SIMLAB Technologies

SIMSPAIR

High-Fidelity Rotables Optimisation

Case Studies

Low Cost Carrier (LCC) Operations
An MRO company supporting LCCs in China and South East Asia is supporting multiple contracts, differing in service levels and penalty structures, using a single pool of spare parts inventory. D-SIMSPAIR is used to determine the optimal levels of components required at all main bases and outstations, taking into account all contract constraints.

Component Support Contract Design
An Original Equipment Manufacturer (OEM) bidding for a component support contract has the option to propose different service levels, penalty structures and associated charges. D-SIMSPAIR is used to determine the marginal cost for various service levels along with value- added services of mainbase consignment backfill and outstation coverage.

Component Support Contract Execution
An OEM provides component support services for a long-term contract with a fleet ramp-up. D-SIMSPAIR is used on a regular basis to determine optimal additional components to be deployed in the network as well as re-distribution of existing spares needed to minimise risk of AOG.

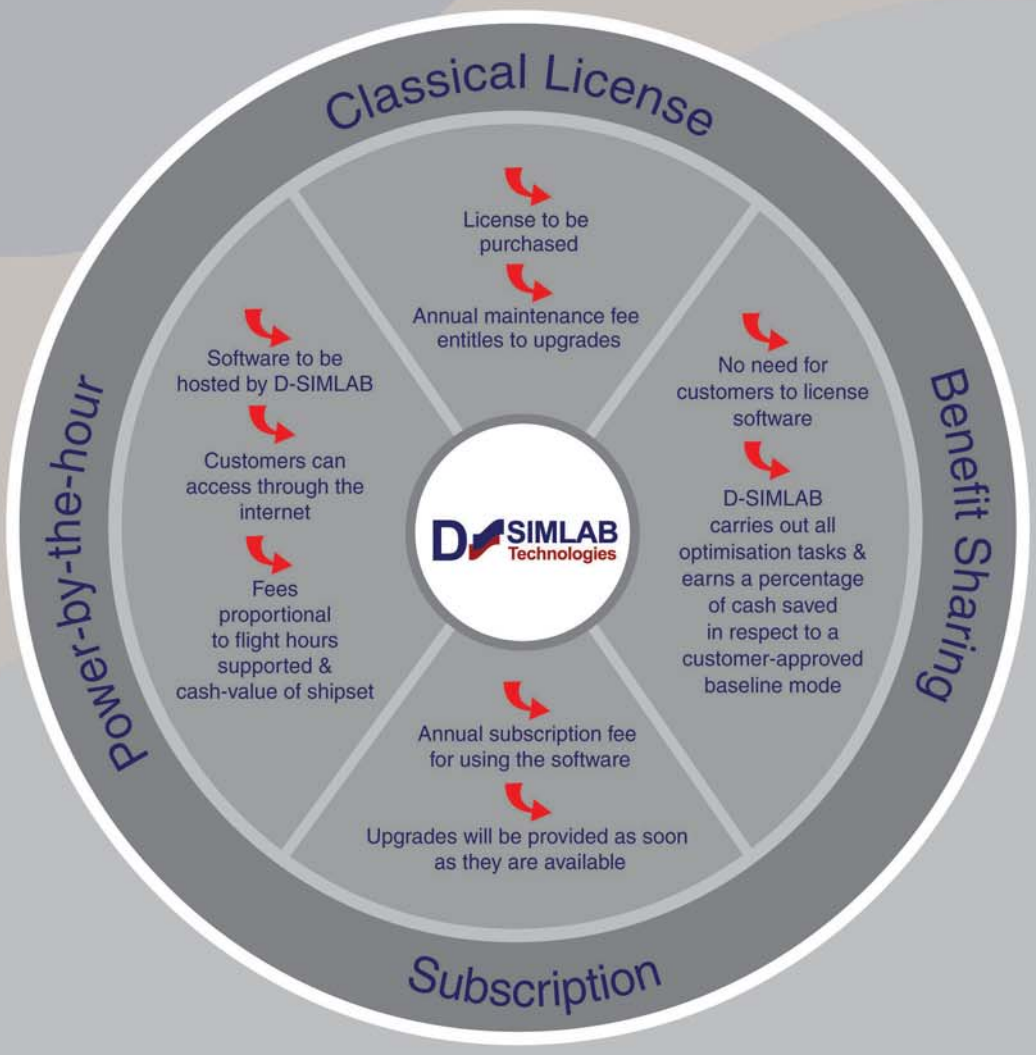
Mission-Centric Operations
An OEM manages component support contracts for helicopter fleets owned by multiple operators. D-SIMSPAIR is used to study the synergy between the different inventory pools in such a mission-centric network.

