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Airbus Spares Support and Services

AGENDA

▶ *Market Situation*

▶ *Spares Planning for maintenance*

▶ *How much is enough?*

▶ *Conclusion: Spares Supply Logistics*



Home

Airbus today

Shareholders



80%

BAE SYSTEMS

20%



AGENDA

Market Situation

Spares Planning for maintenance

How much is enough?

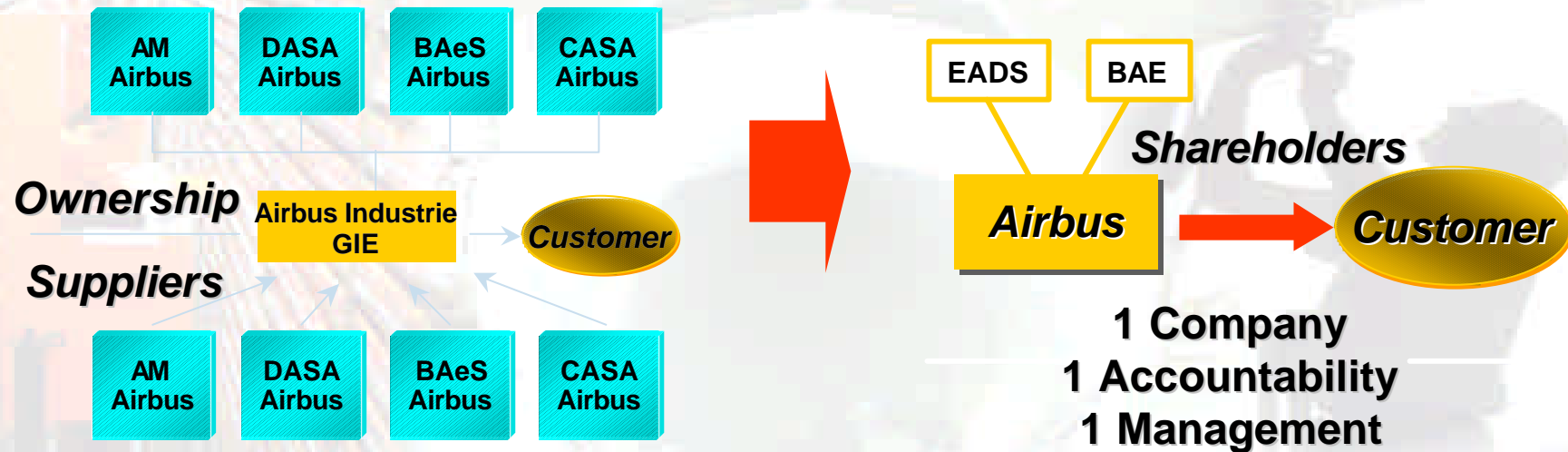
Conclusion: Spares Supply Logistics



Home

New Airbus organisation

Create an integrated, highly competitive company



Yesterday

- 4 national managements
- National companies optimising their performance

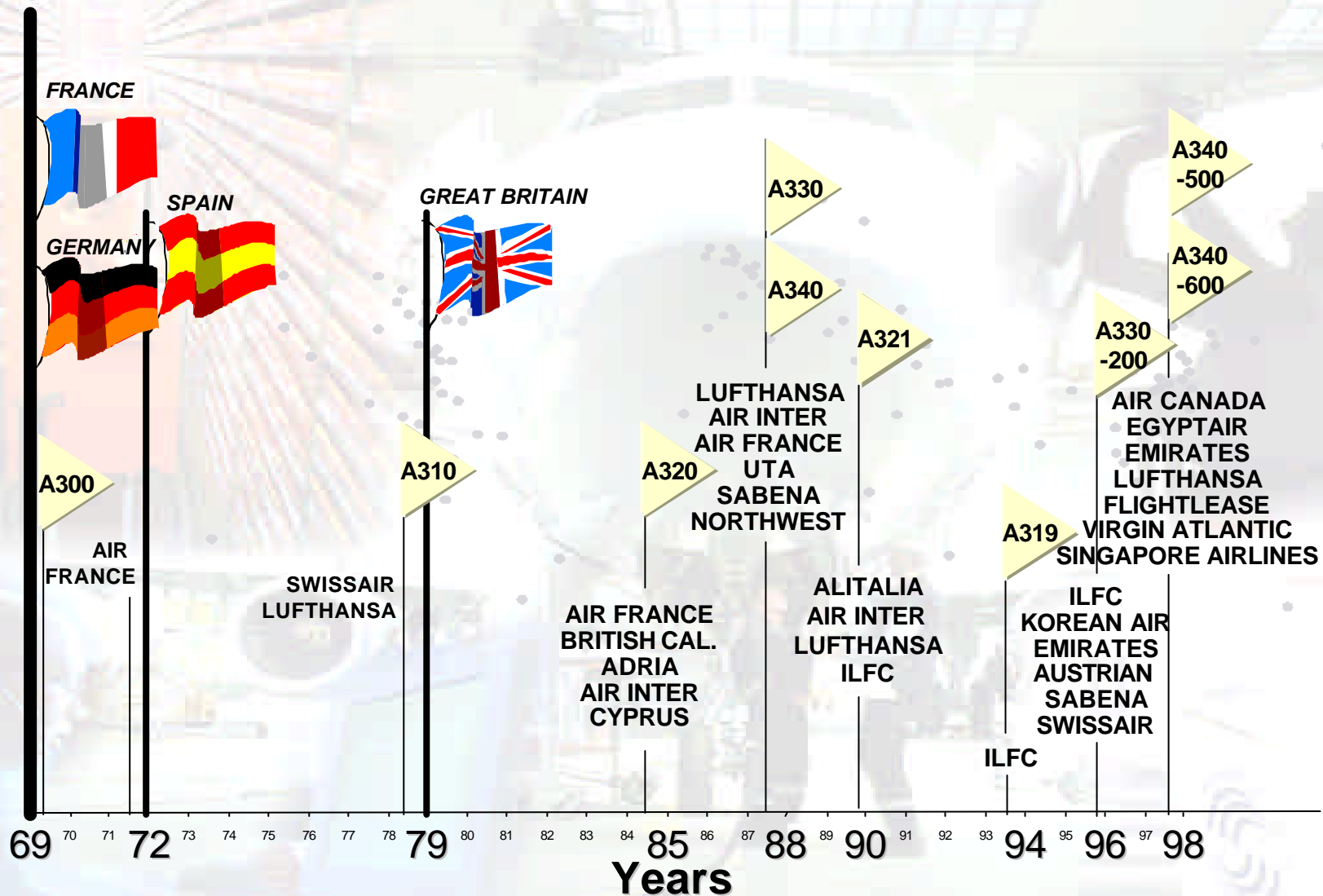
Now

- One management line
- One company with one target to enhance the performance of Airbus
- Clear accountabilities

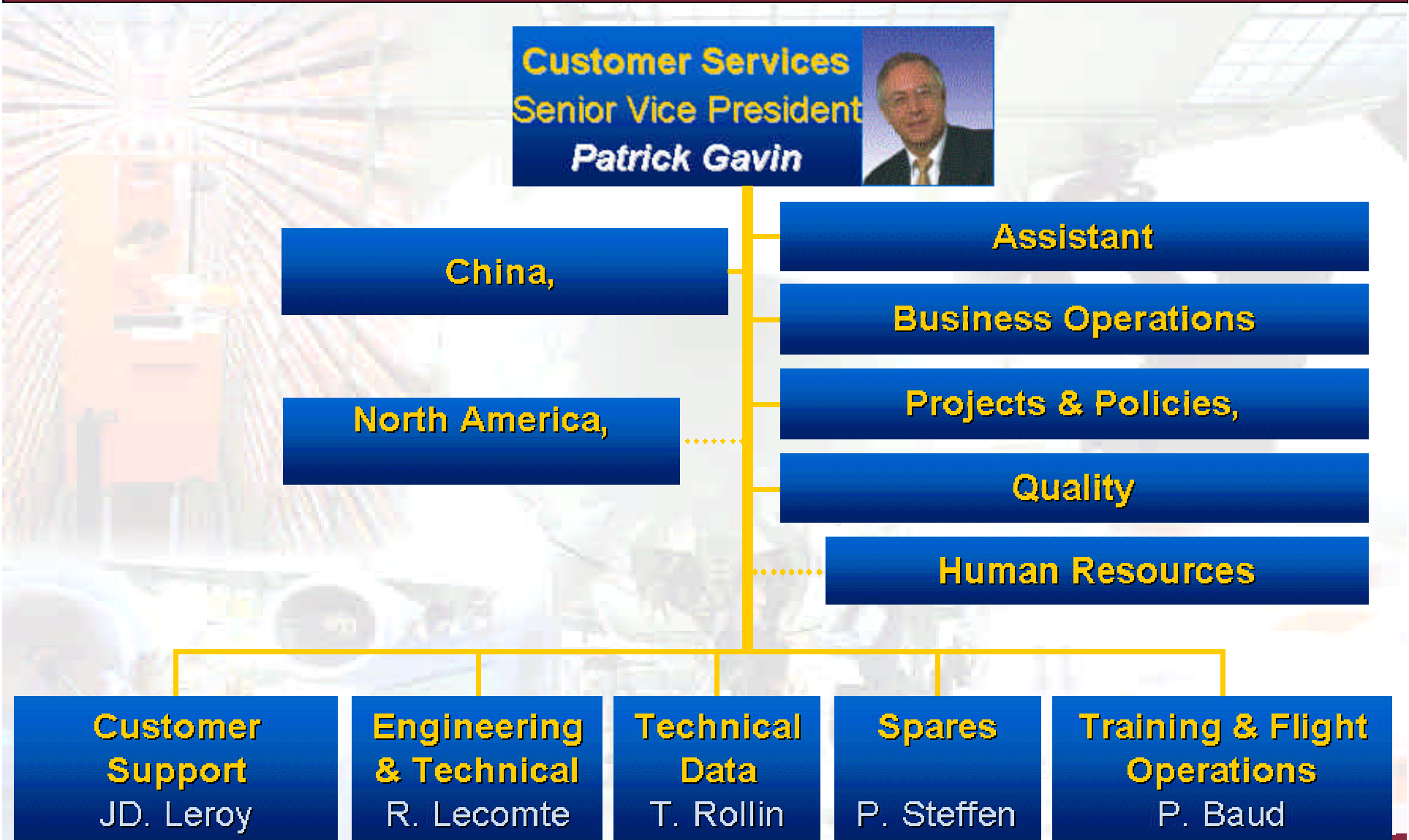
Deliver faster and better solutions to the Customer

