An Aeronautics Supplier’s viewpoint

INTERTECHNIQUE
within
the quality aerospace environment

I.A.Q.G., 26th-29th June 2001 in Berlin

G. Dion/I.A.Q.G. - 11/06/01 – 0.1
Summary

Intertechnique Company brief presentation

Quality system requirements
- By Official Authorities
- By Customers
- Types of scoring

Audits
- By Customers and Official Authorities
- Internal audits (*quality system, product audits*)

Other fields
- Quality questionnaires and surveys
- Quality tools
- Accompanying documents

Conclusion
Presentation of Intertechnique
Presentation of Intertechnique

**ZODIAC Group**: 5 business segments

**AIRCRAFT SYSTEMS**
- Fuel systems, oxygen systems, hydraulic systems.
- Electrical systems.
- Systems management.
- Lighting, flight deck controls and displays.

**AIRLINE EQUIPMENT**
- Passenger seats.
- Cabine equipment (trash-compactors systems, galleys).

**TECHNOLOGY**
- Telemetry.
- Computer-Aided Telephony.
- Airbags.

**AERO SAFETY SYSTEMS**
- Emergency evacuation systems.
- Deceleration systems.
- De-icing cells systems.

**MARINE – LEISURE**
- Marine.
- Swimming pools.
- Leisure.
Presentation of Intertechnique

ZODIAC in 2000
Sales breakdown

| Category               | Percentage | Sales Breakdown
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<tr>
<td>Aircraft systems</td>
<td>27%</td>
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<td>Airline equipment</td>
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<td>Aero safety systems</td>
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<td>Derived technologies</td>
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<td>Marine – Leisure</td>
<td>24%</td>
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Financial highlights:

- Zodiac Group Manpower: 9,615 people
Presentation of Intertechnique

Core Businesses
Presentation of Intertechnique

Fuel Systems

- On ground refuelling equipment and systems
- Systèmes de gestion de carburant
- On board fuel circulation systems
- In-flight refuelling equipment and systems

Locations

- Intertechnique at Plaisir and Roche-La-Molière - (France)
- IDC Aerospace at Milwaukee (Wisconsin, USA)

Equipment for fuel, air and hydraulic circuits:
- Refuelling ports, valves
- Fuel boost and transfer pumps, fuel jet pumps
- Couplings and control equipment for aircraft-fuelling systems
- Refuelling units
- In-flight refuelling pods
- Formula 1 race cars refuelling systems
- Man-machine interfaces
  - indicators, control units and panels

Aircraft Fuel System Test Bench
## Presentation of Intertechnique

### Systems Monitoring and Management

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<th>Fuel management systems</th>
<th>Air management systems</th>
<th>Monitoring and control</th>
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<td>Gauging</td>
<td>Bleed air monitoring</td>
<td>Hydraulic systems</td>
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<td>Level sensing</td>
<td>Air temperature control</td>
<td>Circuit breakers</td>
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<tr>
<td>Flowmetering</td>
<td>Cabin pressure control</td>
<td>Window heat controllers</td>
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### Measurement sensors
- level sensing: thermistors, float
- Flowmeters

### Actuators
- Electrovalves
- Ram air door actuators

### Man-machine interfaces
- Indicators, control units and panels

### Monitoring and control computers

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**Location**

Intertechnique at Plaisir
Presentation of Intertechnique

Oxygen and Life Support

- Storage, regulation and oxygen instrumentation
- Respiratory protection for pilots, passengers and crew members
- Pilot protection (accelerations, hypoxia, NBC, noise ...)

- Liquid and gaseous oxygen tanks
- quick donning masks
- anti-smoke protective breathing hood
- Regulators
- Passenger oxygen drop out module
- anti-g Valves
- NBC hood

Location
Intertechnique at Plaisir

ERGONOMICS, PHYSIOLOGY

Pilot protection (accelerations, hypoxia, NBC, noise ...)