Great Expectations

A 10-year support contract was signed with OEMServices (JV between Diehl Aerospace, Liebherr, Thales and Zodiac). Under this contract, D-SIMLAB regularly re-optimises the spare parts inventory allocations and the logistics policies within the continuously evolving network of destination airports served by OEMServices' Airbus A380 customers (currently Singapore Airlines and Emirates).

D-SIMLAB's simulation-based spare parts optimisation approach makes sure that the specific constraints arising from our tailor-made service contracts with different A380 operators are taken into account with sufficient accuracy. This is absolutely critical for us since it allows us to ensure a high service level even at our customers' outstations.

Jean-Noel Barrere, OEMServices, President



Commercial Engagement Modes

Strategic and Tactical Questions

How many spares to be kept where?
What is the risk associated with not positioning any spares at certain locations?

What service levels can be committed with what confidence?
How can this be done at minimum cost?

What is the effect of changes of critical parameters such as delivery time commitment, performance monitoring period and repair turnaround time?

Operational "Day-to-Day" Questions

How to move inventory within the network to minimise risk when a spare component has been consumed at a high-demand destination airport?

To what location should a component be returned to after repair?

Critical Challenges in Rotables Management

1 Dozens of aircraft to be supported in a complex, diverse network

2 Hundreds of part numbers to be handled

3 Different essentiality codes, failure characteristics and interchangeability constraints

4 Emergency demand or planned maintenance demand

5 Different service commitments and penalty structures negotiated with different operators

Significant cost reductions

- Up to 25% for a main base focused, single-operator support contract, compared to conventional Poisson-based approaches
- Up to 40% in a multi-station, multi-operator environment

Competitive service offering enabled

- Component support service extended to outstations
- Customised contracts based on presently deployed spare part inventories

Maintainable benefit across entire service lifecycle

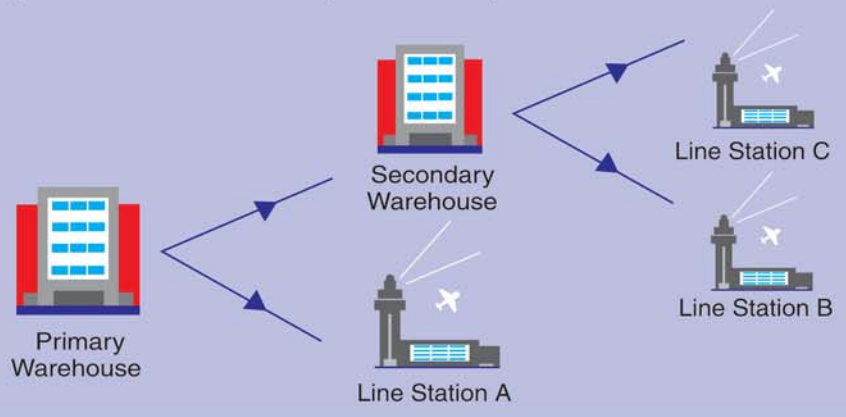
- Before ramp-up of new aircraft entering into service - for Initial Provisioning, design of logistics support structure and contract negotiations with operators
- During ramp-up - to minimise costs at a time when spare parts are still provided under warranty
- In a matured network - to minimise redundancies and eliminate inefficiencies at all times