Airbus worldwide

AIRBUS INDUSTRIE



Customer Services management structure



Airbus Customer Services

Mission

*“To ensure safety of operations.
To maintain high level of customer satisfaction.”*



**To be the undisputed
Number 1 in Customer Services**

Airbus Customer Services

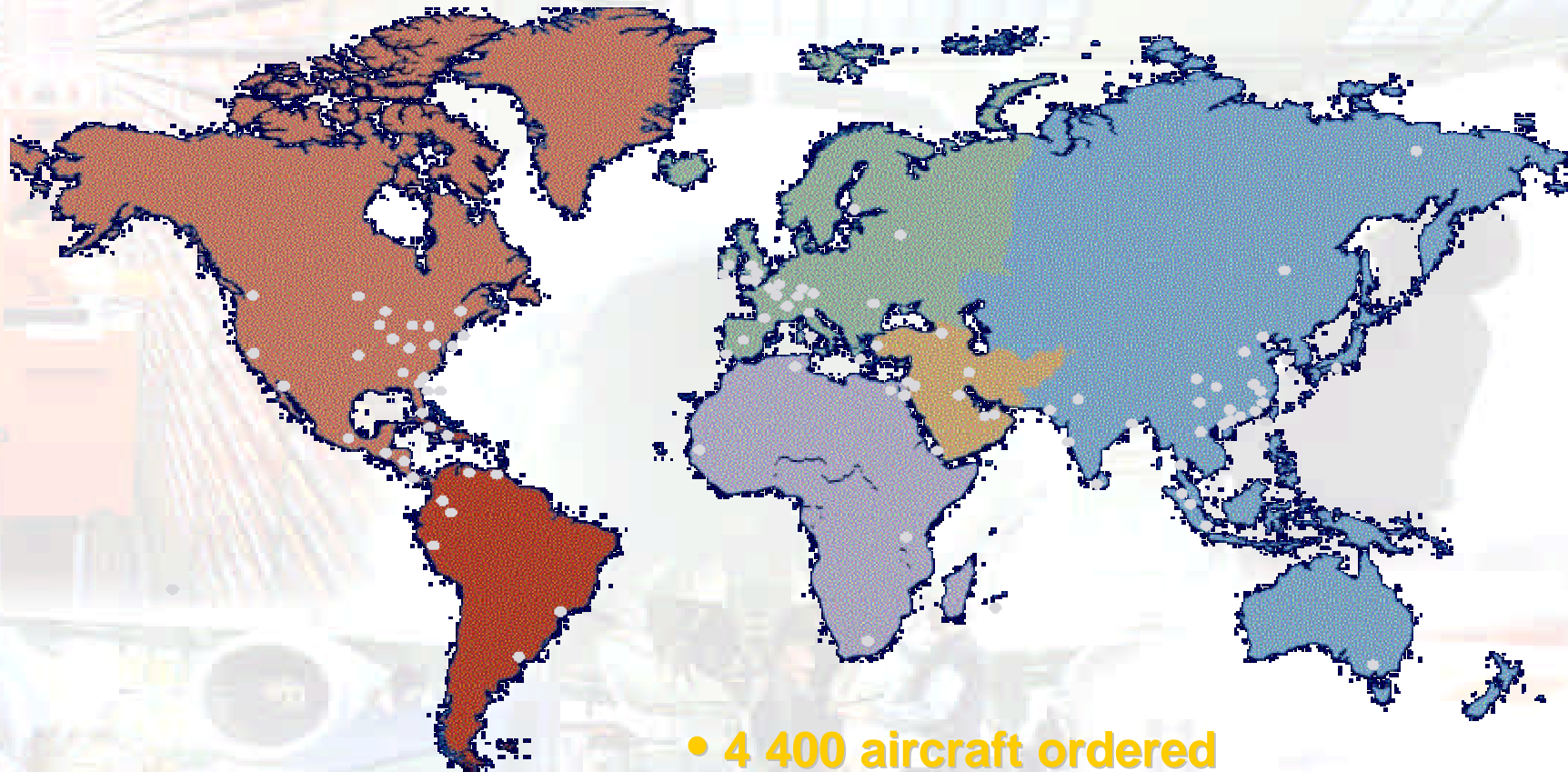
Operational objectives

- Support customised to customer requirements
- Materiel and engineering support available on a 24-hour basis
- A wide range of services to help ensure that the customer's fleet is flying on schedule



