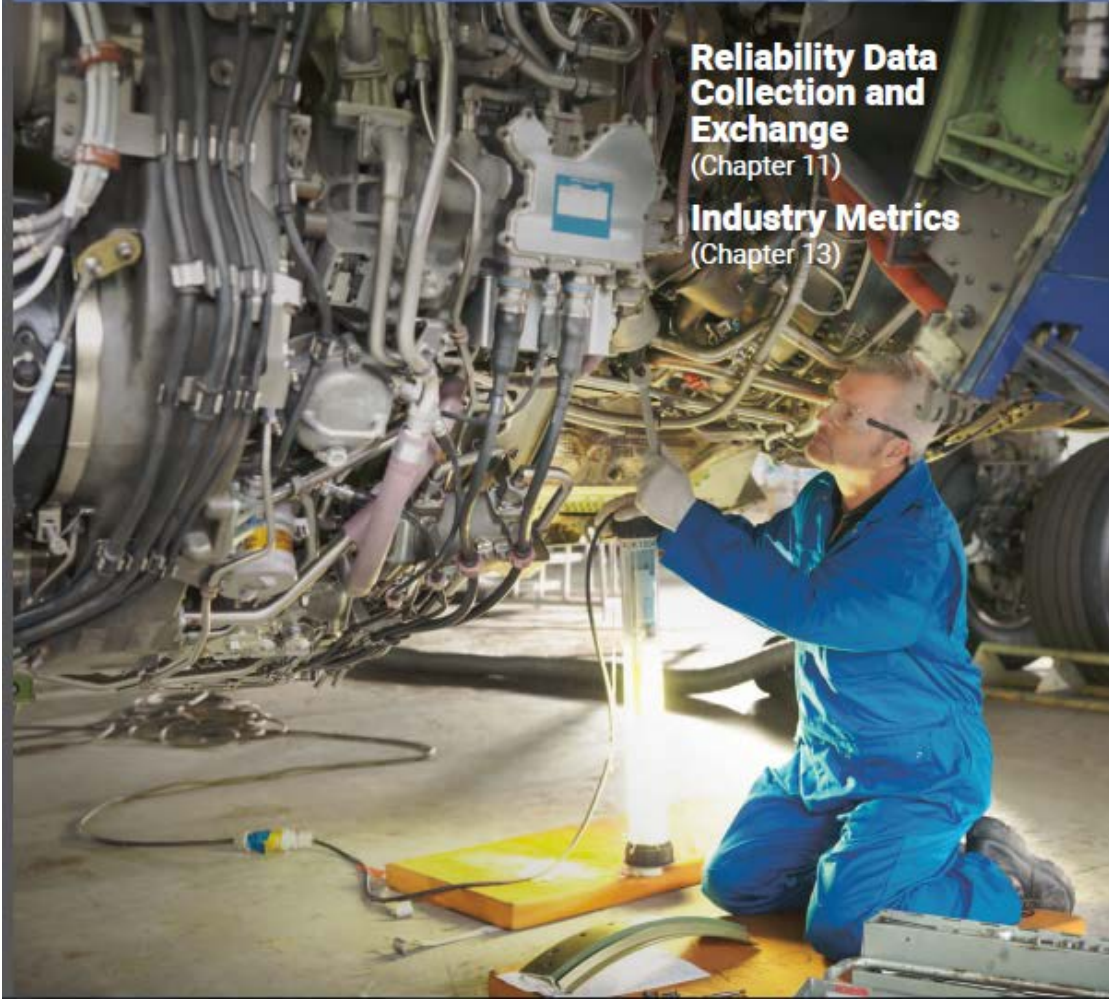


SPEC 2000

**Reliability Data
Collection and
Exchange**
(Chapter 11)

Industry Metrics
(Chapter 13)



A person wearing a blue jacket is using a tablet computer. The background is a blurred aircraft engine bay. A blue text box is overlaid on the image.

SPEC 2000

Continues to Evolve and Provide Solutions

Reliability data is successfully collected, analyzed and utilized by aircraft operator, airframe, engine and component manufacturers world-wide every day. Our goal is to streamline the best practices of individual companies for the exchange of reliability data industry wide – enabling us collectively to better understand and further enhance aircraft reliability.