Value Proposition

Comprehensive Component Logistics

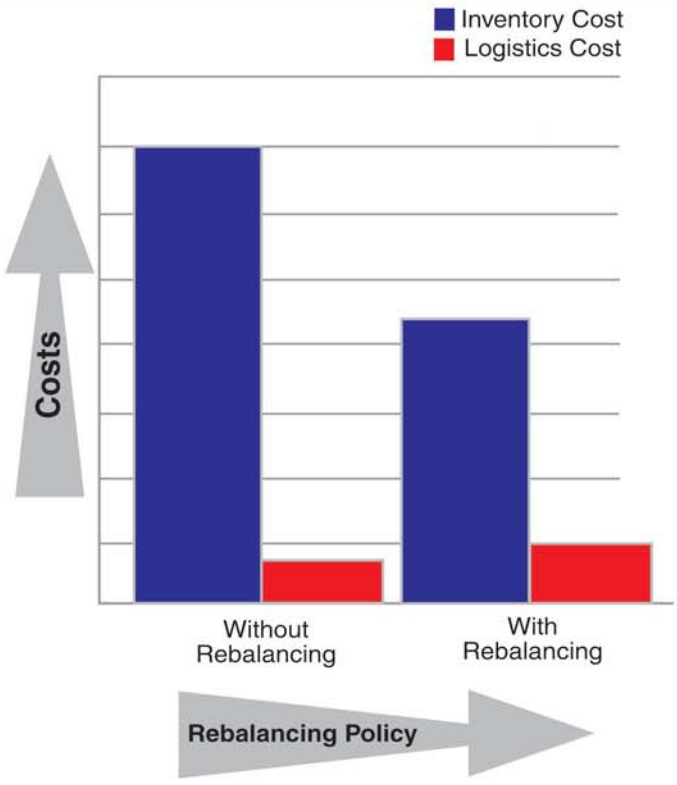
Warehouse Structure

Hierarchical structure of warehouses and line stations used to store components with different replenishment policies



Rebalancing

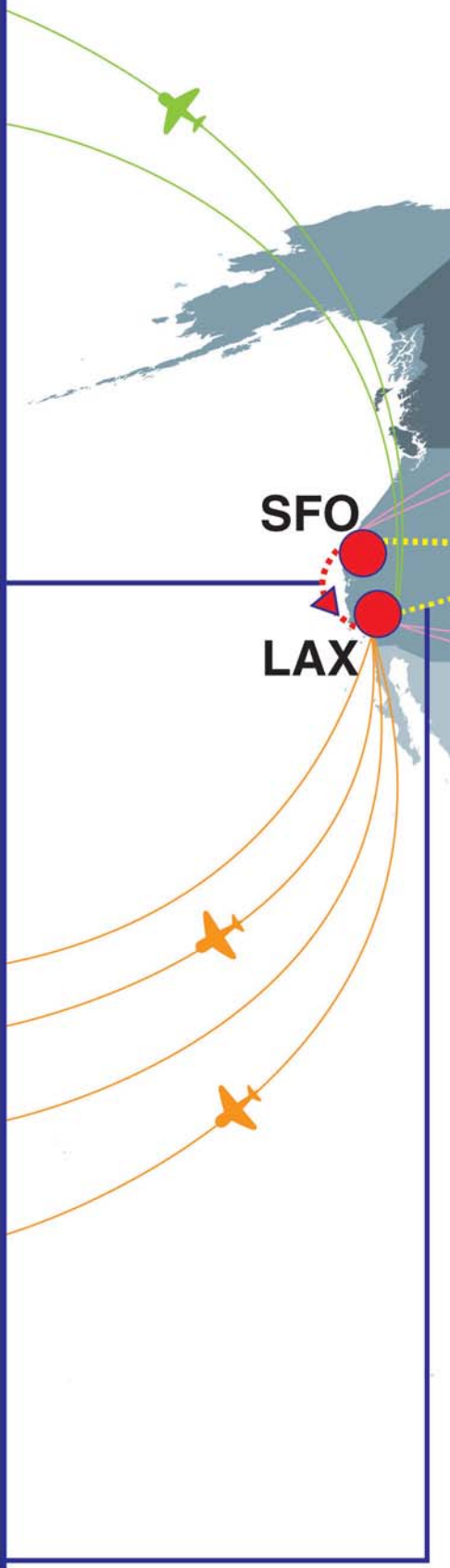
Proactive measure of relocating spares inventory after a component exchange to minimise risk of not being able to meet demand from subsequent component failures