*Our customers get the best
operational results
from their fleet*

Airbus worldwide



- 4 400 aircraft ordered
- 2 700 in service
- 188 customers / 178 operators

Airbus Product Line

12 models
2,800 delivered
303 2002 production



4,400 aircraft sold to
188 customers

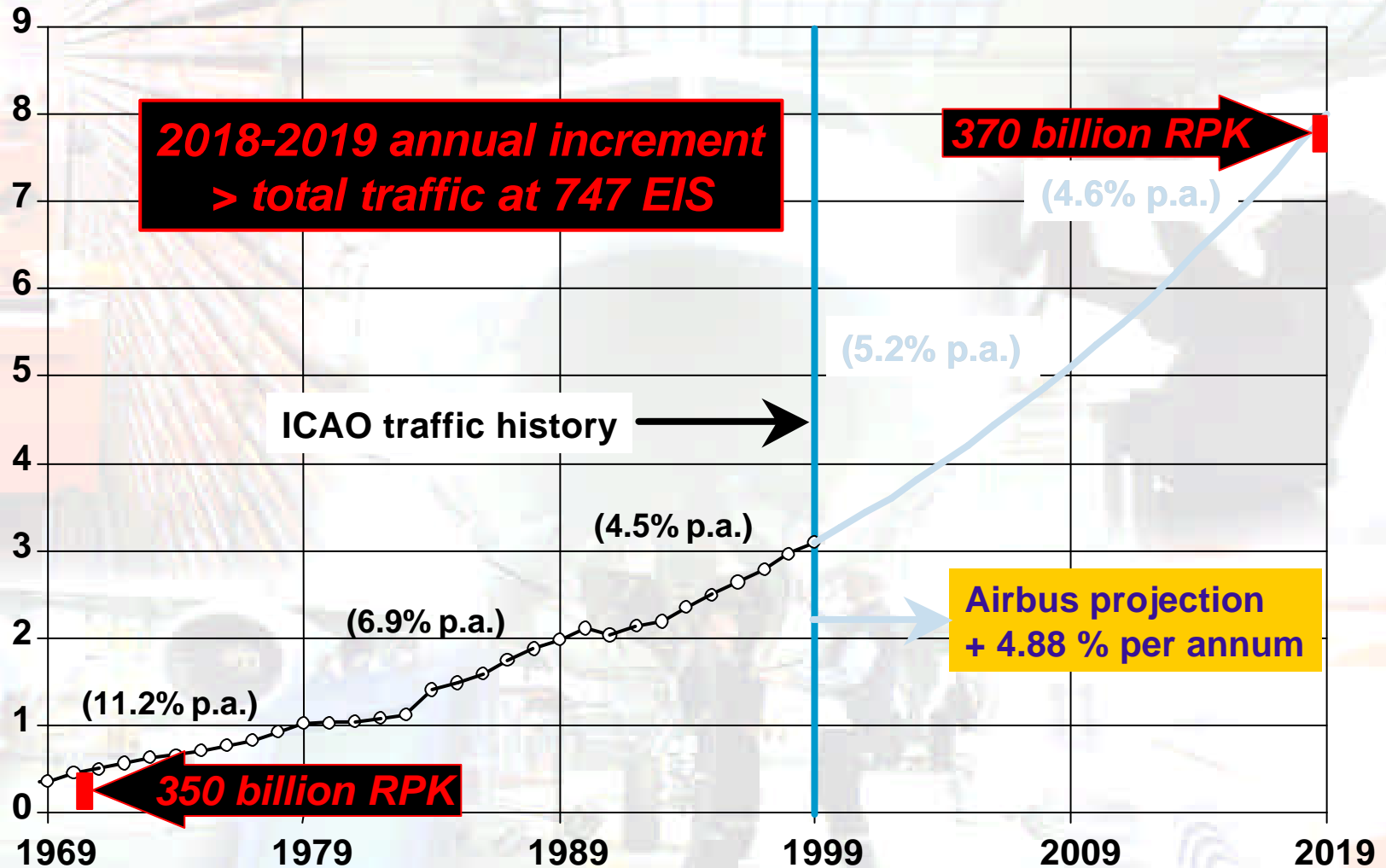
An Airbus aircraft takes off



. . . . every $5\frac{1}{2}$ seconds

Air travel will continue to grow strongly

World annual traffic - trillion RPK





20-year forecast (2000-2019) - World

15,403

new passenger and cargo aircraft

valued at

\$1.3 trillion

768

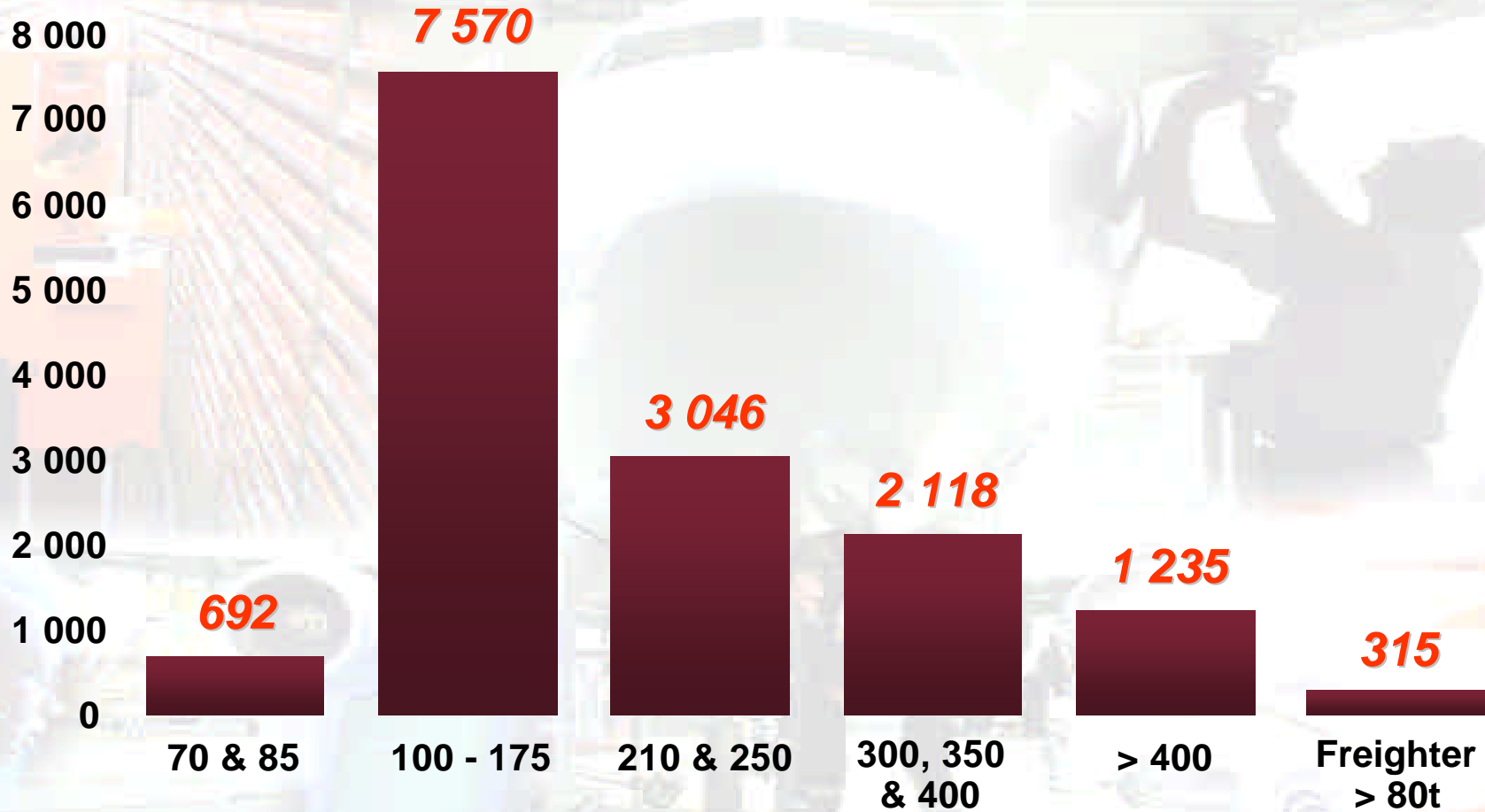
new passenger and cargo aircraft per year

Valued at

\$65 billion

New aircraft deliveries

Number of aircraft



★ Mission and Role



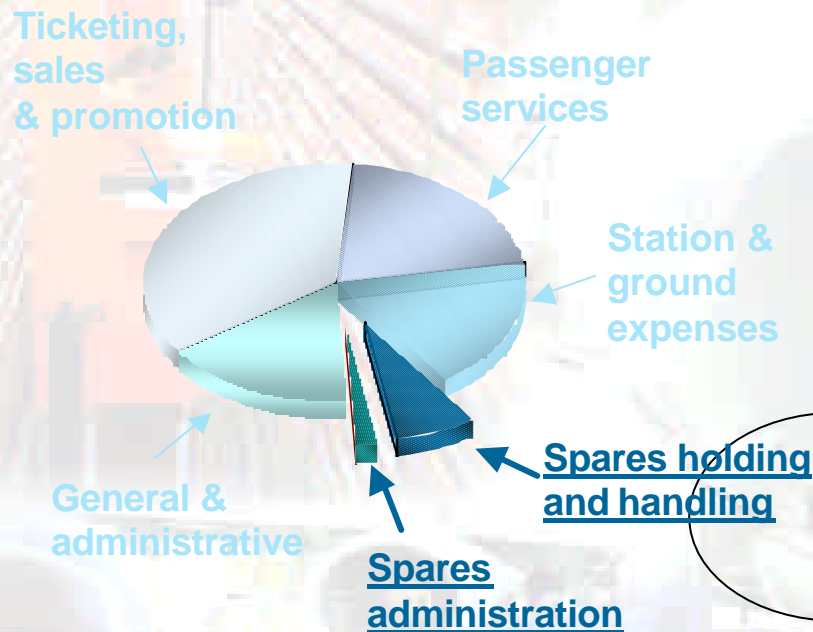
Delivering aircraft value

- **Safety**
- **Spares to assure operational reliability**
- **Operating costs reduction**

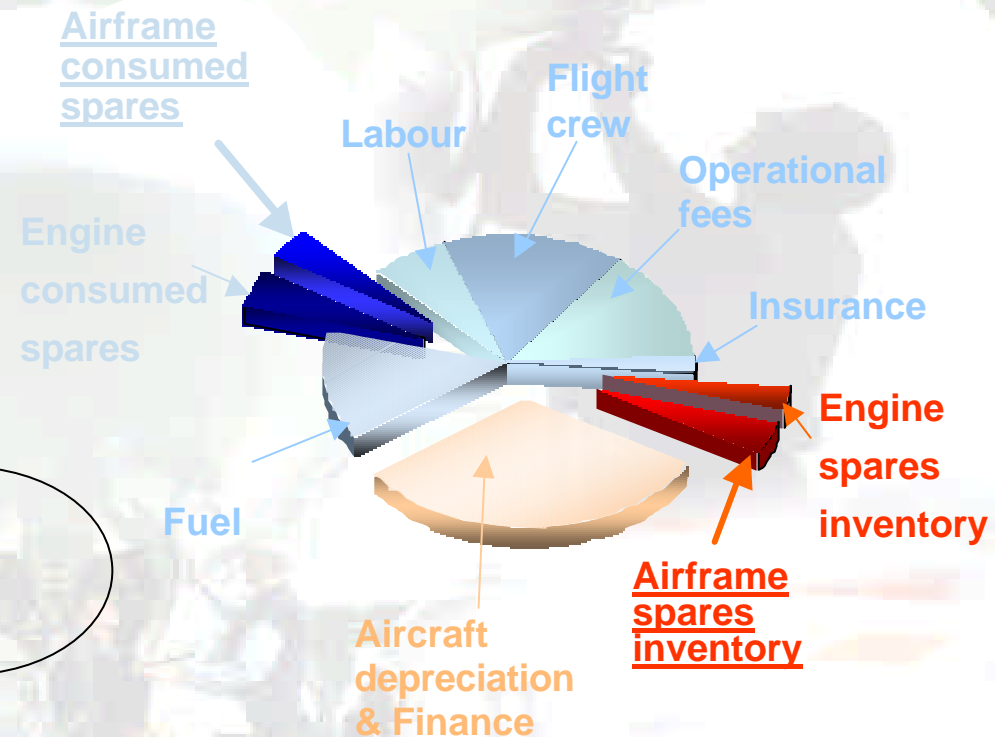
➔ **To contribute to the sale of more Airbus Aircraft**

Optimizing utilization, reliability & costs

Indirect Operating Cost (IOC)



Direct Operating Cost (DOC)



8 - 9 % of OC is influenced by materiel

Matériel Supply and Services

→ Airbus Matériel Support's operation



- ⇒ **Assuring supply and availability of Airbus spares world-wide**
120,000 different part numbers on stock
1,5 million part numbers in database



- ⇒ **Order desk services for all maintenance needs**
24 hours around the clock
192,000 customer orders
US\$ 327 million turnover



- ⇒ **Full spare parts data and provisioning support**
101 days of consultancy and provisioning conference
2800 spares investment forecast studies



- ⇒ **Consultancy and On-site spares assistance**

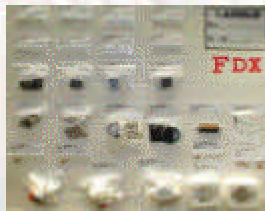
To operate as a service centre in providing matériel and related services for the Airbus fleet world-wide.

Matériel Supply and Services

→ Matériel supply



Proprietary Parts



Modification and Repair Kits



Vendor parts



GSE and Tools

Supply management of Standard hardware and Raw bulk materiel.

