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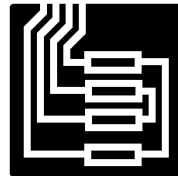
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Lockheed L-1011 TriStar –Archived 08/2002

Outlook

- Lockheed converting 13 L-1011s to cargo configuration, but no buyer announced
- Outlook for further L-1011 upgrades is dimming

Note: Icons indicate area(s) of current retrofit/modernization activity



Orientation

Description. Widebody, three-engine commercial transport.

Application. Medium/long-range transport seating 230-400 passengers depending on variant and configuration.

Developer/Primary Manufacturer. Lockheed Corp, Lockheed-California Co, Burbank, California, USA.

Price Range. On the used aircraft market: L-1011-200, \$7 million; L-1011-500, \$8-\$10 million.

Current Status. Production ended in 1983.

Total Produced

| | |
|--------------|--------------------|
| L-1011-1/100 | 157 ^(a) |
| L-1011-200 | 44 |
| L-1011-500 | 50 |
| Total | 251 |

^(a)Includes one prototype/company testbed aircraft

Technical Data

(L-1011-500)

| | <u>Metric</u> | <u>US</u> |
|-------------------|---------------|---------------|
| Dimensions | | |
| Length overall | 50.05 m | 164.16 ft |
| Height overall | 16.87 m | 55.33 ft |
| Wingspan | 50.09 m | 164.30 ft |
| Wing area, gross | 329.0 sq m | 3,541.0 sq ft |

Weight

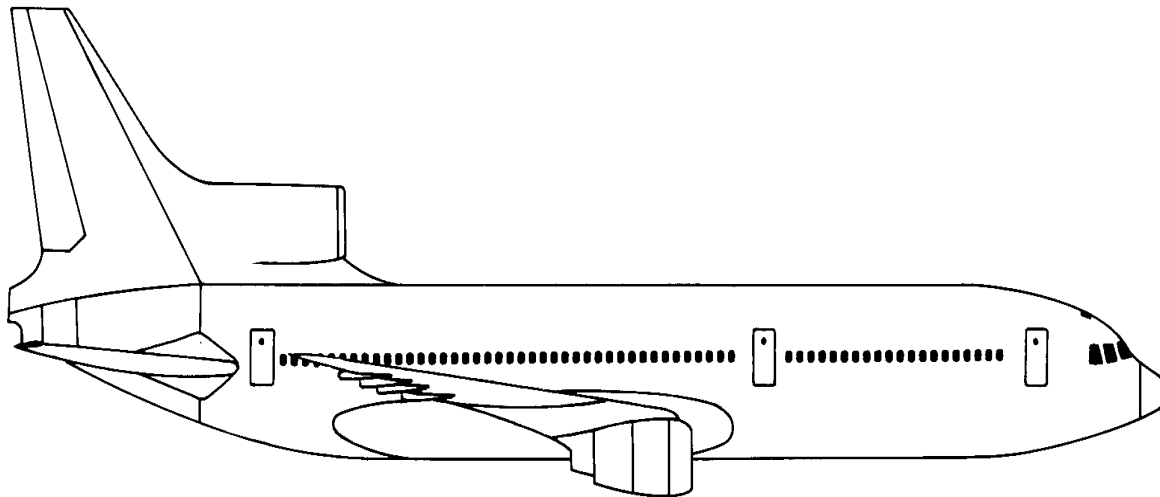


| | <u>Metric</u> | <u>US</u> |
|--|---------------|-------------|
| Operating weight empty | 111,313 kg | 245,400 lb |
| Max payload | 42,003 kg | 92,600 lb |
| Max T-O weight | 231,334 kg | 510,000 lb |
| Performance | | |
| Never exceed speed | Mach 0.95 CAS | |
| Max cruising speed ^(a) | 973 km/h | 525 kt |
| Service ceiling ^(b) | 13,110 m | 43,000 ft |
| Range ^(c) | 9,905 km | 5,345 nm |
| Propulsion | | |
| Three Rolls-Royce RB211-524B or -524B4 turbofans | | |
| Thrust (each) | 222.4 kN | 50,000 lbst |

^(a)Mid-cruise weight at 9,146 m (30,000 ft).

^(b)At maximum T-O weight.

^(c)At maximum T-O weight; with maximum passengers and baggage, international reserves.



