total volume available on the A340-300LCF, therefore, is 15,281 cubic feet with a total container tare weight of 12,103lbs *(see table, this page)*.

The lower gross weight A340-300LCF will therefore have a net revenue payload of 132,042lbs after deducting ULD tare weight. The higher gross weight version will have a maximum of 136,163lbs of net revenue payload. These ULD tare weights and volumes give a maximum packing density of 8.64lbs per cubic foot for the lower weight A340-300LCF, and 8.91lbs per cubic foot for the higher weight variant *(see table, this page)*.

A340-300LCF FREIGHTER SPECIFICATIONS:

	A340-300LCF WV 004	A340-300LCF WV 026
MTOW lbs	573,300	606,375
MLW lbs	414,540	423,360
MZFW lbs	392,490	399,105
OEW lbs	248,345	250,839
Gross structural payload lbs	144,145	148,266
Range @ MZFW-nm:	4,950	5,400
Main deck pallets:	25 PMC	25 PMC
Main deck volume-cu ft:	10,225	10,225
Main deck tare weight-lbs:	7,175	7,175
Lower deck containers:	32 LD-3	32 LD-3
Lower deck volume-cu ft	5,056	5,056
Lower deck tare weight-lbs:	4,928	4,928
Total volume-cu ft	15,281	15,281
Container tare weight-lbs	12,103	12,103
Net revenue payload	132,042	136,163
Packing density lbs/ft^3	8.64	8.91

Operator suitability

In terms of payload and range, the A340-300LCF will compare favourably to other freighters in the same class, such as the A330-200F, A330-300F and 767-300F. "The A340-300LCF will carry a virtually identical payload to the A330-200F and A330-300F that are to be converted under a programme offered by Airbus. The A340-300F's range will be well over 5,000 miles," says Coupland. This compares to a range of 4,000nm for the A330-200F and 3,600nm for the -300F *(see A330 P-to-F programme, Aircraft Commerce, February/March 2012, page 58)*.

Other differences include the A340's higher packing density compared with the A330-300F. "The A330-300 freighter conversion offers more volume than the A340-300LCF, but no more payload. This results in the A330-300F having a very low average packing density of about 7lbs per cubic foot," says Coupland. "While some integrators may experience such a low density on some routes, international express traffic and general cargo densities are 8.2-10.5lbs per cubic foot. This is likely to mean that, in practice, the A330-300F will be carrying unutilised volume."

The A340-300LCF, however, will offer a similar volume to the A330-300F, but the A340-300LCF will have similar packing densities to the A330-200F factory-built freighter.

Despite these comparisons, the A340-300LCF is not aimed as a competitor to the A330-200F or A330-300F, but rather as a complement to these aircraft. "Although fuel burn for the A340-300 is about 15% higher than for the A330, the A340-300LCF will be able to complete high-density, long-haul routes without the need for a fuel stop," says Coupland. "The low-cost A340-300LCF could be used for premium-yield, long-haul services, as well as high-season extra sections."

Crew and maintenance commonality is another potential advantage of the A340-300LCF with A330F operators. "The same flight crews could operate both types and many airframe components are interchangeable, although not on the engines," says Coupland. This will help to further lower the costs of owning and operating A340-300LCFs for such operators.

LCF Conversions feels that the A340-300LCF can also compete in the heavy freighter sector. "We see a real market for the A340-300LCF in the

Major passenger A340-300 fleets are in the 15-20 year age band, and would make ideal candidates for the LCF programme.

heavy freighter sector, especially where loads are directionally imbalanced. A 777F or 747-400F will deliver undeniably lower tonne-kilometre costs than an A340-300LCF, but that is of no consolation if the larger aircraft are half-empty, or worse, on the return leg," states Coupland.

The main constraint of the A340-300LCF, however, is that with no large cargo loading door, as is seen with conventional freighters, all ULDs and pallets are restricted to a maximum height of 64 inches. This is the height of the lower deck cargo door. This means that the A340-300LCF is not suitable for operators with particularly large, or outsize cargo.

LCF Conversions does not see this as a large problem, however. "Only a minority of cargo operators have to be to carry livestock and other outsize cargo, which would require a larger door," says Coupland. "Over 60% of cargo is transported in the lower cargo hold, so we do not see the lack of a large loading door as a significant issue."

The low cost of aircraft acquisition and the low conversion costs are the biggest selling point for the A340-300LCF programme, and it is these low costs that will appeal to freight operators most. A 15 to 16 year old A340-300 has a market value of $10-15 million, with most of the value in the engines. With several passenger operators of the A340-300 set to retire them in favour of new fleets over the coming years, the potential for further affordable airframes for the A340-300LCF conversions is good.

The oldest A340-300s are 19-20 years old, and large numbers are operated by Lufthansa, Iberia, Swiss, Air France, Cathay Pacific and Turkish Airlines. There are also 13 or so in storage.

The total cost of the LCF conversion is set to be about $6.5 million, meaning that a 68-tonne freighter can be acquired and converted for a total cost of about $22 million, and in some cases for less than $20 million.

This is less than the used market value of the oldest A330-300s. The all-up cost of preparing an A340-300LCF for operation is a fraction of buying used passenger aircraft in its size class, and converting them with conventional passenger-to-freighter modifications. This includes the 767-300 and A330-200.

The all-up cost of preparing converted 767-300s and A330-200s for service is unlikely to come close to the probable $22-25 million cost of the A340-300LCF for the short- to medium-term. The A340-300LCF offers good value for the available payload and range that it can deliver, despite its higher fuel burn.

Such low acquisition costs also mean there is less pressure on its operators to achieve high utilisation rates for the A340-300LCF do not have to be high for the operator to use them profitably. "There is no need for the A340-300LCF to fly for more than 2,500 flight hours per year. This means that operators can limit their use to a small number of more profitable routes, without having to worry about using them more widely across the route network," says Coupland.

With other aircraft types, with higher acquisition and ownership costs, operators must utilise the aircraft as much as possible, even on marginal routes, in order to cover financing costs. This is not the case with the A340-300LCF, and it can be used to fly a smaller number of more appropriate routes, for example where its payload is combined with its long range, or to provide extra capacity on other routes during busy periods.

Summary

The A340 LCF conversion programme offers an innovative and low-cost method for cargo operators to increase capacity. A comparable payload as well as a turnaround time of 90 minutes for the A340-300LCF, along with longer-range capabilities makes it a viable aircraft for the market. The low acquisition and ownership costs of the aircraft are likely to be its biggest draw, however.

Cargo operators without larger aircraft such as the 747F, 777F, and MD-11F may see the A340-300LCF as a viable alternative for flying payloads over long distances non-stop. Cargo operators with these large aircraft, however, may also find use for them on directionally imbalanced routes, or just for cheaper extra capacity.

Another set of potential customers could also be current passenger-only operators. This is because the A340-300LCF does not have a large cargo-loading door, and uses the normal lower main cargo doors that passenger aircraft use for cargo. This means the A340-300LCF does not necessarily have to be parked in a cargo loading bay, but instead could be parked at a passenger gate, for interlining cargo coming from passenger aircraft. Their own fleets could be converted at minimal cost, and the aircraft used for their own freight divisions.

It remains to be seen, however, exactly how and where the A340-300LCF will fit into the market. Once launch customers can be found, the A340-300LCF is likely to enter into service in 2013. AC