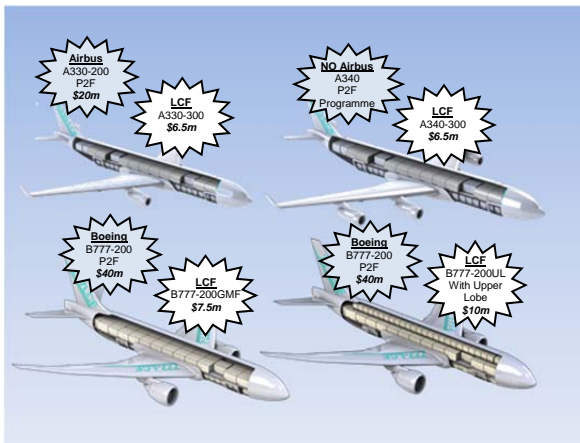


# LCF

## THE LOW COST FREIGHTER



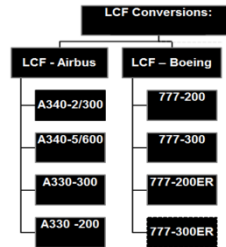
An innovative, flexible, cost effective P2F conversion solution for 3<sup>rd</sup> & 4<sup>th</sup> generation Medium Wide Body (MWB) aircraft



## LCF THE FUTURE FOR NON-OEM MWB P2F CONVERSIONS

### Applicability & Availability

- LCF is complementary to conventional Main Deck freighters. 60% of world airfreight is carried in the holds of Medium Wide Body (MWB) pax aircraft, 90% could be - this is the LCF focus
- The LCF Conversion is applicable to all MWB aircraft:



Apart from LCF, the only MWB P2F conversions that may be offered are from the OEM's – some A330's & B777's (no A340's) – and, if they happen, they will be post 2017

- The LCF conversion provides competitive range and payload compared with new build and planned OEM P2F freighters - at significantly lower capital cost
- The LCF conversion results in a net \*reduction in the weight of the aircraft – the planned OEM P2F conversions all result in a net increase in weight

PAX TO FREIGHTER WEIGHT CHANGE	A340-300 & A330-300	B777-200
LCF – Lbs (Kgs)	-4,060 (-1,842)	-2,859 (-1,297)
Airbus P2F Lbs (Kgs) A330 Only	+2,400 (+1,089)	
Boeing P2F Lbs (Kgs)		+16,691 (+7,573)

\* except in the case of the B777 UL (with Upper Lobe) where the UL structure and its two lift installations weigh 5947Lbs (2698Kgs) and add a net 3087Lbs (1401Kgs)

- Converted Airbus and Boeing 3<sup>rd</sup> generation MWB aircraft will satisfy all current and proposed worldwide noise regulations
- There are 3 main phases supported by a Lift System Demonstration phase in obtaining the LCF FAA and EASA STC's:
  - Phase 1 – **Completed**. Included 30% of the STC design activity for the Airbus and Boeing aircraft
  - Lift System Demonstrator – **16 week** design & build programme
  - Phase 2A – **30 week programme** to obtain a Lift System STC
  - Phase 2B – **26 week programme** to obtain a LCF STC for either OEM's aircraft

In parallel with Phases 2A & 2B the Cargo Loading System supplier will obtain separate STC's for the Main Deck CLS

### Operation

- LCF has no Main Deck Large Freight Door – it utilises the existing <sup>1</sup>Lower Hold doors



- A patented, self-contained electrically operated Lift in each hold moves freight onto and from the Main Deck
- A Main Deck high loader is not required



- An LCF conversion delivers competitive range / payload performance compared with the planned OEM P2F conversions, e.g:

At typical cargo densities of 8 FT<sup>3</sup> an A330-300LCF will carry the same payload as the OEM A330-300P2F over the same range.

With the weight upgrades the OEM 777-200ER can accommodate 8T more payload but with a range penalty of 1,400nm. At 4,500nm range the LCF and OEM PTF carry the same payload.

- The Airbus nose down attitude of about 1.5° does not adversely impact LCF loading & unloading



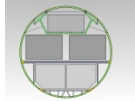
- LCF does not need the (very) expensive Airbus A330F new build nose leg extension solution
- AND
- Main Deck PDU's are not required on an LCF, unlike the proposed Airbus A330 P2F conversion solution

<sup>1</sup>Can accommodate containers up to 125"x96"x64" high

13. The Lift:
  - Operating mechanism is contained within each Lift platform and is easily accessible
  - Operating parts are fully interchangeable between Lifts
14. Each Lift Platform can lift a weight of 6000Lbs (2727Kgs)
15. All Lifts can be operated simultaneously. Total load / unload times are the same as for a conventional Main Deck freighter, and satisfy all Main Deck freighter load / unload targets (See LUM in 15 below)
16. LCF Conversions has created a:
  - Calibrated Economic Performance Model (EPM) that calculates specific LCF economic route performance
  - Load / Unload Model (LUM) to simulate load / unload activity and calculate realistic LCF load / unload times
  - Ground Handling Manual that is used to ensure the design facilitates efficient loading and unloading activity