Reliability Working Group (RWG)

Ed Sweezey, Chair

Sebastien Touzot, Vice Chair

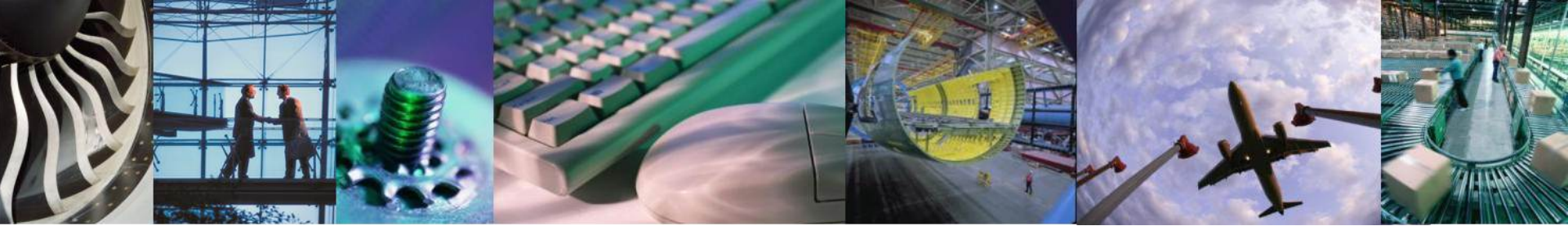
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- The Reliability Working Group (RWG) is responsible for the development of data exchange standards relating to aircraft reliability, including operational and maintenance history of aircraft and components. The scope of the RWG includes standards for exchange of aircraft hours & landings, aircraft logbook, aircraft events, scheduled maintenance data, shop findings, LRU removals, service bulletin / modification incorporation, out of service information, part quantity per aircraft and other related information. The group is also responsible for development and maintenance of industry reliability metrics. The RWG is responsible for Spec 2000 Chapter 11 and 13-2.



- **SPEC2000 Chpt 11 & 13 :**
- **User friendly electronic format**
- ATA Spec2000 chapter 11 is an industry standard XML data format for
- collecting and exchanging aircraft and component reliability, maintenance and repair data.
- ATA Spec2000 chapter 13.2 outlines a method to compute Reliability metrics

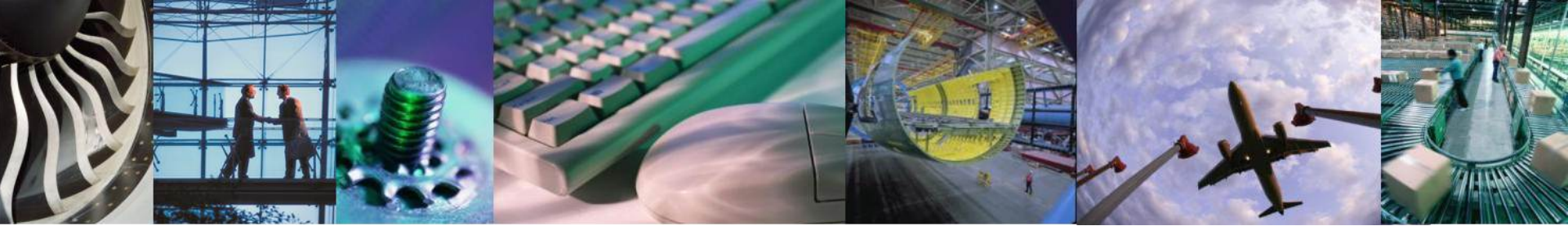


- **ATA Reliability Working Group (RWG) Charter**
- **Purpose**
- To provide an industry forum for developing electronic data exchange standards related to aircraft reliability, maintenance and repair data



Responsibilities

- Responsible for maintaining Spec2000 Chapter 11's, Reliability data collection/exchange records
- Spec2000 Chapter 13-2's Reliability metrics



SPEC2000 Chapter 11/13 - Overview

- SPEC2000 Chapter 11 – “Aircraft Reliability Data Collection and Exchange”, has been part of ATA Spec2000 since May 2004
- It was endorsed by IATA for use by it’s members in January 2005
- Called out in ISO STEP 10303 / AP 239 PLCS
- It is being refined as operators use it.
- SPEC2000 Chapter 13 - Performance Metrics Standards.



