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# **Spare Part Supply Chain: The case of airlines**

# CP

## ◆ CP is a Hong Kong based airline

- Established in 1946 to fly between HK, Australia, Southeast Asia. Introduced online reservation system

## ◆ Operational:

- CP worldwide staff 18528; HK staff 20,050
- Serves 119 destinations in 38 countries in 2009
- Length of scheduled route network 481,000 km
- Number of passengers 24,558,000

## ◆ Financial

- Revenue \$8,631 M; Profit 605 M in 2009
- 3<sup>rd</sup> most profitable airline in the world
- Major shareholders
  - » 42% Swire Pacific Limited
  - » 30% Air China Limited
  - » 3% CITIC Pacific

## ◆ Alliance

- Founding member of OneWorld: American Airlines, British Airways, Cathay Pacific, Iberia, Finnair, Japan Airlines, LAN (Latin American), Mexicana, Malév Hungarian Airlines, Qantas and Royal Jordanian.



# Fleet

## ◆ Fleet as of 2010

- 12 Boeing 777-300
- 18 Boeing 777-300ER
- 5 Boeing 777-200
- 20 Boeing 747-400
- 13 Boeing 747-400 BCF
- 6 Boeing 747-400F
- 6 Boeing 747-400ERF
- 11 Airbus A340-300
- 31 Airbus A330-300

## ◆ Total 128 aircrafts

## ◆ Average age of 10.8 years



Boeing 777; 2 engines

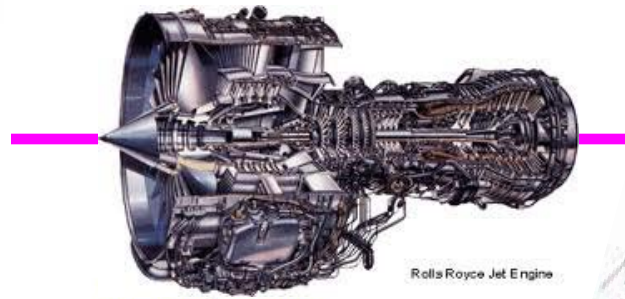
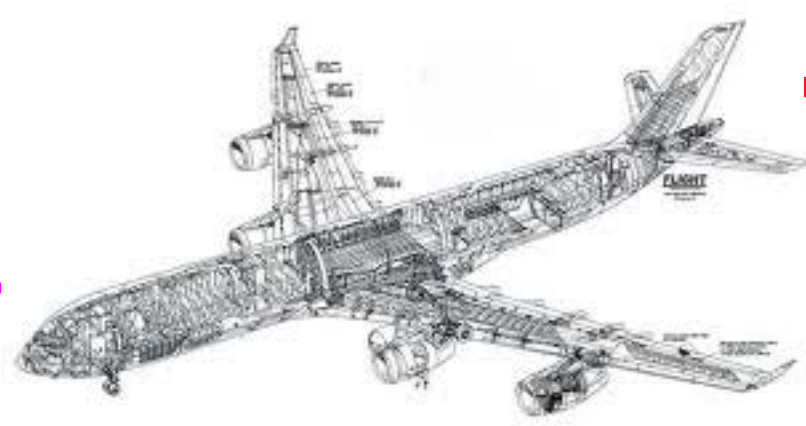
## ◆ Fleet on order

- 12 Boeing 777-300ER
  - Deliver by 2013
- 10 Boeing 747-8F
  - Deliver over 2010-2012
- 8 Airbus A330-300



Airbus 330; 2 engines

# Spare Part Classes



Rolls Royce Jet Engine



FUEL SYSTEM



Parts are also grouped according to criticality.

◆ Rotable, engine

◆ Repairable, fuel pump

◆ Expendable

Integral (close fit, extensive contact)  
dowel, sleeve

Non-integral (loose fit, limited  
contact), spring, bulb

◆ Consumable, fabrics

◆ Expendable-repairable, seat arm



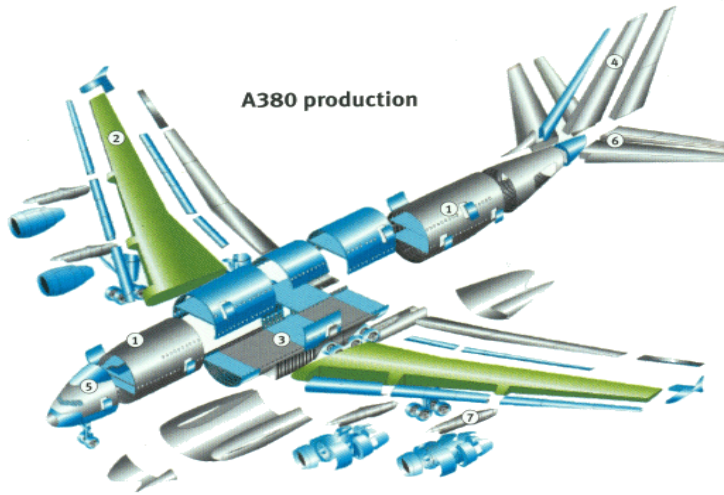
# Aviation Spare Parts Supply Chain Management

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- ◆ Procurement
  - Normal replenishment
  - Initial provisioning
  - Special provisioning
- ◆ Inventory Management
  - Monitor stock turnover
  - Order once reorder point is reached; Ultramain software
  - Against downtime
    - » Build safety stock
    - » Ship parts via same-day express delivery
    - » Borrow it from another airline
    - » International Airline Technical Pool:
    - » Borrow from another Cathay aircraft
- ◆ Repair Management
  - 300 major aircraft spare part repair shops
  - Aeroxchange system
- ◆ Logistics
  - Individual part shipments repair house to hubs to reduce lead times
  - Outsourced transport unserviceable spare parts to third party logistics companies

# AoG: Airplane on Ground, Costs \$60/min.

FoG: Fleet on Ground at Qantas, Nov 4-10 (perhaps more), 2010



- 1 Hamburg (AIL)
- 2 Broughton (UK)
- 3 St. Nazaire/Nantes (France)
- 4 Stade (AIL)
- 5 St. Nazaire/Méaulte (France)
- 6 Getafe/Puerto Real (E)
- 7 Toulouse (France)

An en-route engine failure on a flight Singapore -> Sydney leads Qantas to ground its fleet of 6 Airbus A380s.