Passenger oxygen drop out module

Regulators

NBC hood

anti-g Valves

anti-smoke protective breathing hood

quick donning masks

Liquid and gaseous oxygen tanks
Presentation of Intertechnique

General information

Locations

- PLAISIR (France)
- ROCHE-LA-MOLIERE (France)
- INTERTECHNIQUE (Aerospace) Ltd (Great Britain)
- IDC Aerospace (Milwaukee, Wisconsin, USA)
- IN-EROS (Fullerton, California, USA)
- IN-ASIA (Hong Kong, China)

Activities

- Fuel systems
- Systems management
  Fuel, air, hydraulics,
  electrical distribution, optronics
- Oxygen and life support

Manpower : 890 people
Turnover : 1 100 MF (150 M$)

Chairman and CEO : E. MARCHEGAY
Deputy CEO : J.P. BRILLANT
Quality Vice President : Guy DION
Department Vice-Presidents : J.F. HIGOUNET
J.P. LIBIS
J.M. MATHEY
Marketing and sales, Vice-President : M. KNAFO

References

Airbus family, Agusta, Alenia, ATR, Bell, Boeing,
Bombardier Canadair, Casa, Dornier, Eurocopter,
Falcon, Gulfstream, Jetstream, Mirage, Rafale, Saab,
Sikorsky.
Quality System requirements

- Acronyms
- Certifications timetable
- From Official Authorities
- From Customers
- Types of scoring
## Quality system requirements

### Acronyms

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<th>Description</th>
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<td>AECMA-EASE</td>
<td>(European Aerospace Supplier Evaluation)</td>
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<td>(Bureau Veritas Quality International)</td>
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<td>DGA</td>
<td>(Direction Générale de l'Armement)</td>
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<td>(Direction Générale de l'Aviation Civile / Groupement pour la Sécurité Aviation Civile)</td>
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<td>QUALIFAS</td>
<td>(Qualité des Approvisionnements pour les Industries Françaises Aéronautiques et Spatiales)</td>
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<td>(Transport Canada Civil Aviation)</td>
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- Association affiliated with AECMA (European Association of Aerospace Industries), composed of members from 5 "Regions": North (Denmark, Finland, Norway, Sweden), East (Germany, The Netherlands), South (Italy, Spain, Portugal), Centre (Belgium, France), West (United Kingdom, Ireland)
- Certification body.
- Chinese civil aviation authority.
- French military official authority.
- French civil official authority.
- US official authority.
- European official authority.
- Central Region of AECMA-EASE.
- Canadian civil official authority.
Quality system requirements

Certifications timetable

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(*) RLM = Intertechnique Roche-la-Molière site
Quality requirements from Official Authorities

Company Quality Certifications (by Official Authorities or Certification Bodies)

**Quality System - All activities**
- BVQI
- **ISO 9001**
  - n° 62642 of 12/1999 (Expiry : 12/2002)
  - Quality Manual & Procedures
  - Audits performed every 6 months by BVQI
  - Renewal every 3 years

**Quality System - Military activities**
- DGA/BVQI
- **AQAP 110**
  - n° 62642 of 12/1999 (Expiry : 12/2002)
  - Quality Manual & Procedures
  - Audits performed every 6 months by BVQI
  - Renewal every 3 years

**Civil Equipment - Production**
- JAA/DGAC
- **JAR 21**
  - n° F.G.005 of 12/1997 (Expiry : 12/2001)
  - Production Organization Exposition (POE) & Procedures
  - Audits performed by GSAC (6 per year)
  - Renewal every 2 years

**Civil Equipment - Maintenance**
- JAA/DGAC (Europe)
- **FAA** (USA)
- **TCCA (Canada)**
  - **CAA (China)**
  - **JAR 145**
    - n° F060 of 12/1993 (Expiry : 12/2001)
    - Maintenance Organization Exposition (MOE)
    - Renewal every 3 years
  - **FAR 145**
    - n° I6QY965J (Plaisir)
    - n° I4QY966J (Roche-la-Molière) of 07/1995 (Expiry : 07/2001)
    - MOE + US supplement
    - Annual audit performed by FAA in Plaisir & Roche-la-Molière
    - Renewal every 2 years
  - **CCAR 145**
    - n° F.3516 de 07/1998 (Expiry : 12/2001)
    - MOE + Canadian & Chinese supplements
    - Annual self-evaluation report to be provided to Chinese Authorities
    - Renewal Canada : every 2 years
    - China : every 3 years

**Company Quality Certifications**
- **JAA/DGAC**
- **DGA/BVQI**
- **BVQI**
- **JAR 145**
- **JAA/DGAC**
- **FAA**
- **TCCA (Canada)**
- **JAR 145**
- **FAA**
- **TCCA (Canada)**

G. Dion/IAQG - 11/06/01 – 2.2.1
Quality requirements from Official Authorities

Company Quality Certifications
(by Official Authorities or Certification Bodies)