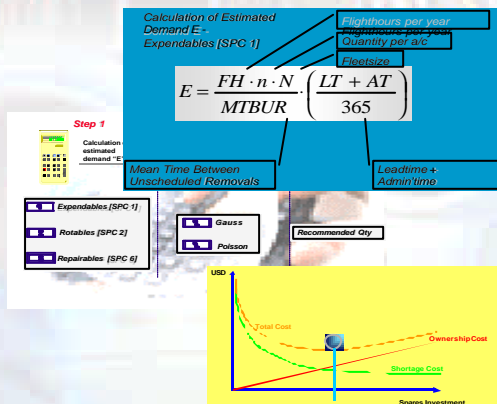
✦ Materiel Management Seminar

Entry Into Service



- Since 2001
- 70 customer participants to date
- Classroom style and case study
- Best industry practice
- AIRBUS benchmark

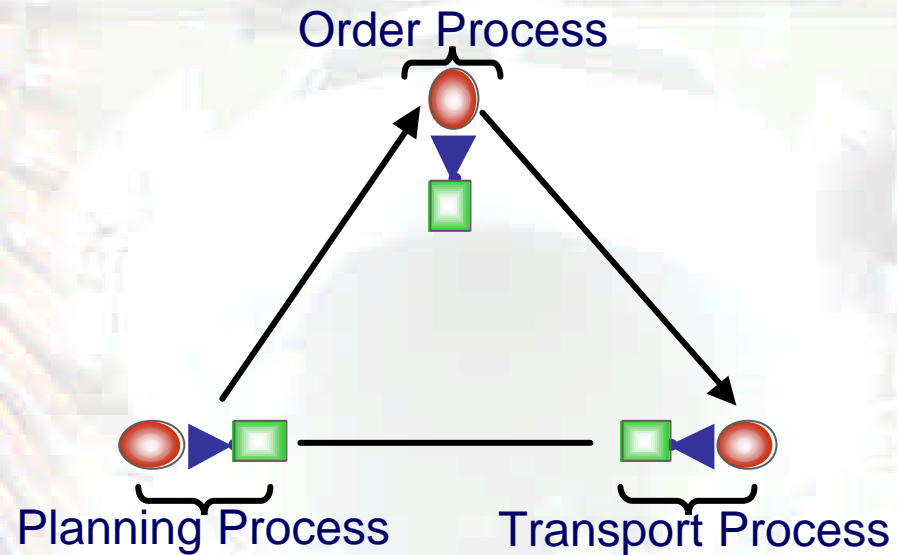
- Customer training for key airline staff
- Helping customers to improve cost effective materiel management in daily business
- Learning about cost implications of materiel management



Consultancy Services

Supply Chain Consultancy

- **Elements**

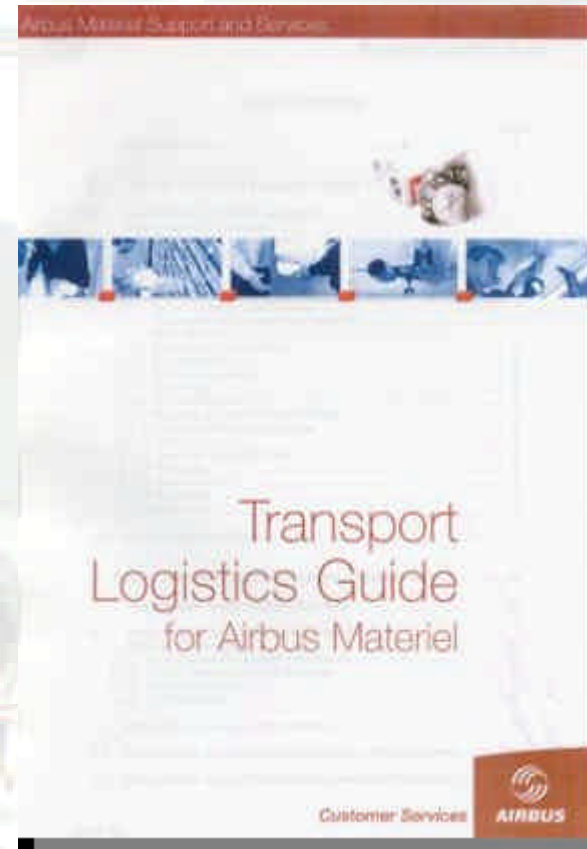


- **Analysis**



✦ Airbus Transport Logistics Guide

- Investigation in Transport Logistics
- General Conditions on Transport
- General Routing Instruction
- Airbus Materiel Support Transport
- Logistics.



AGENDA

Market Situation

Spares Planning for maintenance

How much is enough?

Spares Supply Logistics Management



Home

Mathematical Model

Step 1



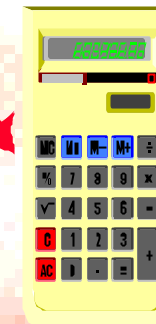
Calculation of estimated demand "E"

Step 2

	1.0	1.1	1.2	1.3
0
1
2

Gauss/
Poisson
Tables

Step 3



Rec. Qty



Expendables [SPC 1]



Rotables [SPC 2]



Repairables [SPC 6]



Gauss



Poisson

Recommended Qty

Mathematical Model - Step 2

Calculation of Recommended Quantity m

$E > 10$

$$m = f(\alpha, E) = \alpha \cdot \sqrt{E} + E$$

Gauss factor

Estimated demand

$E < 10$

$$m = f(PL, E)$$

Protection Level

Poisson distribution

Mathematical Model - Step 1

Calculation of Estimated Demand E - Repairables [SPC 6]

Flighthours per year

Quantity per a/c

Fleetsize

$$E = \frac{FH \cdot n \cdot N}{MTBUR} \cdot \left[\left(\frac{TAT}{365} \right) \cdot \left(1 - \frac{SR}{1000} \right) + \frac{SR}{1000} \cdot \left(\frac{LT + AT}{365} \right) \right]$$

Mean Time between Unscheduled Removals

Scrap Rate

Leadtime + Admin'time

Turnaroundtime = MSPT+TT

Mathematical Model - Appendix III

→ Example for the calculation of recommended quantities using the Poisson distribution for $E < 10$

$$E = \frac{3000 \text{ FH} \cdot 1 \cdot 3 \text{ a/c}}{20000 \text{ h}} \cdot \frac{30 \text{ days}}{365 \text{ days}}$$

Estimated Demand $E = 1,1$

Protection Level $PL = 95\%$

The Protection Level value of the calculated Estimated Demand is between
 $PL [m=2] = 0.900$
and $PL [m=3] = 0.974$

Poisson Distribution Table

m	Estimated Demand [E]										
	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0
0	.368	.333	.301	.273	.247	.223	.202	.183	.165	.150	.135
1	.736	.699	.663	.627	.592	.558	.525	.493	.463	.434	.406
2	.920	.900	.879	.857	.833	.809	.783	.757	.731	.704	.677
3	.981	.974	.966	.957	.946	.934	.921	.907	.891	.875	.857
4	.996	.996	.992	.989	.986	.981	.976	.970	.964	.956	.947
5	.999	.999	.998	.998	.997	.996	.994	.992	.990	.987	.983
6	1.000	1.000	1.000	1.000	.999	.999	.999	.998	.997	.997	.995
7					1.000	1.000	1.000	1.000	.999	.999	.999
8									1.000	1.000	1.000

Since $PL = 95\%$ is above $PL [m=2] = 90\%$, the result is
==> Recommended Quantity $m = 3$

BACK

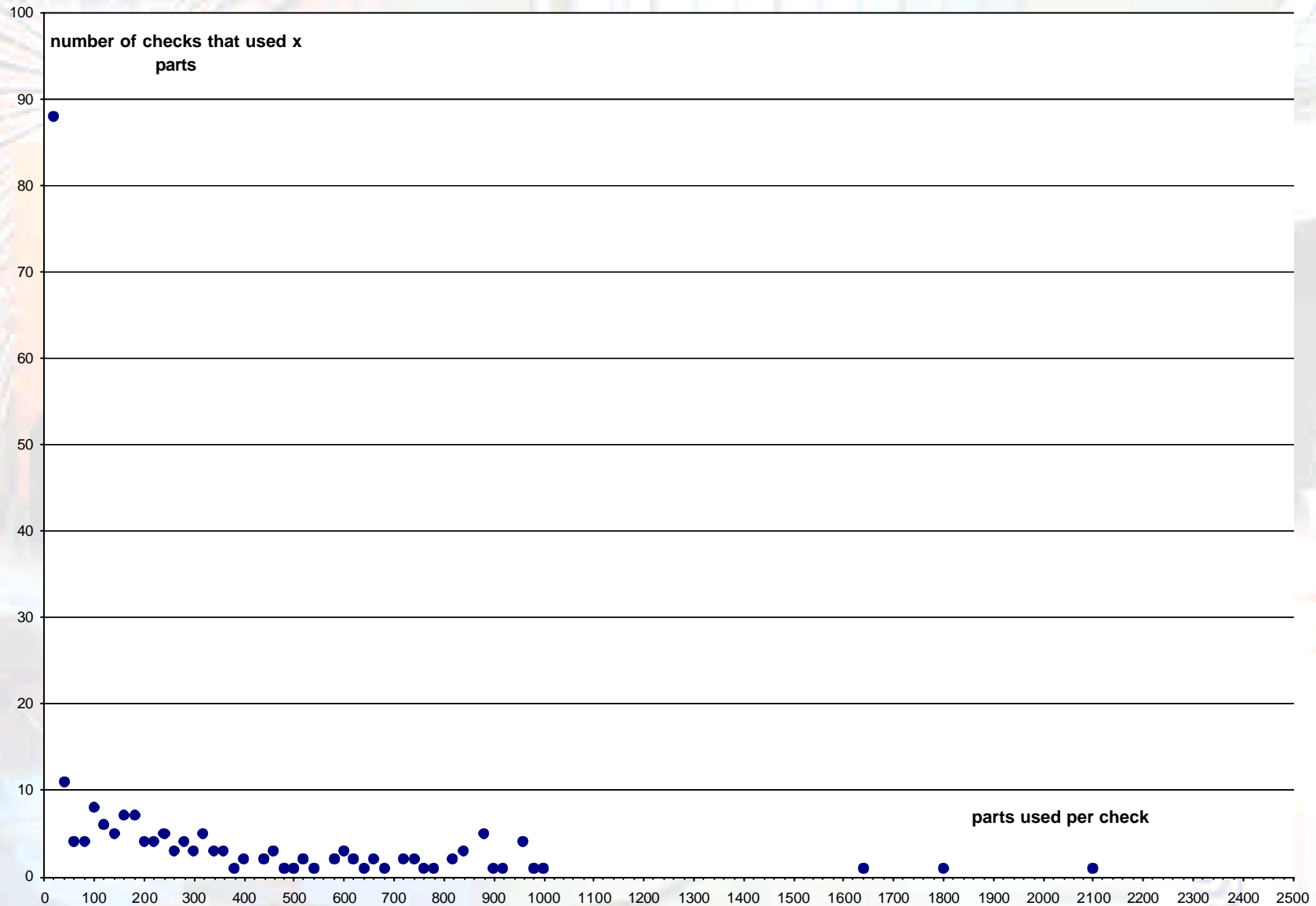


$$\text{Recommended Investment} = \sum_{m>0}^{m_{\max}} m \cdot \text{unit price}$$