SPEC2000 Chapter 11 - What is it?

- It defines what events constitute the reliability & maintainability landscape of aircraft in the air transport business
- It identifies which elements within each event are important to capture
- It defines what each element identified means
- It is a common language that allows aviation industry partners to exchange detailed reliability data easily and cost effectively.
- It defines a protocol for exchanging data – XML

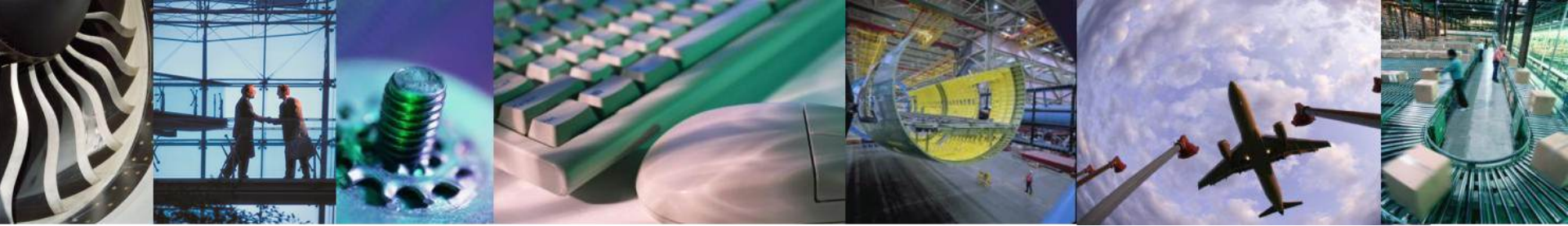


- **SPEC2000 Chapter 11 Record Tables**
- **Chapter 11 has 12 records :**
- **Aircraft Hours and Landings Record**

Purpose: Collect detailed hours, cycles and utilization data from operators.

This data can also be used as the basis for MTBUR calculations, etc.

- **Aircraft Event Record**
- Purpose : To capture aircraft event data such as delays, cancellations, incidents, etc.



- **LRU Removal Record**

- Purpose : Collect details of the components removed from an aircraft as well as reasons for removal and details of component being installed.

- **Shop Findings Record**

- Purpose: Collect detailed component tear down reports from an airline's shop or other repair facilities.



- **Piece Part Record**

- Purpose: A supplement to the Shop Findings record, to find out the details of the failed part.

- **Aircraft Logbook Record**

- Purpose : Collect technical/journey log entries such as pilot reports, maintenance corrective action, etc.

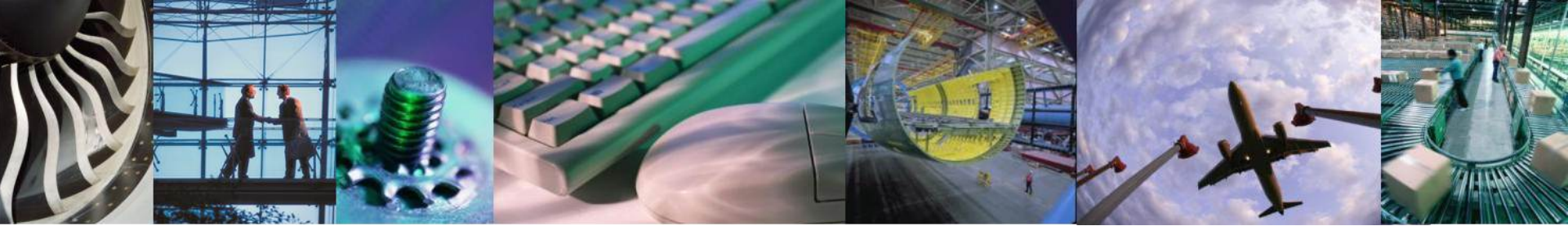


- **Scheduled Maintenance Record**

- Purpose : Collect scheduled (heavy and line) maintenance data, findings and corrective action, and provide reference ability back to the operator's maintenance program.