LOCKHEED L-1011-500

Source: Forecast International

Program Review

Background. Lockheed's L-1011 trijet was designed to meet the same specifications as the McDonnell Douglas/Douglas Aircraft Co DC-10, with both companies competing for sales in the late sixties, and with Douglas jumping to an early lead. Lockheed faced a number of hurdles in attempting to penetrate the transport market. The firm's turboprop Electra had not sold well, and Lockheed was unable to appeal to user loyalty. The firm was also promoting a new airframe design to be powered by a new engine incorporating several new technological features. Many prospective customers doubted the abilities of both Lockheed and

Rolls-Royce to meet their respective development goals. In the meantime, Douglas was a well-established airframe manufacturer, whose new design used the GE CF6 powerplant, more conventional (less risky) in design than the Rolls-Royce engine.

Lockheed's L-1011 program encountered a series of obstacles which placed it well behind the DC-10 in the trijet race. However, despite its seemingly bleak future, the program slowly pulled forward and gradually narrowed the gap with the DC-10. Lockheed developed two long-range variants of the -1/-100 TriStar to further

enhance the aircraft's sales potential: the L-1011-200 and the -500.

Despite the difficulties Lockheed had in marketing the L-1011, it has proven itself to be a sound design for its operators. In all likelihood, the majority of the current operational TriStar fleet will remain in service for several more years, although their operators and primary roles will change significantly.

Among the major airlines, there is a move to the more economical, newer generation of transports that include Boeing's 757 and 767; the McDonnell Douglas MD-11; and the Airbus Industries A320, A330 and A340. Although the L-1011 competes favorably with some of these aircraft, there is a trend toward procuring aircraft that achieve the highest commonality of systems, specifically engines, within the fleet.

Variants

L-1011-1. Initial production version. Deliveries began in April 1972. Powered by RB211-22B engines, rated at 186.8 kN (42,000 lbst) each.

L-1011-100. Extended-range version. Entered service in 1975.

L-1011-200. Extended-range version. Powered by RB211-524 engines rated at 213.5 kN (48,000 lbst), or RB211-524B or B4 engines rated at 222.4 kN (50,000 lbst). The first -200 flew in late 1976, and the version entered service in 1977. It offers improved hot/high performance for Middle East operators.

L-1011-250. Converted and re-engined L-1011s. Extended payload/range version. Powered by RB211-524B4 Improved engines rated at 222.4 kN (50,000 lbst). Other existing L-1011 conversions include the L-1011-50 and the L-1011-150.

L-1011-500. Approximately 4.12 meters (13.5 ft) shorter than the previous TriStar versions, this model seats 246 (in mixed class configuration) and has a 9,905

kilometer (5,345 nm) range. The -500 was aimed at the DC-8/707 replacement market and was originally ordered by British Airways. Also powered by the RB211-524B or B4, the -500 has a max T-O weight of 231,334 kilograms (510,000 lb).

Lockheed developed an active aileron controls system for the -500. This improved model incorporates a 2.74 meter (9 ft) wingspan increase, made possible by the automatically activated control surfaces, and uses RB211-524B3 engines. These improvements have resulted in a 6 to 8 percent reduction in fuel consumption. Pan Am received the first of 12 active aileron-equipped -500s in April 1980, and these modifications were standard features on all subsequent production -500s. In addition, Lockheed Aircraft Service began retrofitting this system to 11 earlier model -500s of Delta, British Airways, LTU and BWIA in September 1980.

Milestones

| <u>Month</u> | <u>Year</u> | <u>Major Development</u> |
|--------------|-------------|---|
| | 1966 | Initial design studies launched |
| Jun | 1968 | Prototype design begins |
| Nov | 1970 | Prototype first flight |
| Apr | 1972 | Certification and initial production deliveries |
| Oct | 1978 | L-1011-500 first flight |
| Apr | 1979 | Initial -500 deliveries |
| Apr | 1980 | Initial delivery of improved -500 variants |
| | 1983 | RAF L-1011 tanker conversion program begins |
| Aug | 1983 | L-1011 production line closed |
| Jan | 1985 | Monarch Aviation awarded L-1011 cargo conversion contract |
| Jul | 1985 | Initial Monarch conversion completed |
| Oct | 1985 | Delta announces modification of six L-1011s |
| | 1987 | Certification of modified Delta TriStars |
| May | 1987 | Certification of L-1011 freighter conversion |