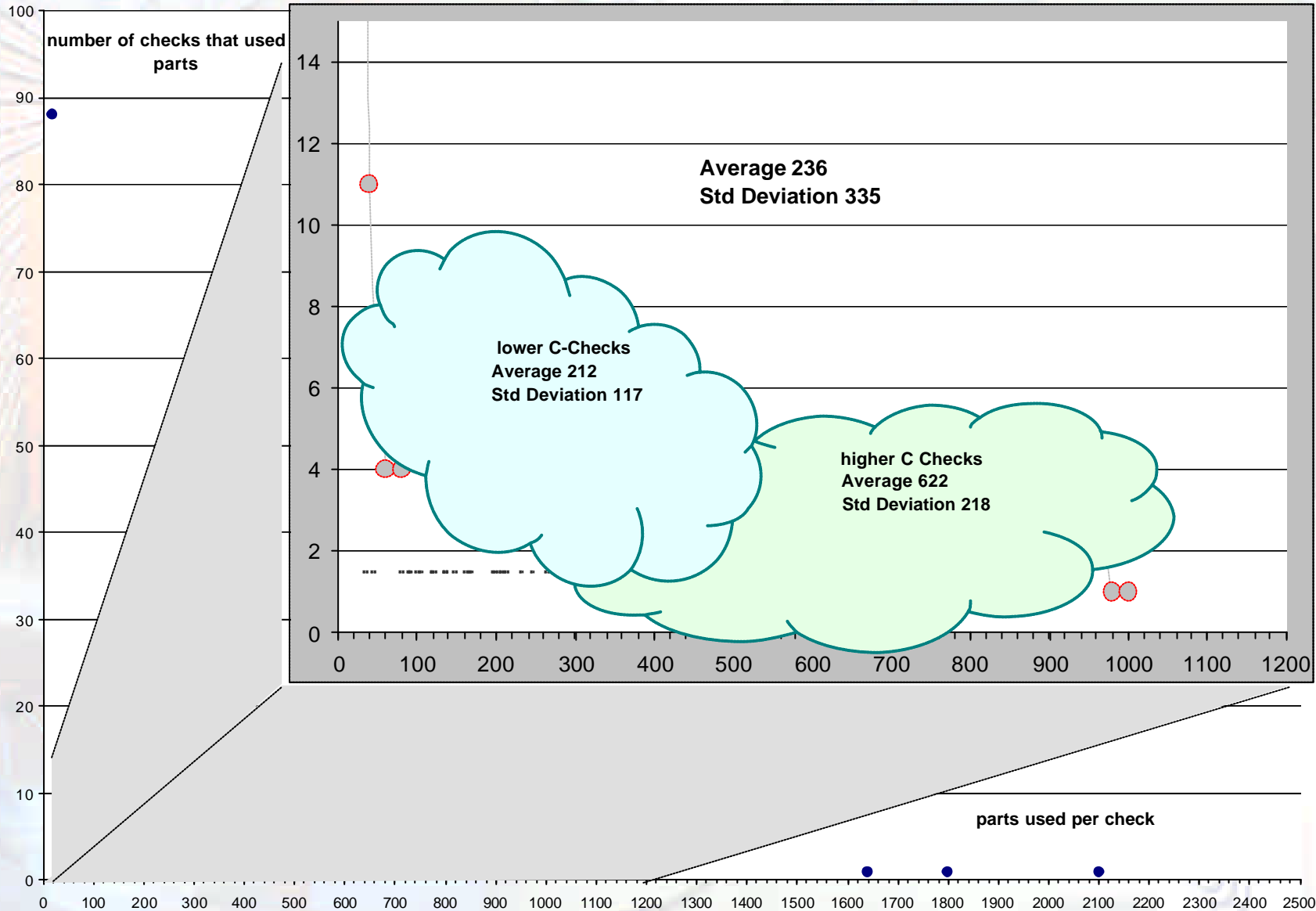
Divided in material categories:

- *Line Replaceable Units (LRUs)*
- *Line Maintenance Parts (LMPs)*
- *Airbus Proprietary Parts*
- *Standard Hardware / Cockpit Push Buttons*
- *Tools and Ground Support Equipment*

✦ Consumption Report Data Analysis



Consumption Report Data Analysis



AGENDA

Market Situation

Spares Planning for effective maintenance

How much is enough?

Spares Supply Logistics



Home

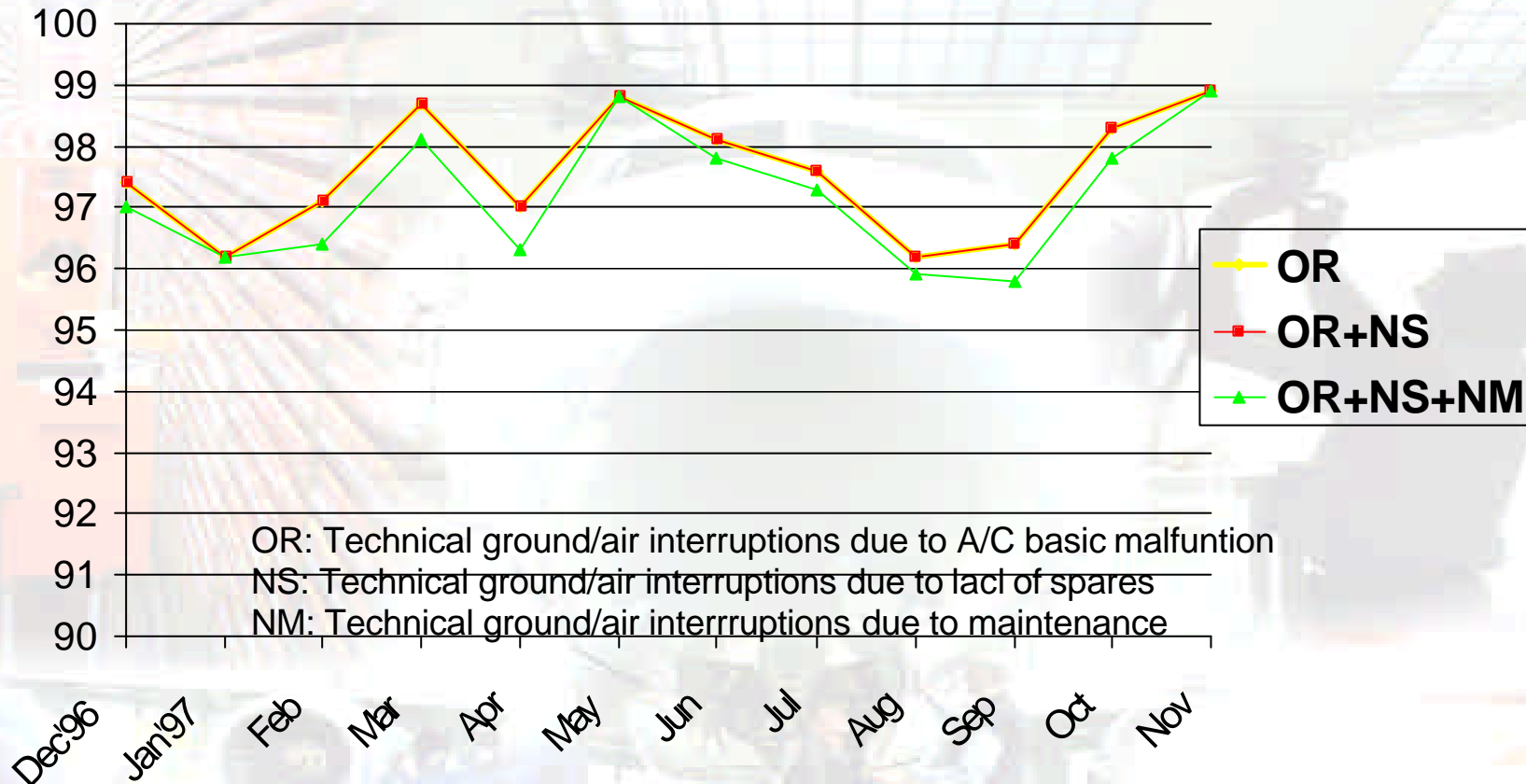
Logistics Challenges

- Complexity of operational “Model”
 - High variance in quality of operational and strategic management in spares area
 - Spares planning, movement, and organisation
 - Supplier management skills: procurement, monitoring / reporting, remedial actions
 - QC and safety factors: spares attributes, data, control
 - Regional and cultural factors
- Conflict between spares availability and operating costs targets
 - Balance of power within airline: Operations - Engineering - Materiel – Finance
 - Financial and economic conditions

Logistics Challenges

- Inherent lack of forecasting data and technical predictability: Expendable parts
 - Very low repeat usage of parts between checks
 - Little or no shared consumption data
 - Few reliable benchmarks
- Technical or Design Factors
 - Component reliability and mod status
 - System redundancies and MEL
 - On-condition maintenance
 - Maintenance cycles and maintainability

What exactly do you get from spares ?