- **Service Bulletin/Modification Record**

- Purpose : Provide data on service bulletin/mod incorporation and unincorporation.



- **Aircraft Status Change Record**

- Purpose : Capture changes in aircraft ownership, operator, long term storage disposition, engine model changes, etc.

- **Summary Counts Record**

- Purpose : Collect summarized rate and count information on an operator's fleet, e.g. schedule interruption counts by ATA, etc.



- **Out of Service Record**

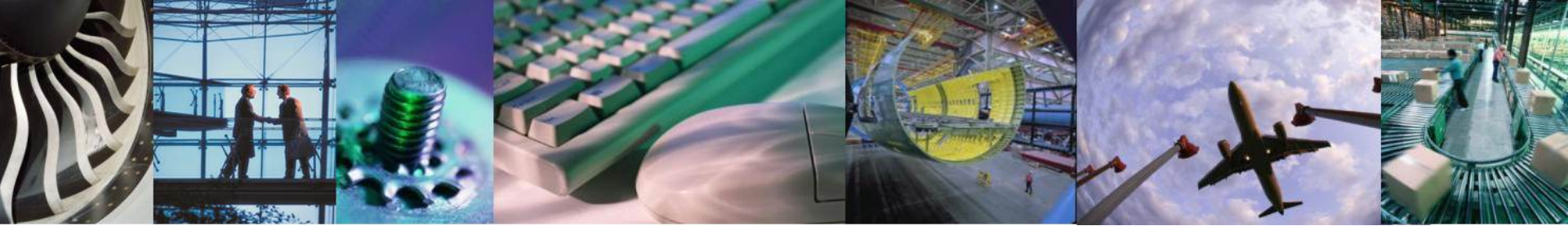
- Purpose : Capture changes short term out of service for maintenance, convenience, etc.

- **Quantity Per Aircraft Record**

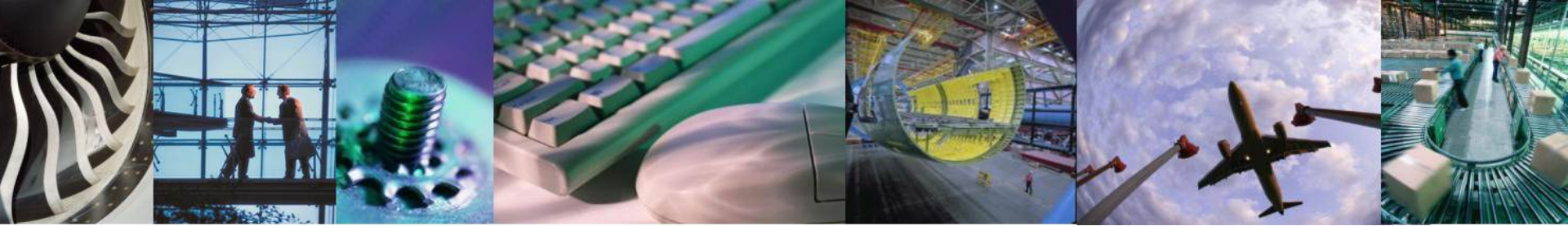
- Purpose : Identify specific quantity configuration of key tracked components to validate various reliability metrics calculations



- **SPEC2000 Chapter 13-2 Reliability Metrics**



- **4.1 Dispatch Metrics**
- **Technical Dispatch Reliability (TDRL)**
- **Technical Dispatch Interruption Rate (TDIR)**
- **Schedule Reliability (SREL)**
- **Schedule Interruption Rate (SIRT)**
- **Technical Cancellation Performance (TCPF)**
- **Technical Cancellation Rate (TCNR)**
- **Technical Completion Rate (TCRT)**
- **Technical Non-Completion Rate (TNCR)**



- **4.2 Service Difficulty Metrics**
- Aircraft Incidents are events that cause technical service difficulties such as aborted takeoffs, air turnbacks, emergency landings, etc. The metrics herein are based on such incidents
- **Incident Rate = 1000 * (Incident Count) / (total actual departures for the same period) → gives incidents per 1000 departures.**