Repair

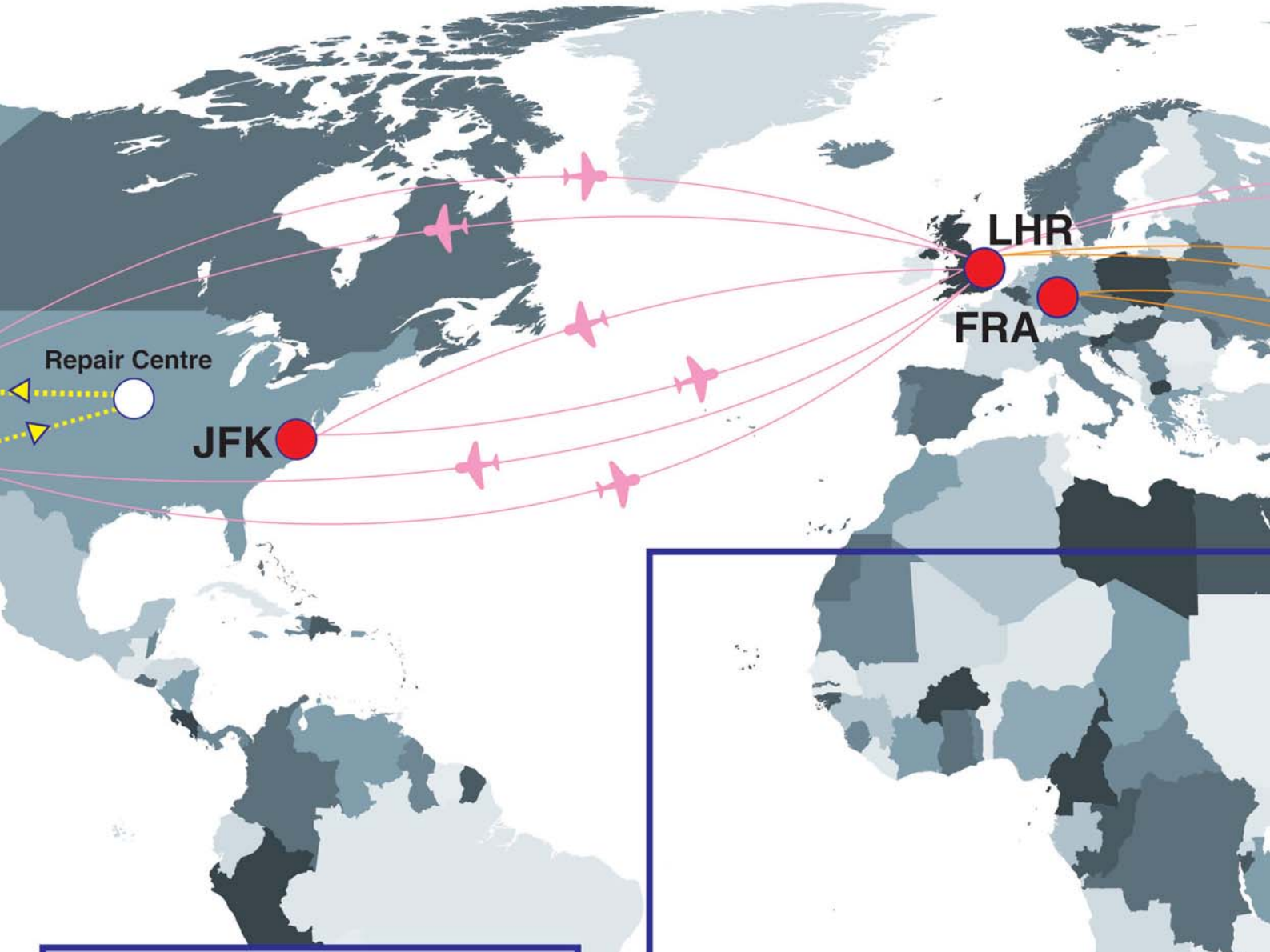
Movement of an unserviceable component from the aircraft to the repair center and back, including related repair cycle parameters and return policies