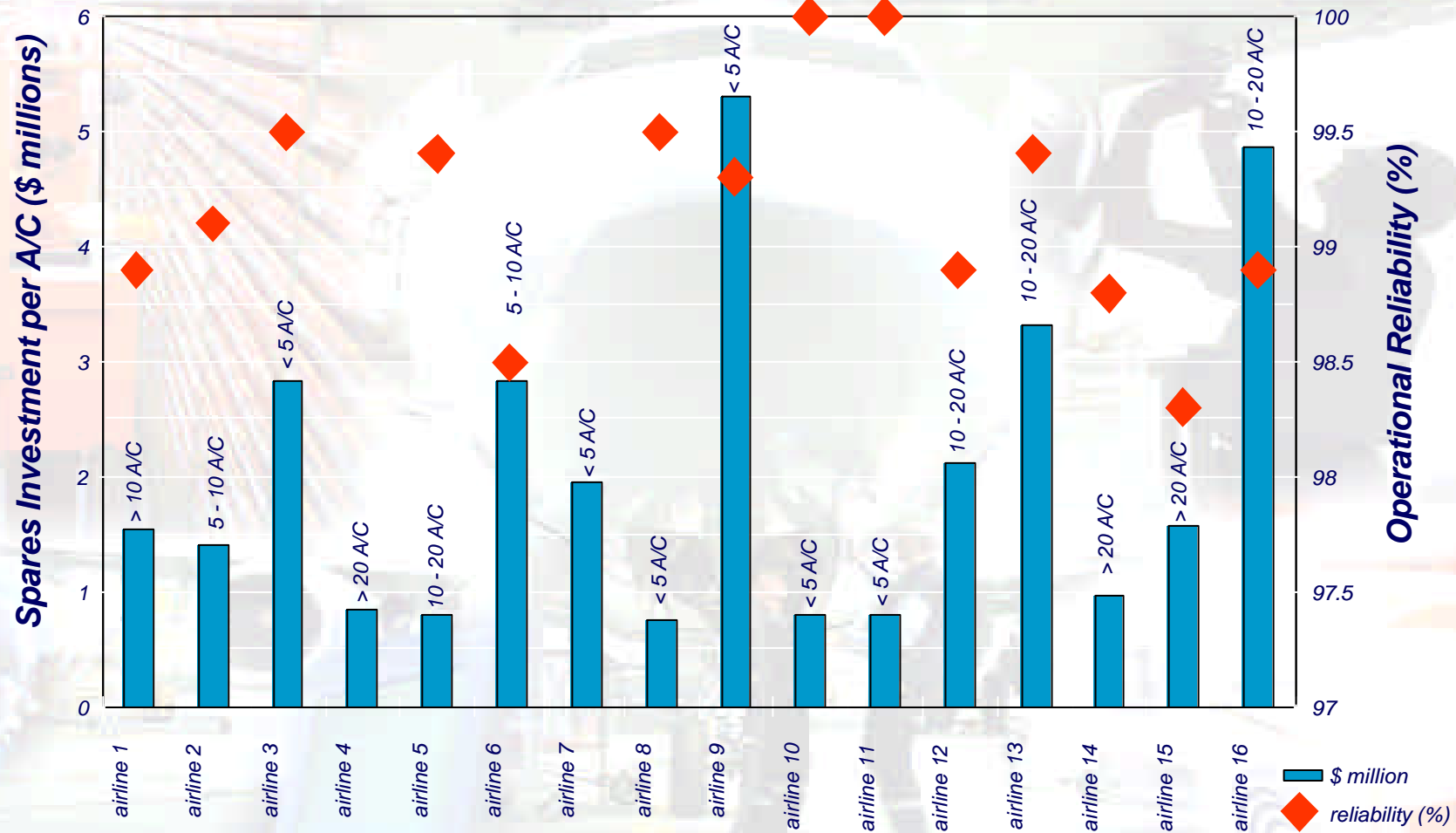


- Logbook defect list leads to passenger/pilot dissatisfaction

- Delay in maintenance due to missing parts leads to excess labour cost

A319/320/321 Spares Investment and OR

More spares => higher operational reliability?

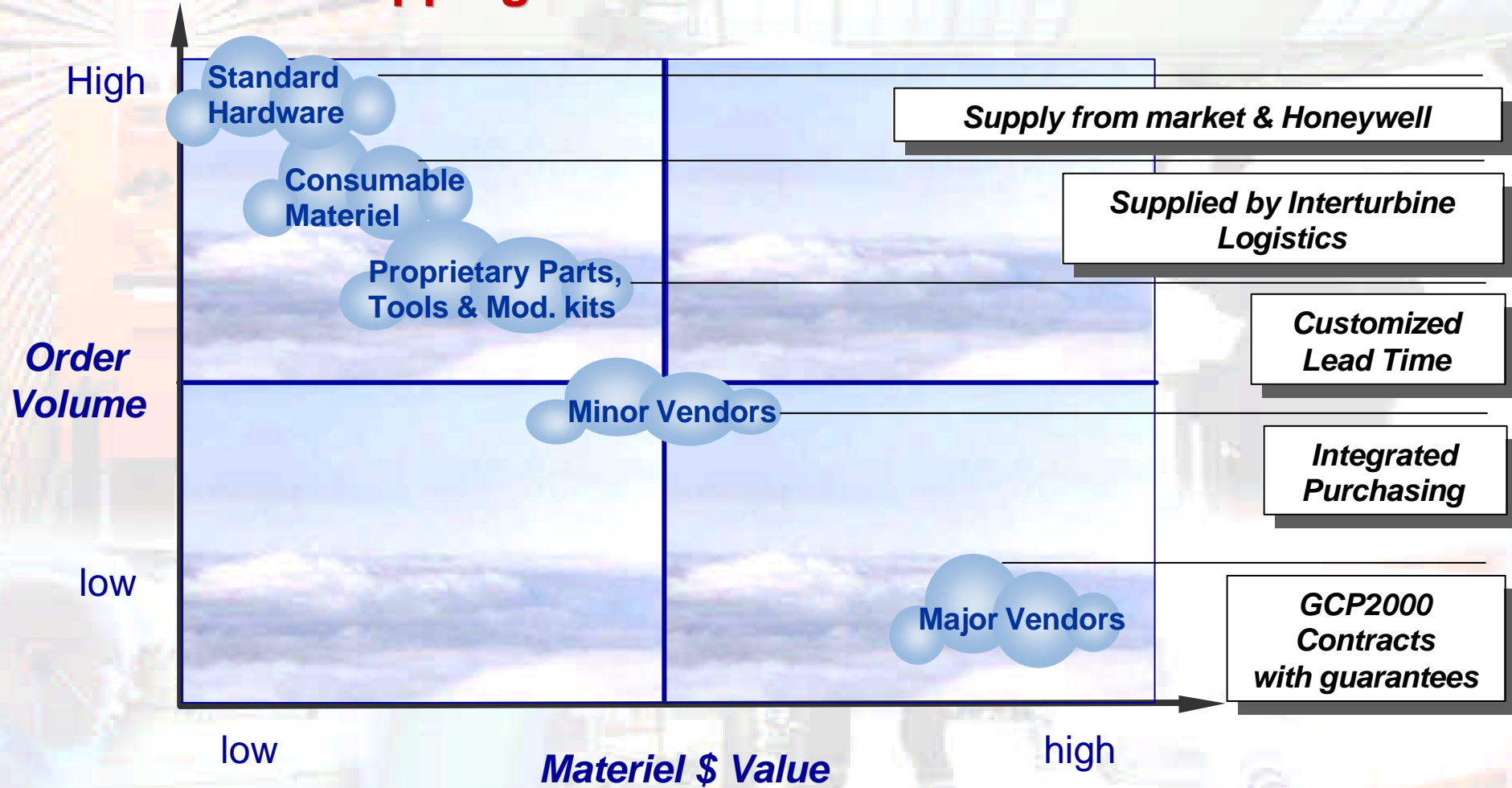


Optimizing utilization, reliability & costs

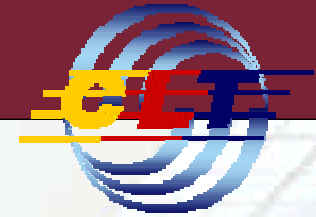
Breakdown of Indirect Operating Costs



Clustered Shopping

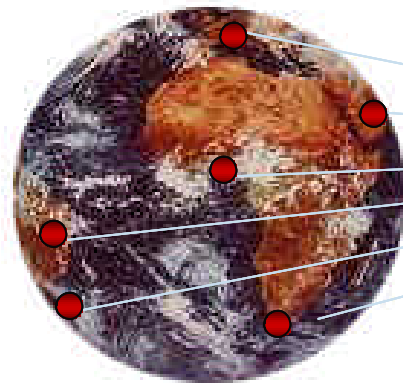


Customized Lead Time



Objective

- **Improve supply chain efficiency for Airbus proprietary parts**
 - **Reduce stocks through just-in-time lead time**
 - **Less wastage through better shared planning**
 - **No additional cost**