- **Diversion Rate (DVRT)**
- **Air Turnback Rate (ATBR)**
- **Aborted Takeoff Rate (ABTR)**
- **Return to Gate Rate (RTGR)**
- **Aborted Approach Rate (ABAR)**
- **Emergency Descent Rate (EMDR)**
- **Inflight Shutdown Rate (IFSDR)**
- **Total Air Incident Rate (TAIR)**
- **Total Incident Rate (TINR)**

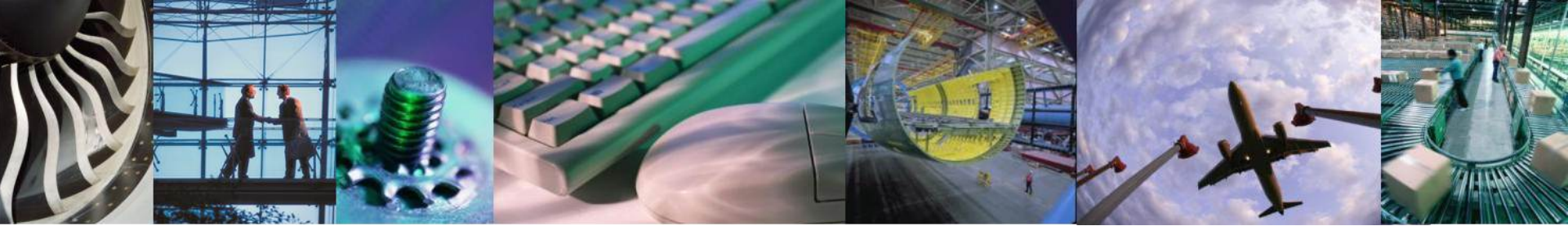


4.3 Component Reliability Metrics

- **Mean Time Between Removal - MTBR**
- **Mean Time Between Unscheduled Removals - MTBUR**
- **Mean Time Between [All] Unscheduled Removals - MTBUR**
- **Mean Time Between [Non-induced] Unscheduled Removals – MTBUR(N)**
- **Mean Time Between Failure - MTBF**
- **Mean Time Between Failure - Justified – MTBF(J)**
- **Mean Time Between Failure – Non-Induced – MTBF(N)**
- **Mean Time Between Failure – Confirmed – MTBF(C)**



- **Mean Cycles Between Removals – MCBR**
- **Mean Cycles Between Unscheduled Removals - MCBUR**
- **Mean Cycles Between [All] Unscheduled Removals - MCBUR**
- **Mean Cycles Between [Non-induced] Unscheduled Removals – MCBUR(N)**
- **Mean Cycles Between Failure - MCBF**
- **Mean Cycles Between Failure - Justified – MCBF(J)**
- **Mean Cycles Between Failure – Non-Induced – MCBF(N)**
- **Mean Cycles Between Failure – Confirmed – MCBF(C)**



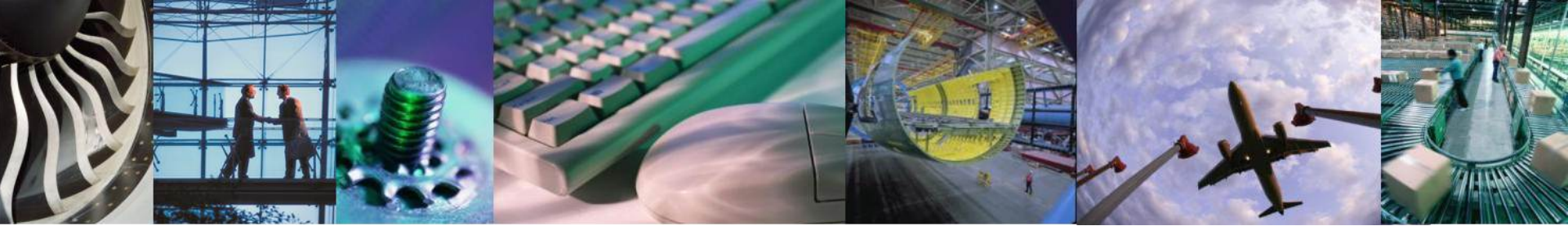
4.3 Component Reliability Metrics – cont.