- Multiple repair return policies including Return-to-optimal-location and Return-to-source-location can be modelled including any additional steps in the repair cycle
- Scrapping of parts and subsequent reordering can be portrayed
- Location-based and component-specific repair turnaround time can be taken into account



D-SIMSPAIR

High-Fidelity Rotables Optimisation



Part Interchangeability

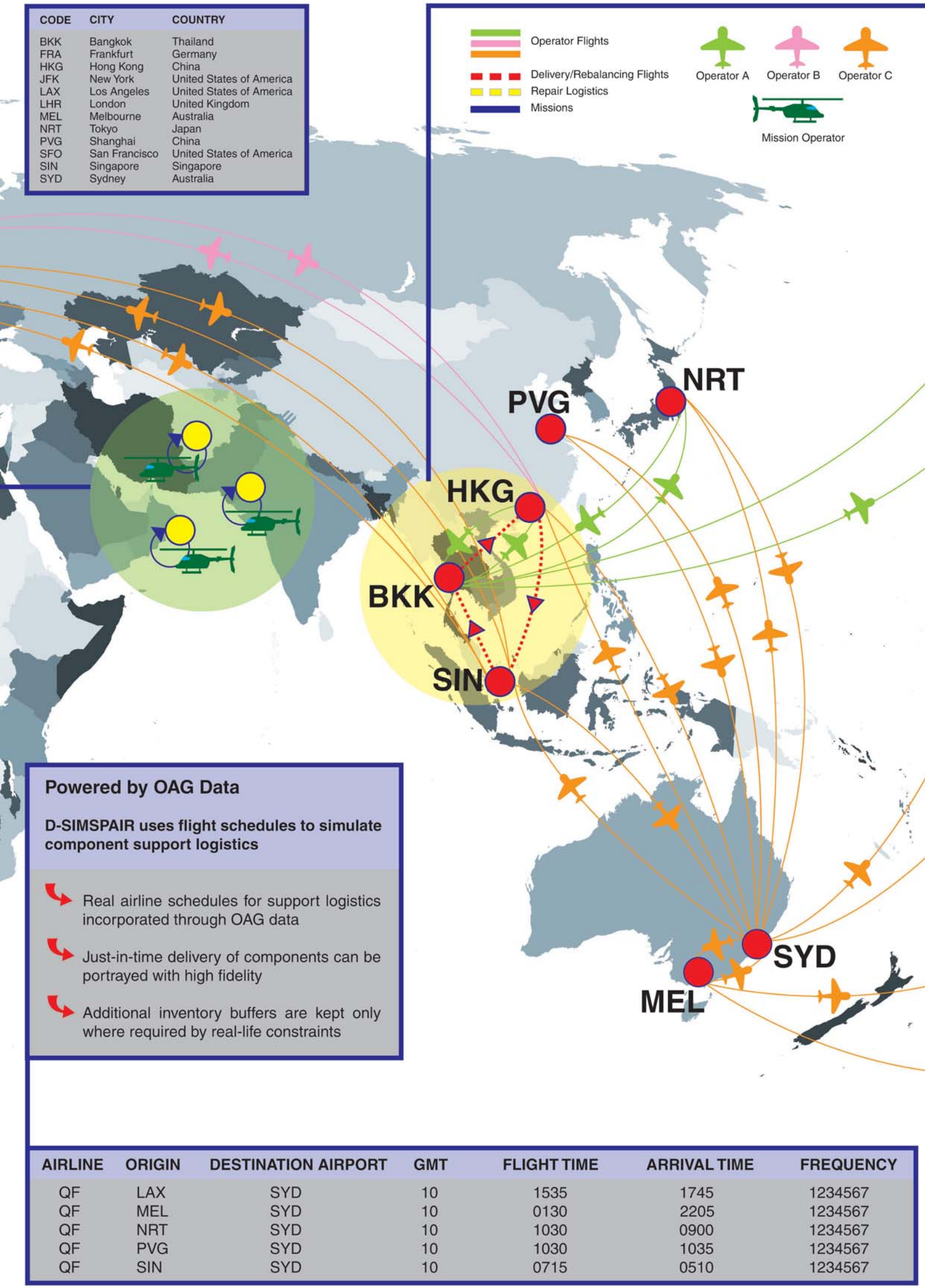
Different configurations of a component can or cannot be interchanged with each other based on specific interchangeability conditions