Customer holds less stock

Regional stores hold required parts



Hamburg



Frankfurt



Washington



Beijing

Singapore

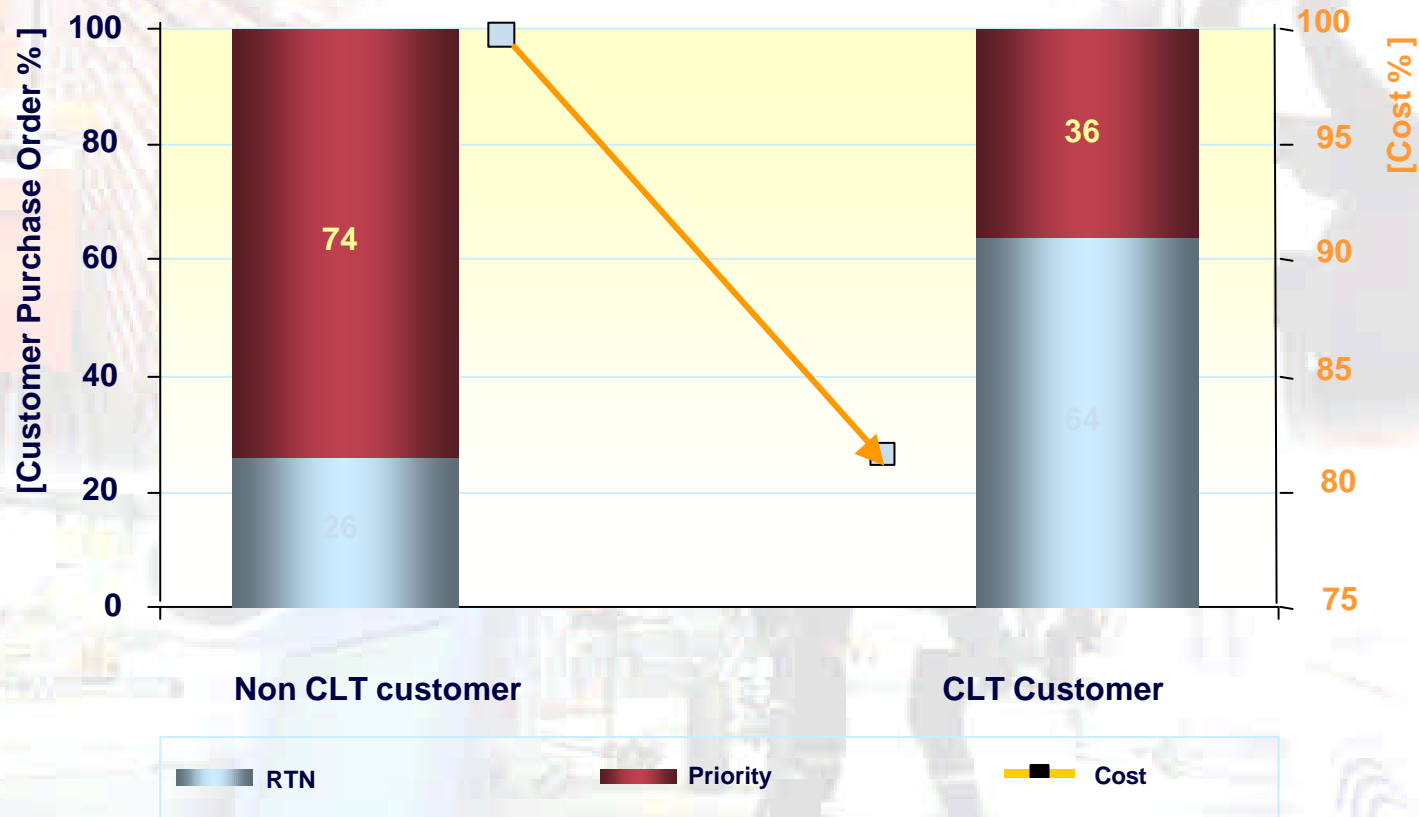
Customized Lead Time



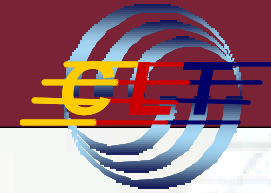
Customized Lead Time Service - Advantages

Order administration costs

Order administration costs



Customized Lead Time



Customized Lead Time - current customers

Canadi>n

AIR CANADA

NORTHWEST

AA American Airlines

FedEx Federal Express

UNITED AIRLINES

Daimler-Chrysler Aerospace Airbus Flugzeugwerke GmbH

virgin atlantic engineering

British Midland

swissair

Lufthansa Technik

Hapag-Lloyd

AIR FRANCE

LTU INTERNATIONAL AIRWAYS

CYPRUS AIRWAYS

ANA All Nippon Airways

Malaysia Airlines

GAMCO

Philippine Airlines

ANSETT AUSTRALIA

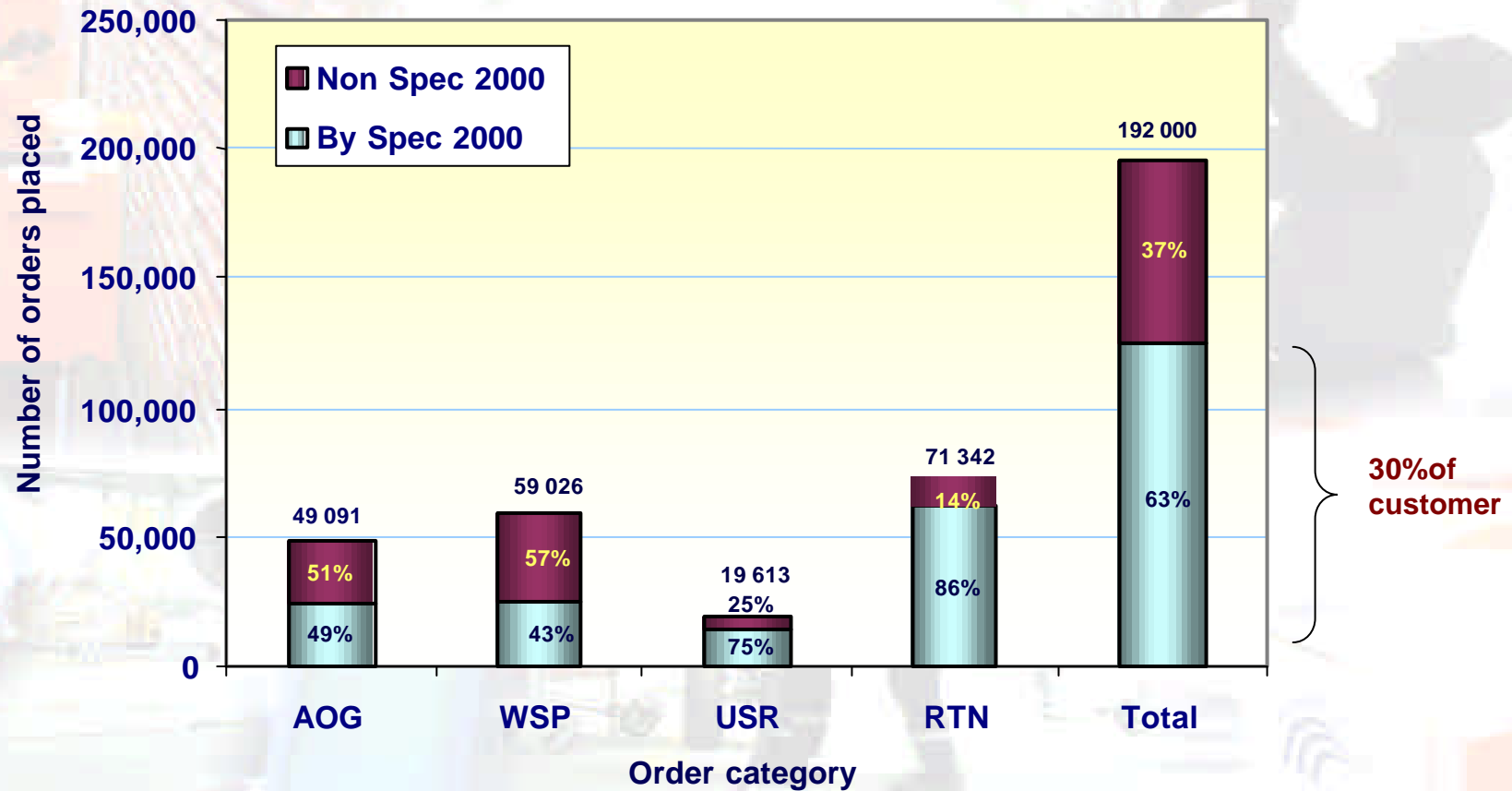


Breakdown of Indirect Operating Costs



Material Supply and Services

→ Electronic ordering by Spec 2000

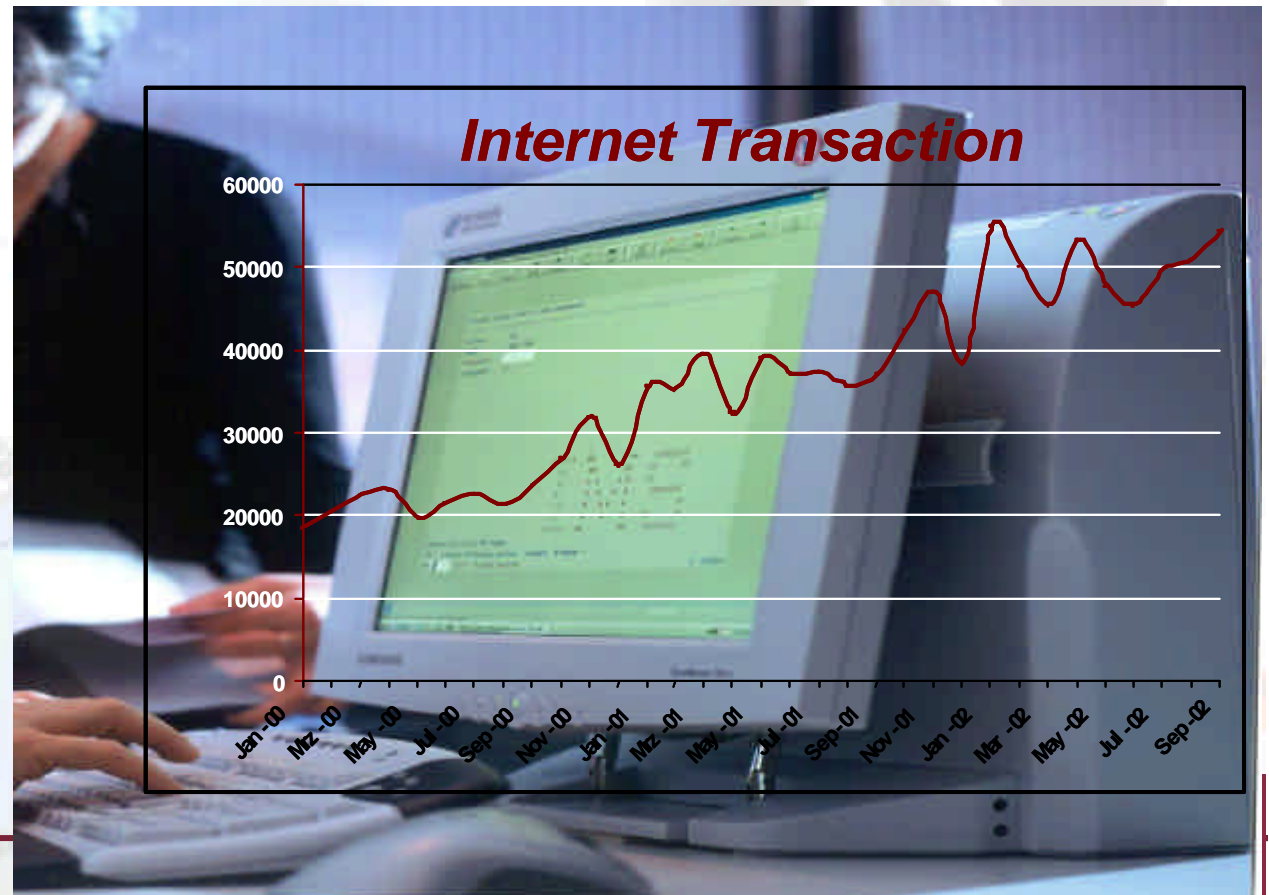


✦ Airbus Spares Portal

- Material Support Menu
 - User Information
 - Info
 - News
 - Requirements
 - Contacts
 - FAQs
 - User Guide
 - Material Flash
 - Ordering
 - Entry
 - Change
 - Report
 - Status
 - Parts Information
 - Part Inquiry
 - Invoices
 - Invoice Print
 - Provisioning Support
 - EndItem Inquiry
 - Spares Calculator
 - User Comments
 - Feedback Entry
 - User Settings
 - Password Administration
 - Repair Guide
 - Spares Support Guide
 - Transport Logistics Guide
 - Tools for Loan
 - Airbus Vendor Information
 - Excess Materiel List
 - Excess List Inquiry