Both Airbus and Boeing allow airlines to pick engines. Qantas picked **Rolls-Royce Trent 972** for its A380s.

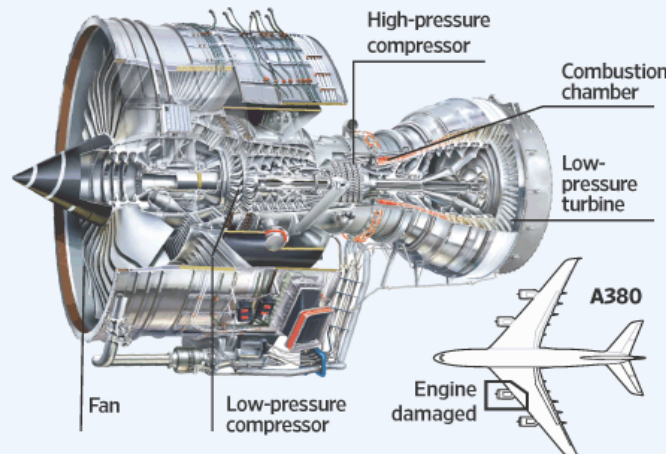
RR Trent 900 has two compressors, a tiled combustor and three types of turbines.

RR produces Trent 900 with partners:

[Industria de Turbo Propulsores](#) (turbine), [Hamilton Sundstrand](#) (electronic controls), [Avio S.p.A.](#) (gearbox), [Marubeni Corporation](#) (components), [Volvo Aero](#) (compressor), [Goodrich Corporation](#) (fan casings and sensors) and [Honeywell](#) (pneumatics).



**Under the Wing**  
Key parts of the Trent 900 Rolls-Royce engine



# What are challenges?

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- ◆ Infrequent (sporadic) demand, costly downtime
- ◆ Accurate demand forecasting
  
- ◆ Spare part obsolescence
  
- ◆ Expensive and complex parts
  
- ◆ Strict quality control standards
  
- ◆ Superior service level
- ◆ Low inventory holding cost

# How to handle shortages at CP?

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- ◆ Expensive AOG (Aircraft on Ground) order
  - Locating and securing part
  - Parts are similar; part databases have duplications
- ◆ Borrowing from another airline
  - Unwillingness to lend
  - Incompatibility of the part
- ◆ Borrow from another CP aircraft
  - The other aircraft is grounded
- ◆ Part pools, also see next page
  - Mechanisms to facilitate managing part pool inventories
  - Price of buying from the pool, paid to whom?

# Aeorxchange.com: Aviation (parts) supply chain solution

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- ◆ **AeroBuy**: “catalog-based procurement system that facilitates optimum value in the supply chain by connecting buyers and sellers”.
  - Portal for acquisition of technical parts from OEMs, surplus suppliers, distributors, airline surplus inventory.
  - Search supplier database, view results or pedigree documents and create Request for Quotes (RFQs).
  - For **normal provisioning**.
- ◆ **AeroAOG**: “solution for managing AOG situations”
  - An airline's loan/borrow/exchange business
  - Over 3.6 million unique part numbers stocked at 700+ global stations.
  - For **special provisioning**.
- ◆ **AeroRepair**: “manages the repair order lifecycle”.
  - Search repair capabilities from hundreds of providers by specific location or region.
  - Monitor order status, TAT (turnaround time) performance and track delays with exception reporting and status updates.
  - For **normal/special provisioning**.
- ◆ **AeroComponent**: “manages component support contracts for rotatable parts where fees are based on flight hours and cycles”.
  - Manages the entire transaction process from part request to serviceable replacement.
  - Tracks actual contract performance levels against targeted service levels.

# Outsource procurement of which parts?

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Outsource the procurement of the standard parts

# Why to use a third party logistics company?

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Focus on core business: aviation  
Provides technical capability  
Extensive network

# Policies of Southwest Airlines (SWA)

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Keep two spare aircrafts in Dallas to substitute for broken-down aircrafts. SWA is not a part of an airline alliance.

In case of AoG, the entire associated department is dedicated to find a quick solution. The department locates the needed part and if necessary ships it by the first available flight.

Since SWA operates only Boeing 737's, the inventory of a lot of parts are compatible with the 300, 500 and 700 series. Compatibility reduces the inventory held. Spare part inventory for different series can be pooled.

SWA lends parts and receive parts from other airlines. This practice is quite widespread, but limited by the compatibility of aircraft model.

# SWA Policies

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It has been observed that spares were bought from other airlines often at exorbitant rates. In other words, the airline that ships the part charges a very high price for the part.

Most of the spare parts shipped from suppliers are shipped by either FedEx, UPS or third party logistics providers.

For spare parts to be shipped to other facilities, use of a third party can be a costly proposition as the airline can more or less ship it for free, unless it is a hazardous material.

The last **two pages** are based on Tejas Govande's statements.

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He focuses on spare parts inventory.