Worldwide Distribution

| <u>Region</u> | <u>Country</u> | <u>Total</u> | <u>Variant</u> | <u>Avg. Age (Yrs)</u> |
|----------------------|-----------------------------|--------------|----------------|-----------------------|
| <u>Asia</u> | | | | |
| | Cambodia | | | |
| | Kampuchea Airlines | 1 | L-1011-1 | 27 |
| | Indonesia | | | |
| | Merpati Nusantara | 1 | L-1011-1 | 28 |
| | Sri Lanka | | | |
| | Sri Lankan | 1 | L-1011-100 | 28 |
| | | 2 | L-1011-500 | 21 |
| | | 1 | L-1011-50 | 32 |
| <u>Europe</u> | | | | |
| | Ireland | | | |
| | Aer Turas Teoranta | 1 | L-1011-1 | 29 |
| | United Kingdom | | | |
| | Caledonian Airways | 4 | L-1011-100 | 28 |
| | Iceland | | | |
| | Air Atlanta Icelandic | 2 | L-1011-100 | 27 |
| | | 1 | L-1011-1 | 28 |
| | | 1 | L-1011-50 | 29 |
| | Sweden | | | |
| | Finans Skandic AB | 1 | L-1011-1 | 28 |
| | Novair Sweden | 3 | L-1011-500 | 21 |
| <u>North America</u> | | | | |
| | Canada | | | |
| | Air Transat | 2 | L-1011-1 | 27 |
| | | 3 | L-1011-100 | 26 |
| | | 5 | L-1011-50 | 21 |
| | | 3 | L-1011-500 | 19 |
| | Arizona Aircraft Support | 1 | L-1011-1 | 25 |
| | | 1 | L-1011-100 | 27 |
| | Trinidad & Tobago | | | |
| | BWIA International | 4 | L-1011-500 | 20 |
| | United States | | | |
| | AAR Aircraft & Engine Group | 1 | L-1011-500 | 20 |
| | Agro Air | 1 | L-1011-500 | 23 |
| | American Trans Air | 2 | L-1011-1 | 28 |
| | | 2 | L-1011-100 | 24 |
| | | 10 | L-1011-50 | 27 |
| | | 5 | L-1011-500 | 20 |
| | Arrow Air | 3 | L-1011-200 | 20 |
| | Avtec | 1 | L-1011-1 | 29 |
| | BPI Aerospace | 2 | L-1011-1 | 28 |
| | Custom Air | 17 | L-1011-200 | 24 |

| <u>Region</u> | <u>Country</u> | <u>Total</u> | <u>Variant</u> | <u>Avg. Age (Yrs)</u> |
|----------------------|---------------------------|--------------|----------------|-----------------------|
| <u>North America</u> | | | | |
| (continued) | | | | |
| | United States (continued) | | | |
| | Delta | 20 | L-1011-1 | 23 |
| | | 4 | L-1011-40 | 25 |
| | | 1 | L-1011-200 | 23 |
| | | 6 | L-1011-250 | 22 |
| | | 16 | L-1011-500 | 21 |
| | Fine Airlines | 1 | L-1011-200F | 24 |
| | Interlease | 3 | L-1011-1 | 23 |
| | | 2 | L-1011-200 | 25 |
| | | 1 | L-1011-40 | 26 |
| | International Air Lease | 7 | L-1011-1 | 26 |
| | | 4 | L-1011-50 | 27 |
| | Kitty Hawk International | 7 | L-1011-200 | 24 |
| | | 1 | L-1011-50 | 27 |
| | Pegasus Aviation | 1 | L-1011-1 | 26 |
| | | 1 | L-1011-50 | 27 |
| | Tradewinds Airlines | 1 | L-1011-1F | 24 |
| | | 1 | L-1011-200 | 24 |
| | Trans World Airlines | 1 | L-1011-100 | 25 |
| <u>South America</u> | | | | |
| | Peru | | | |
| | Aero Continente | 1 | L-1011-1 | 28 |
| | | 1 | L-1011-100 | 26 |
| | Faucett | 1 | L-1011-1 | 28 |

| <u>Region</u> | <u>Country</u> | <u>Total</u> | <u>Variant</u> | <u>Avg. Age (Yrs)</u> |
|--------------------------------------|--------------------|--------------|----------------|-----------------------|
| <u>Military/Government Operators</u> | | | | |
| <u>Europe</u> | | | | |
| | United Kingdom | | | |
| | Royal Air Force | 4 | K.Mk 1 | 22 |
| | | 3 | K.Mk 2C | 21 |
| | | 2 | KC.Mk 1 | 21 |
| <u>Middle East</u> | | | | |
| | Jordan | | | |
| | Jordan Gov't | 1 | L-1011-500 | 25 |
| | Saudi Arabia | | | |
| | Saudi Royal Flight | 2 | L-1011-500 | 27 |

Opportunities

Lockheed is under contract to modify 13 ex-Delta TriStars for freighter operations but to date has no customer for the aircraft. Kitty Hawk said it was parking its TriStar freighters due to rising maintenance costs, a development that does not bode well for Lockheed in its efforts to find a buyer for the ex-Delta trijets.