- No Fault Found Rate
- Fault Found Ratio (FFRT) – FFRT_j, FFRT_n, FFRT_c
- Mean Time To Failure (MTTF) – MTTF(J), MTTF(N), MTTF(C)
- Mean Time To Unscheduled Removal (MTTUR)
- Unscheduled Removal Rate (URR):
 - URRH (in FH), URRC (in cycles)
- Time Since Installation at Removal (TSR)
- Time Since Repair (TSRP)
- Time Since Overhaul (TSO)
- Time Since New (TSNW)
- Mean Cycles To Failure (MCTF) – MCTF(J), MCTF(N), MCTF(C)
- Mean Cycles To Unscheduled Removal (MCTUR)
- Cycles Since Installation at Removal (CSI)
- Cycles Since Repair (CSRP)
- Cycles Since Overhaul (CSO)
- Cycles Since New (CSNW)

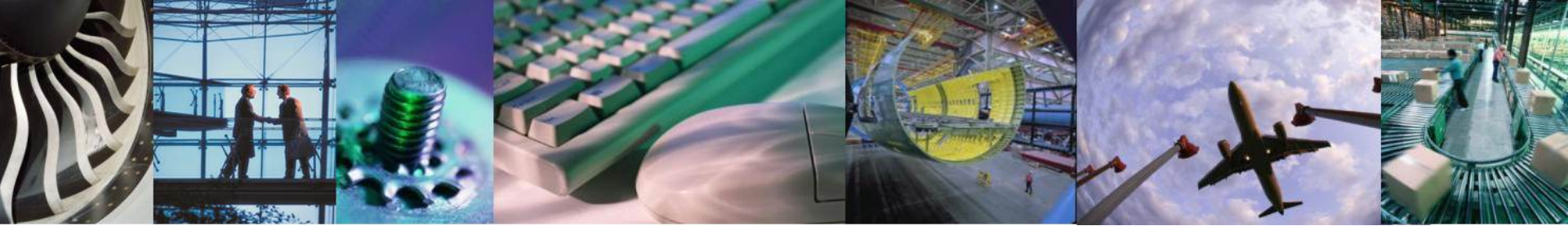


4.4 Logbook Rates

- **Snag Report Rate (SRRT)**
- **$SRRT_h = 1000\{(\text{logbook count for all snags})/(\text{total flight-hours for the same period})\}$**
- **$SRRT_c = 100\{(\text{logbook count for all snags})/(\text{total actual departures for the same period})\}$**
- **Pirep Rate (PRRT)**
- **PRRT_h, PRRT_c**
- **Pilot Initiated Log Rate (PILR)**
- **PILR_h, PILR_c**



- **Cabin Log Rate (CLRT)**
- **CLRTh, CLRTc**
- **Cargo Log Rate (CGLR)**
- **CGLRh, CGLRc**
- **Maintenance Reports [Marep] Rate (MRRT)**
- **MRRTh, MRRTc**



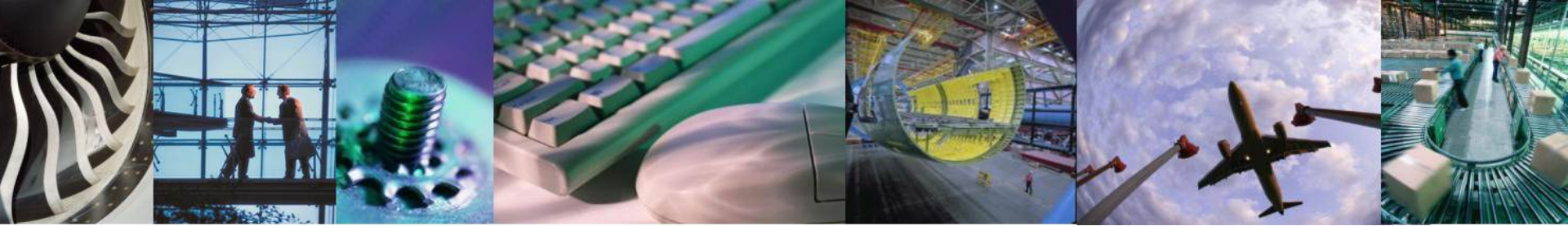
Dispatch Availability (DA)

Purpose: To measure the percentage of time that an aircraft is available for use.