- **Military Aviation Authorities**: Requirements based on ISO 9001

- **Civil Aviation Authorities**: Specific requirements
  - JAR 21 Production certification:
    - Mutual recognition from FAA and DGAC
    - Product certifications: JTSO, TSO
  - Maintenance certification:
    - FAA / DGAC: turnover FAR145 (FAR 145 survey by DGAC)
    - CAA (China) and TCCA (Canada) certifications (audits and supplemental costs)

- **Certification Body (BVQI)**
  - Today: ISO 9001 & AQAP-110 certifications
  - Next future: AS/EN 9100 assessment?
# Quality requirements from Customers

**Customers’ audits, results and approvals**

<table>
<thead>
<tr>
<th>AUDIT FIELD</th>
<th>CUSTOMER</th>
<th>Standard</th>
<th>Result</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>QUALITY</td>
<td>QUALIFAS AECMA-EASE</td>
<td>• EN 9000-1 *</td>
<td>19,2 / 20</td>
<td>New standard EN 9100 *</td>
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<tr>
<td>SYSTEM</td>
<td>BOEING</td>
<td>• D1-9000 rev. A *</td>
<td>7,8 / 10</td>
<td>New standard BQMS (AS 9100) *</td>
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<tr>
<td></td>
<td>AIRBUS UK</td>
<td>• EFQM model</td>
<td>&quot;Silver&quot; level</td>
<td></td>
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<td></td>
<td></td>
<td>• BAe/AG/QC/SC1 *</td>
<td>No scoring</td>
<td>New : AUK/SA/001-3 *</td>
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<tr>
<td>AUDITS</td>
<td>BOMBARDIER CANADAIR</td>
<td>• QD4.6-40 *</td>
<td>No scoring</td>
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<tr>
<td></td>
<td>LIEBHERR- AEROSPACE</td>
<td>• LTS-AQ-INS-06-0032 *</td>
<td>18,9 / 20</td>
<td>New : LTS-AQ-INS-06-0276 *</td>
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<tr>
<td></td>
<td>SAAB</td>
<td>• 80-V-10.1E</td>
<td>89 / 100</td>
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<tr>
<td></td>
<td>GULFSTREAM</td>
<td>• SQAR 0001</td>
<td>No scoring</td>
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<tr>
<td>MAINTENANCE</td>
<td>AIRBUS INDUSTRIE</td>
<td>• EN-9110 *</td>
<td>16,4/20</td>
<td></td>
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<tr>
<td>QUALITY</td>
<td>FEDEX, DHL, SAS</td>
<td>• CASE (North America)</td>
<td>No scoring</td>
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</tr>
<tr>
<td>SYSTEM</td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

*: documents based on the ISO 9001 standard
Quality requirements from Customers

Customers’ audits, results and approvals

**Quality System**: Harmonized requirements 😊
- in France: through QUALIFAS  ➞ RG.Aéro 000 83 in 1994
- in Europe: through AECMA-EASE ➞ EN 9000-1 in Feb. 1999
- At the international level: through IAQG ➞ AS/EN 9100 in Feb. 2001

**Maintenance activities**: Requirements to be harmonized 😞
- EN 9110 (every 3 years) (applicable in Europe since 2001)
- CASE (every 2 years)

**Scoring**: Quality System scorings to be harmonized 😞
- Several quality system scoring methods *(6 for Intertechnique)*
- Scoring is an *incentive element for improvement*: it enables to rate the progress achieved
Types of Scoring

**Several levels of scoring**
with various calculation methods

- **Quality System**
  - Examples:
    - ../20, ../10, ../100, Approved / Not approved

- **Delivery indicators**
  - New products or repairs
    - % delivered on time, delayed deliveries, TAT, ...

- **Product quality**
  - Examples:
    - Rejection rates, QN, R₁, R₂, IF, IE

- **Overall scoring**
  - Examples:
    - NCC, IP, Q100, quartiles, Gold/Silver/bronze

**Expected objectives**

- A simple calculation method
- Indicators to be easily understood by the General Management of companies
- Indicators jointly checked by the customer and the supplier
Audits

Quality system audits performed by Customers / Authorities at Intertechnique’s

(Products audits not included)

Substantial quantities of audits

- Audit periodicities linked to the certifications
- Decrease trend
Audits

Quality system audits performed by Customers / Authorities at Intertechnique's

(Products audits not included)

- **Expected objective:**
  - 1 quality system audit every 3 years based on the international aerospace standard, performed either by customer association or certification body