- One-way Interchangeable - New part number is acceptable as replacement for both new and old part number, but old part number can be used as replacement for old part number only
- Two-way Interchangeable - Both new and old part numbers are acceptable as replacement for new and old part numbers
- Not Interchangeable - Old part number can only be replaced by old part number and new part number can only be replaced by new part number
- Contracts with components groups having different interchangeability codes can be optimised

Mission-Centric Operations

Unscheduled and frequent field missions supported by a customised logistics network

- Helicopter operations for oil rig support, military logistics as well as emergency and rescue missions can be analysed
- Military aircraft fleets including mission profiles and security constraints regarding component transportation can be taken into account
- Aircraft and fleet readiness can be studied
- Performance-Based Logistics (PBL) contracts for mission-centric operations can be designed and executed



CODE	CITY	COUNTRY
BKK	Bangkok	Thailand
FRA	Frankfurt	Germany
HKG	Hong Kong	China
JFK	New York	United States of America
LAX	Los Angeles	United States of America
LHR	London	United Kingdom
MEL	Melbourne	Australia
NRT	Tokyo	Japan
PVG	Shanghai	China
SFO	San Francisco	United States of America
SIN	Singapore	Singapore
SYD	Sydney	Australia

Powered by OAG Data

D-SIMSPAIR uses flight schedules to simulate component support logistics

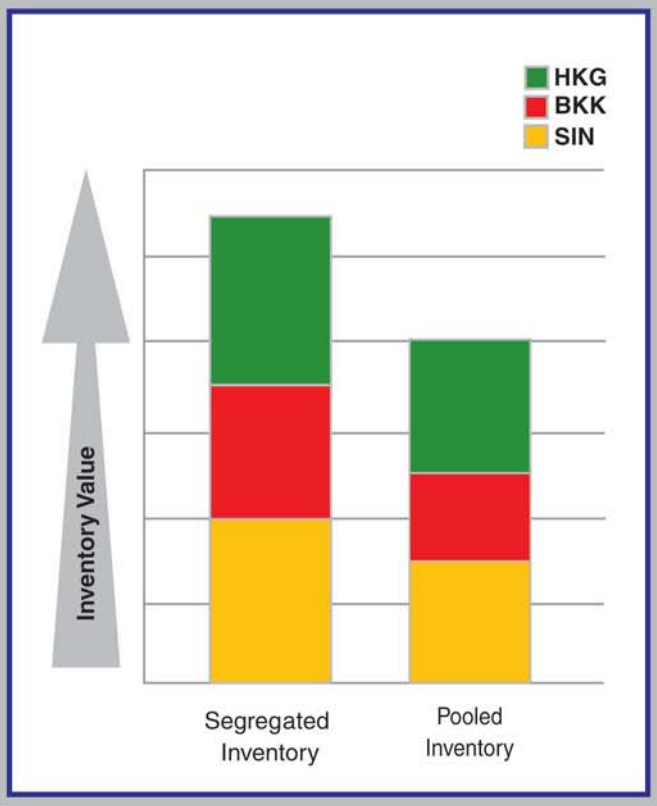
- Real airline schedules for support logistics incorporated through OAG data
- Just-in-time delivery of components can be portrayed with high fidelity
- Additional inventory buffers are kept only where required by real-life constraints