It takes into account all downtime due to unscheduled maintenance even if a substitute aircraft is used to cover for the aircraft with technical problems.

Example: An aircraft is planned for use 16 hours a day for a month. In that time it has technical problems which keep it unavailable for use for a total of 20 hours in the month.

$$\text{DA} = \{16 * 30 - 20\} / \{16 * 30\} = 95.8\%$$



- Current activities:

- About to publish “Flight Record” to capture more information about individual flights.
- Developing schema for the transfer of major component data (Engine, APU, Landing gear, etc.)
- Developing finding/repair codes

The Benefits of Enhanced Reliability Data Exchange in the Digital World

Aviation prioritizes a culture of safety, collaboration and efficiency in everything we do – and that culture is driving positive change in how we implement reliability data standards and exchange throughout the industry.

Airline operators and manufacturers continually strive to improve aviation operations and maintenance by utilizing best practices to enhance the exchange of reliability data from company to company. Spec 2000 Chapters 11 and 13 provide a global industry standard to do so, which helps to ensure a smooth passenger and operational experience.

How Spec 2000 Reliability Data Exchange and Metrics can work for you:

- 1 Utilizing standard formats and business content has proven to streamline efficiency, lower costs, eliminate inconsistencies and improve the overall quality of the data.
- 2 By identifying a “template” of operational and maintenance data, Spec 2000 offers new opportunities for improvements to your reliability data program.
- 3 Simple, structured XML formats facilitate development from a wide variety of IT platforms
- 4 Standardized Metrics allow benchmarking to be done without the problem of varying measurement techniques among companies
- 5 Enhanced reliability data leads to better product performance analysis with less manpower

Reliability Data Exchange

Spec 2000, Chapter 11

contains standards for detailed data exchange of:

- Aircraft, Engine, APU Hours, Cycles and Flight Data
- Aircraft Detailed Flight Data (legs, stations, etc.)
- Aircraft Events (delays, cancellations, service difficulties, etc.)
- Technical Logbooks
- LRU Removals & Installs
- Shop Teardown and Findings data
- Line and Heavy Maintenance Findings
- Service Bulletin / Modification Incorporation Data
- Out of Service Data
- Quantity Per Aircraft of Key Components