We anticipate very little in the way of further TriStar upgrades. Several operators are seeking to unload their aircraft while others are likely to wring out what remains of their aircraft's lifespans before pulling them out of service.

Conversions of widebody twins such as the 767 and A300/A310 types appear to be squeezing the TriStar cargo conversion out of the marketplace.

AIRFRAME

Cargo Conversion. Lockheed Aeronautical Systems Co and the UK firm of Marshall of Cambridge both offer a cargo conversion of the L-1011 based on a military freighter conversion Marshall developed for Britain's Royal Air Force. In 1994, American International Airways contracted Marshall to convert eight -200s, the first of which was redelivered in 1995. In 1996 Marshall began offering conversions of the -500, incorporating a 155-inch x 115-inch cargo door and capable of 135,000-pound cargo payloads on ranges up to 3,400 nautical miles.

Lockheed Aircraft Service also offered a modification of the L-1011-100/-200 variants. In this TriStar 2000 project, the aircraft would undergo structural strengthening and would be fitted with a cargo door measuring 4.3 meters x 2.9 meters. The modified TriStar would offer ranges of 4,600 kilometers (2,500 nm) and a payload of better than 55,400 kilograms (121,880 lb).

No customers emerged for the original Lockheed proposal, but in 1999 the company revived the program using Marshall's STC. Initially 13 ex-Delta TriStars are being converted and a total of 40 of that airline's aircraft may eventually be modified. Cost is approximately \$13 million per aircraft.

Lockheed has yet to announce a buyer for the 13 trijets, however, and the aircraft's acknowledged high maintenance costs may hinder the manufacturer's sales efforts. The window for this program may well have closed.

ELECTRONICS

TCAS II. Since 1994 all civil airliners with 30 or more passenger seats operating in US airspace have been operating with a Traffic Alert/Collision Avoidance System (TCAS) as mandated by the US FAA. TCAS is a family of airborne systems that operate independently of ground-based ATC systems. According to FAA officials, current TCAS II devices feature state-of-the-art Version 6.04A software which significantly reduces the false alarm rate.

Manufacturers of TCAS II systems, which cost \$120,000-\$145,000 each, include Rockwell Collins and Honeywell. TCAS II manufacturers will continue to refine and upgrade this equipment in the years ahead.

TCAS II has been mandated for US-registered freighters by the end of 2002, and several overseas regulatory agencies have also announced plans to require TCAS II installations. In light of the L-1011's already high maintenance and operating costs, the TCAS II decree may further accelerate the retirement of the existing TriStar cargo fleet.

GPS/FMS. In December 1994, the US FAA approved the NAVSTAR Global Positioning System (GPS) for en route operations over oceanic and remote areas with some restrictions. However, during 1997-98 concerns about over-reliance on the GPS as the sole means of navigation surfaced in the United States, with the threat of signal-jamming receiving particular attention.

In late 1998, the FAA said it would not approve GPA for sole-use navigation and it now appears the agency will extend and expand the existing Loran-C system as an economical backup to GPS, at least through 2008.

Nonetheless, we expect modest L-1011 GPS receiver retrofits even as the FAA and its overseas counterparts continue to explore alternative solutions.

FI's Opportunity Outlook

| | | | | | | | | | | | | | | | |
|-------------------------|---------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Program | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | 13 | 14 | 15 |
| AIRFRAME | | | | | | | | | | | | | | | |
| Cargo Conversion | | | | | | | | | | | | | | | |
| In Progress | +====> 13 L-1011 | | | | | | | | | | | | | | |
| Available | <===== 40-50 L-1011 | | | | | | | | | | | | | | |
| Program | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | 13 | 14 | 15 |

(chart continued on next page)

| | | | | | | | | | | | | | | | |
|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Program | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | 13 | 14 | 15 |
|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|

ELECTRONICS

TCAS

Anticipated <=====> 15-25 L-1011

GPS/FMS

Anticipated <=====> 15+ L-1011

| | | | | | | | | | | | | | | | |
|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Program | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | 13 | 14 | 15 |
|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