## Installation

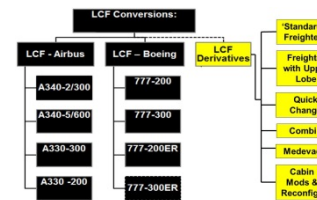
17. Lift alignment is different for Airbus and Boeing aircraft:
  - In the A340 and A330 both Lifts are aligned longitudinally in the Main Deck
  - In the B777 the forward Lift is aligned longitudinally and the aft Lift is aligned laterally across the Main Deck
18. On both the Airbus & Boeing Main Decks apart from the area in the vicinity of the cut-outs for the Lifts, there is:
  - No change to the floor structure
  - No floor strengthening
  - No change to the Main Deck structural load capability
19. On the Main Decks a non-energised (manual) CLS is installed directly onto the existing Main Deck seat rails and ball mats are installed to facilitate loading and unloading
20. In the Lower Holds apart from the installation of a Translating Floor to enable the Lift platforms to fit flush with the hold floors during loading and unloading, there is no change:
  - To the hold structures
  - To the input aircraft energised (powered) CLS systems
  - To the Lower Deck structural load capability
 Existing Lower Hold door CLS guides are modified and additional floor guides are installed to direct containers onto and off the lift platforms during loading and unloading
21. On the B777 there is an option to install an Upper Lobe (UL) cargo area – a 3rd cargo deck - with its own energised CLS accessed by two electrically operated Lift systems:
  - One mounted on the 9g barrier at the forward end of the Main Deck
  - The second a free standing Lift operating at the aft end of the Main Deck.

22. The Upper Lobe is installed utilising the baggage bin installation structure that:
    - Is already a 9g stressed structure
    - Makes the underside of the UL readily accessible from the Main Deck
- 
23. A supernumerary area is installed immediately behind the Flight Deck.
  24. There is an option to include a Crew Rest Area in the Supernumerary Area
  25. A rigid 9g barrier incorporating a smoke barrier and door providing crew access to the Main deck is installed at the forward end of the Main Deck aft of the supernumerary area
  26. Smoke detection and fire control:
    - The Lower Deck holds will retain the Class C classification of the input Aircraft
    - The Main Deck cargo compartment will be certified as Class E
  27. The Conversion installation process requires:
    - Minimal aircraft shoring and no special tooling, and
    - Aircraft can remain fully mobile except for the period the Main Deck lift platform cut-outs are being installed
  28. Once the programme is established LCF conversion down time will be 6 weeks

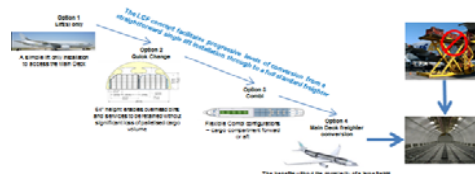
## Through Life Conversion Flexibility

29. LCF offers Options and Derivatives

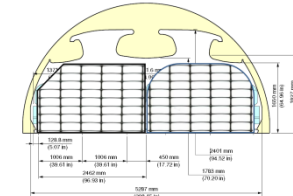
*The standard LCF Conversion installs two lifts – one for each lower hold – and converts the Main Deck into a freight only compartment. But there are Options and Derivatives available*



29. Conversion options can be installed (and uninstalled) progressively through the operational life of the aircraft



30. A Medevac capability. One or two Lifts can be installed to facilitate loading of stretchers and medical equipment
31. Combi & Quick Change. An LCF Combi offers the flexibility to have the freight area either forward or aft of the pax compartment. In addition, because the maximum container height is 64" it is possible to leave the pax baggage bins in place and retain a flexible pax/freight area to create a Quick Change configuration



32. The LCF concept may facilitate other aircraft modifications such as VIP modifications and reconfigurations. It may be cost effective to install an LCF Lift for use only during a conversion or reconfiguration activity after which the Lift(s) will be permanently locked in position and its drive mechanisms removed to be used elsewhere
33. There is an Option to undertake a reduced strip (with associated weight penalty) to retain the capability to restore an LCF back into its original passenger configuration - the LCF modification can therefore be planned to be reversible and the Conversion 'Kit' can be removed and reinstalled on other airframes

## Operational Reliability

34. The standard LCF Conversion will present a very low likelihood of being the cause of an AOG:
  - Two lifts installed – only one operational lift is required to fully load and unload
  - Two independent operating mechanisms on each Lift platform
  - All Lift operating mechanisms are fully & quickly interchangeable
  - Backup manual overrides provided for the lift MD & LD Translating Floor locks
  - Backup mechanical jacking provision provided to cover the remote eventuality a lift cannot be raised using the normal operating mechanism
  - The CLS system is a 'blade' system that enables loading and unloading from either direction

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