Metrics

Spec 2000, Chapter 13.2

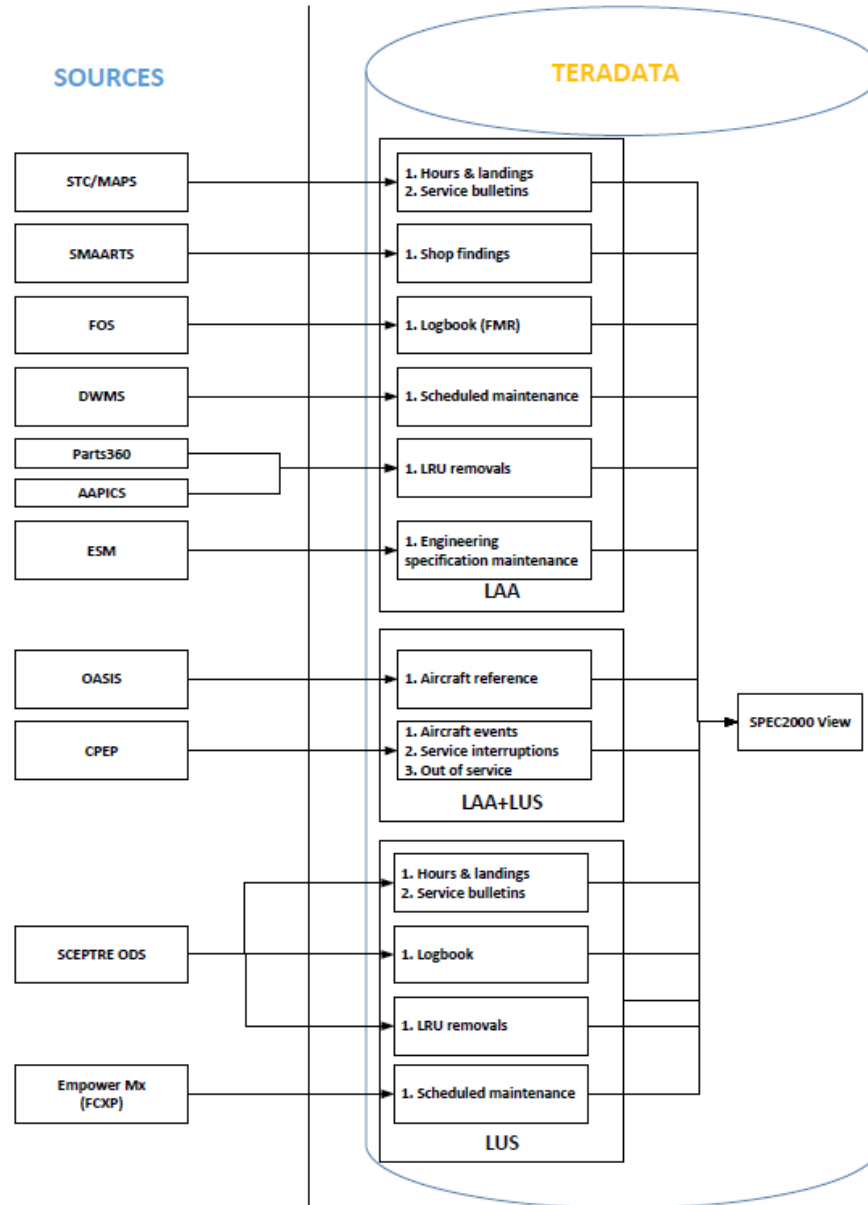
contains standards for industry reliability metrics:

- Component reliability
- Aircraft dispatch and availability
- Service difficulty
- Logbook / faults

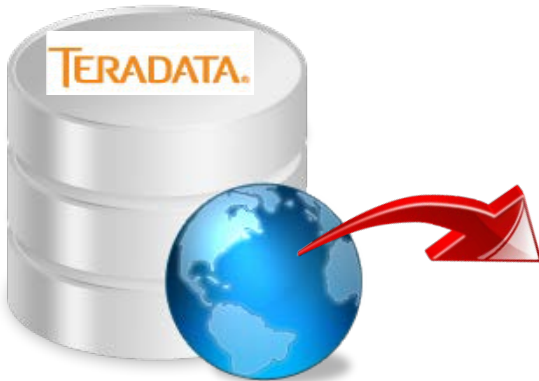
For more information visit
www.ataebiz.org/reliability



SPEC2000 FOR AMERICAN AIRLINES



SPEC2000 FOR AMERICAN AIRLINES



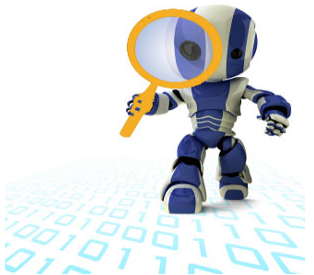
TeraDatabase views of American Airlines



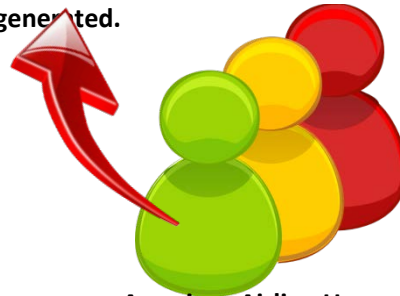
GUI Developed For American Airlines which has a reference to Webservice in which Extraction from Teradata and Xml file is generated.



Airline Transport Association Standards



OEM Analyst



American Airline Users

Xml Generated By The Tool



Xml's Dispatched to OEM Analysts



OEMServer Where Xml's are Stored



Xml Transmitted using OEM web sights