AIRLINE	ORIGIN	DESTINATION AIRPORT	GMT	FLIGHT TIME	ARRIVAL TIME	FREQUENCY
QF	LAX	SYD	10	1535	1745	1234567
QF	MEL	SYD	10	0130	2205	1234567
QF	NRT	SYD	10	1030	0900	1234567
QF	PVG	SYD	10	1030	1035	1234567
QF	SIN	SYD	10	0715	0510	1234567

Pooling Synergies

Multiple locations served by a single inventory pool by delivering components just-in-time

- Pooling synergy between different airlines can be quantified
- Re-usability of spares at nearby airports can be quantified and overall asset utilisation can be maximised

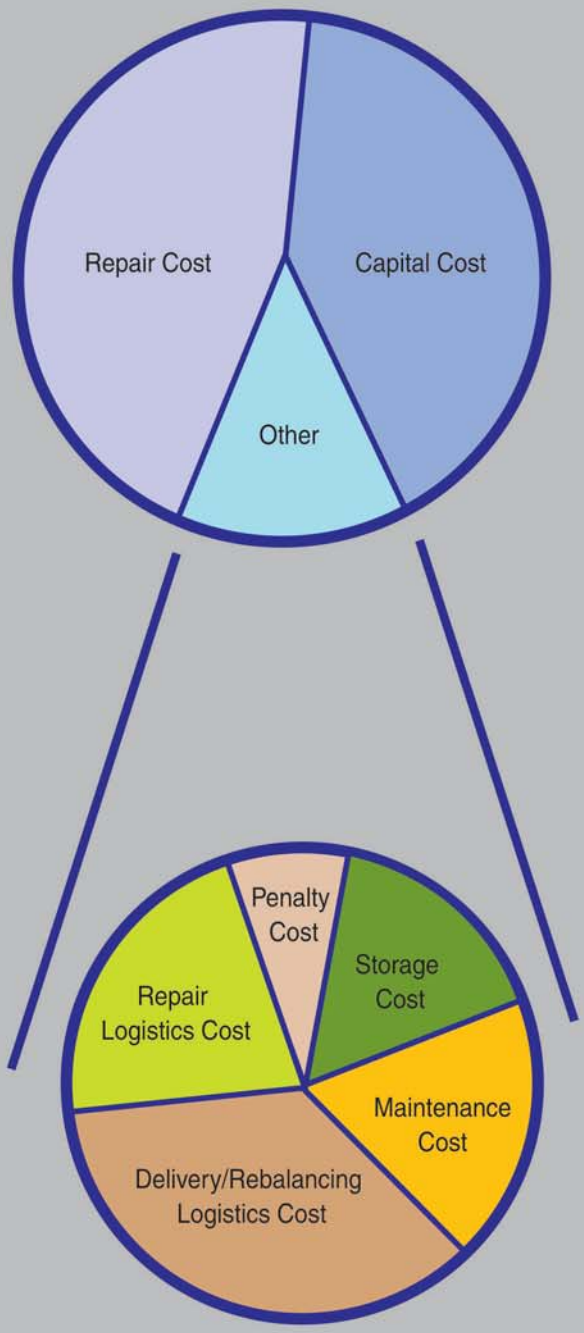


- Effect of delivery time commitment on pooling can be studied

Lifecycle Cost Modelling

Model costs to execute a component support contract including capital cost as well as storage, logistics, maintenance and penalty cost

- Multiple penalty structures with different operators can be taken into account to derive an optimised consolidated set of contracts
- Location-based and component-specific storage, maintenance and logistics costs can be modelled
- Logistics costs can be further broken down into delivery, replenishment and rebalancing costs
- Additional costs can be potrayed, enabled by the underlying high fidelity simulation modelling approach



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