- **What may allow customers to concentrate their efforts on other audits:**
  - Logistics (*management or customer orders, follow-up of delivery dates; purchase control; cost management; leadtime control, …*)
  - Product audits (*FAI, Source Inspections, …*)
  - Process audits (*EMPI, EMPF, …*)
  - Design reviews (*PDR, CDR, …*)

- **To give a greater importance to internal audits:**
  - Self-assessment: more motivating
  - Best conditions to set up improvement actions
Audits

Internal quality system audits

Quantity of audits: increase trend

Audit duration: shorter (since 1999):
- using check-sheets, *(41 audit check-sheets for « system » and « process » audits)*
- standardising the minutes,
- improving the corrective action follow-up
Audits

**Internal products audits**

- **FAI (First Article Inspection)**
  - performed at the beginning of serial production or for equipment changes
  - *(the quantity depends on the quantity of new products)*

- **Products audits**
  - Performed on equipment in production
  - *(the quantity depends on the quantity of product families)*

<table>
<thead>
<tr>
<th>Year</th>
<th>FAI Quantity</th>
<th>Products Audits Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>139</td>
<td>41</td>
</tr>
<tr>
<td>1999</td>
<td>150</td>
<td>38</td>
</tr>
<tr>
<td>2000</td>
<td>200</td>
<td>46</td>
</tr>
</tbody>
</table>
Other fields

Answers to customers quality questionnaires and surveys

Necessary standardisation of the answer process
Other fields

Quality Tools

- **Tools often recommended** by the customers, sometimes mandatory:
  - Self assessment (EFQM model)
  - 6 Sigma
  - Lean Manufacturing
  - Key characteristics
  - Fracas
  - HALT, HASS

- *Do not require, but promote their implementation*
Accompanying Documents

- JAA Form One
- BL/DC Delivery Note Declaration of Compliance
- FAA Form 8130-3
- Yellow Tag
- Chinese Certificate
- Log Card
Quality tools : E.F.Q.M. Model Self-assessment

Reminder - Schedule

1997
- External ASSESSMENT Dec. 1-4
- General Management Committee Sept. (decision)
- On site training (E.F.Q.M. trainers) Oct. 16-17
- GREEN BOOK (Self-assessment book) 1st issue : Nov.

1998
- CIP 1st and 2nd drafts March/April
- Plenary Meeting June 22
- General Management Committee July
- CIP 1st issue Sept.
- Internal training Sept./Oct.
- BAe's review Plaisir May 6
- Internal training Sept./Oct.

1999
- CIP 3rd issue May
- BAe's review Filton Nov. 30
- CIP 4th issue Nov.
- BAe's review Filton Nov. 30
- CIP 2nd issue Feb.
- BAe

IMPROVING OURSELVES

PREPARING THE ASSESSMENT

IAQG, 26th-29th June 2001 in Berlin
G. Dion/IAQG - 11/06/01 – 4.5.1
Quality tools: E.F.Q.M. Model Self-assessment

Reminder - Schedule

2000

- AIRBUS UK
- CIP 5th issue Feb.
- CIP 6th issue May
- CIP 7th issue Aug.
- AIRBUS UK’s review Plaisir Mar. 6
- IN-S

2001

- Airbus UK
- Self Assessment Business Units Seminaries
- D2
  - March 12-13
- D4
  - Feb. 6-7
- D7
  - Feb. 26-27
- EFQM Booklet issue Oct.
- EFQM Internet Site Sept.
- IN CIP issue April
- Revised Green Book issue May
- IN CIP Review Filton May 22

IMPROVING OURSELVES

ORGANIZING SELF ASSESSMENTS

PREPARING SELF ASSESSMENT

IMPROVING OURSELVES
Conclusion
Conclusion

Consequences to the Intertechnique Quality Organization

- Quality System staff
  - 0.5 person in 1995 ⇒ Today : 3 people

- General documents and Standards
  - Complexity of the document management
  - Procedures (Quality Intranet)

- High quantity of external audits
  - Repetition of the same audits (some departments are audited several times per year)
Conclusion

Our reflections

- **Quality System**
  - May be unique and can cover 90% of the requirements from:
    - Civil Authorities / Military Authorities / Certification Body / Aerospace Customers
    - ISO 9001 and international standard AS/EN/SJAC 9100 must be fully deployed

- **Scoring is a progress factor**
  - Simplification
  - Concensus

- **Self-assessment is the basis of the continuous improvement**
  - To be promoted, but not be imposed by customers

- **Focus on products and processes**

- **Any new requirement setting-up should be done only after consultation of the supply chain**