<http://spares.airbus.com>

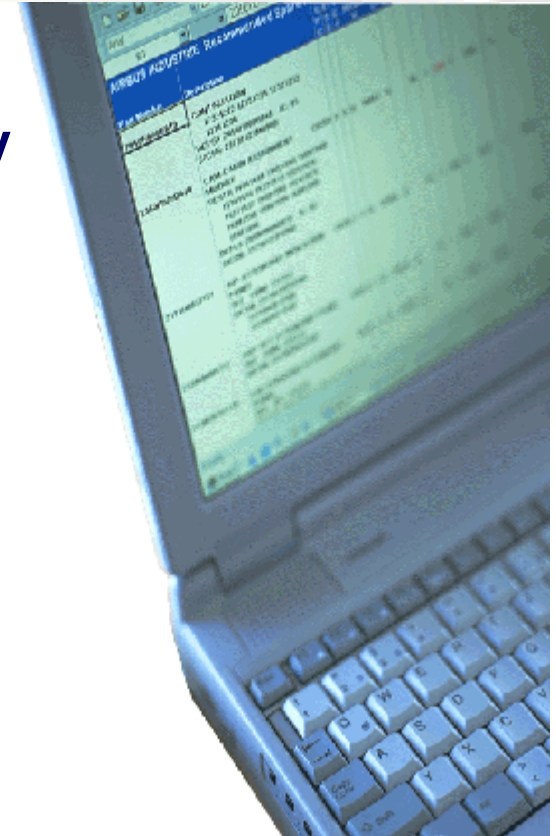
- 39.000 Request for Stock Status
- 3.500 links to supplier sites
- 2.100 orders per month



✦ Airbus Spares Portal

Portal to Access Airbus Spare Parts

- ◆ Improved communication, speed and quality
- ◆ Inventory visibility means order spares security for customers
- ◆ Shipment trace ability
- ◆ One stop source for Airbus aircraft materiel
- ◆ Simplified order administration
- ◆ Reduced Administration Costs
- ◆ Simplified Invoicing
- ◆ Multiple Ordering
- ◆ Links to Supplier





- Welcome
Frederic Mustermann
AIR 2000 LTD.
- Material Support Menu
 - User Information
 - Ordering
 - Entry
 - Report
 - Status
 - Parts Information
 - Provisioning Support
 - User Comments
 - Feedback Entry
 - Repair Guide
 - Spares Support Guide
 - Transport Logistics Guide
 - Tools for Loan
 - Airbus Vendor Information
 - Excess Material List

Customer Order Entry <small>Introduction</small>													
New Order													
CPO	PNR	MFR	QTO	SSD	SHT	PR	ACH	REM	SDC	ORI	CUS		
ABC00				17.10.2002	EMG	A0G		!		RP	AMM		
Current Orders <small>Refresh</small>													
CPO	PNR	MFR	QTO	SSD	SHT	PR	ACH	REM	UNT	UNP	ICR	Status	drop
ABC003	H44	F0138	(1)	17.10.2002	ENG	A0G	F1123	!	EA		USD	✓	
ABC00	10-40	91816	3	01.01.2003	STN	WSP		!	EA	928.00	USD	✓	
ABC002	995000	16827	3	18.01.2003	STN	RTN		!	EA	20.50	USD	✓	
ABC001	A2577221700200	20671	1	21.10.2002	BFS	RTN		!	EA	835.00	USD	✓	

Customer Order Entry

*** New concept ***

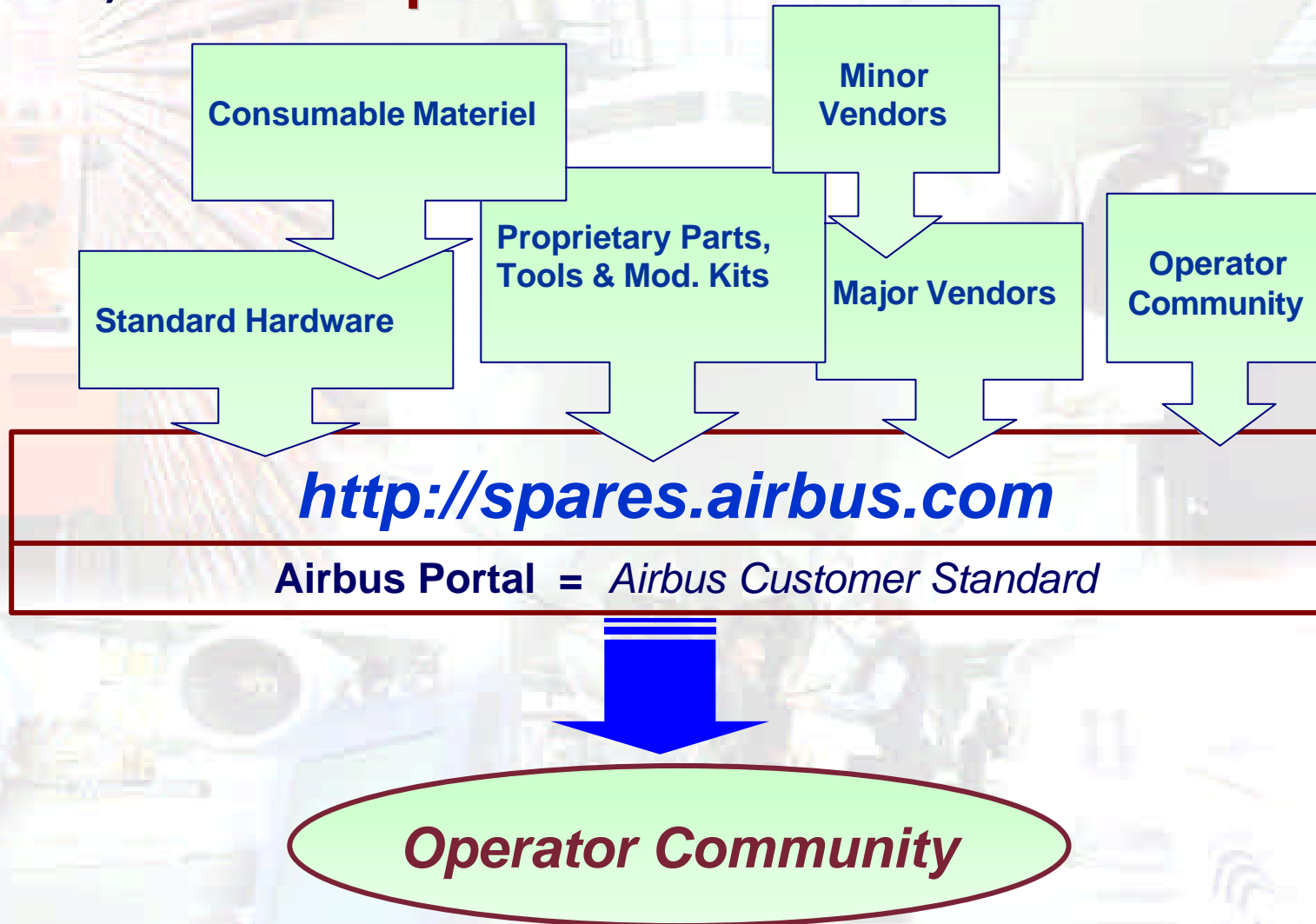
- The input panel keeps on offering the well-known spec2000 fields.
- When you submit an order the function returns immediately and is ready for entering the next order.
- The current status of your orders is listed below the input panel.
- Order status lines are only shown to the user who submitted them. They are displayed until they are marked to be dropped from the view.

icons

- function: Submit new order.
- function: Fetch existing order for change.
- function: Update existing order.
- function: Cancel and return to create mode.
- function: Refresh current order list and drop marked entries.
- function: Setting and displaying text in REM.
- function: Clicking this icon pushes up a dialog to set the corresponding field.
- type: Order create status.
- type: Order change status.
- status: Order is processing. Wait and Click to refresh current order list until result is present.
- status: Order has been successful.

Materiel Supply and Services

→ Airbus Spares Portal



Benefits of the Internet

1. Cost Savings

a) Transaction Queries
(e.g. PNR info / CPO status)

b) Order Transaction
(automated / electronic ordering)

2 Main Streams

2. New / additional Revenues

- Additional Business
- Sales of services
- e-Distribution channel
- Don't double count

80%

20%

Effective tool to improve **COMMUNICATION**
and increase **PRODUCTIVITY**

AGENDA

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Conclusion: Spares Supply Logistics



Home

Indirect Operating Costs

- **Clustered Shopping**
- **Internet / Spec ordering**

Direct Operating Costs

- **Customized Lead Time**
- **Guaranteed Repair Time**
- **Initial Provisioning Improvement**
- **Proprietary Spares Prices**
- **Supplier Spares Prices**

Conclusion: Addressing Logistics Challenges

- Plan what you can:
 - e.g. Customized Lead Time for expendables.
 - Initial Provisioning for rotables based on guaranteed OEM performance
- Effective logistics and information for what you cannot plan
 - Internet or SPEC ordering and information sources
 - Communication within OEM's - Customer supply community
 - Better use of forwarders and transport information
- Management cycle of definition, measurement and communication of performance on logistics for overall improvement.
 - Defined lead time and repair time targets and means of measurement
 - Effective reporting and feedback

Thank you for your attention !

