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GUIDE FOR DATA EXCHANGE BETWEEN AVIATION INDUSTRY AND AIRLINES

(second edition)

Recommendation N° PSC/DEC/83/13984



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BETWEEN AVIATION INDUSTRY
AND AIRLINES**

SECOND EDITION

(PRODUCED IN COLLABORATION WITH THE ASSOCIATION OF EUROPEAN AIRLINES)

JUNE 1983

PSC/DEC/83/13984

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Preface

In the aviation field, the subject of Reliability / Maintainability Data Exchange between operators and manufacturers has been subjected to numerous controversies which it is the intention of this guide to resolve.

However, the same principle applied for analysis and control has been accepted for many years at the Companies management level. No need is seen, therefore, to demonstrate the advantage of «Management Control».

This situation can be reduced to two main obstacles:

— *Communication problems* - As opposed to «Management Control» whose field of application is limited to a Company, «data exchange» in aviation concerns many partners (operators, aircraft, engine, manufacturers and equipment manufacturers), who in general, are located in different countries and have different languages. The first obstacle is then the language barrier, the definition of terms and the parameters used.

— *Investment required* - The economic benefits are generally difficult to assess; the parties concerned are therefore often reluctant to commit the funds required.

With regard to the first obstacle, two documents are intended to provide a solution:

- the World Airlines Technical Operations Glossary = a glossary of aviation terms
- the following Aecma Guide For Data Exchange Between Aviation Industry And Airlines = a definition of parameters for exchange.

The annex of this document deals with the second obstacle and is intended to demonstrate:

- the technical/economical advantage of Reliability/Maintainability Control
- that the procedure to attain the desired objectives can be simple, hence cost effective.

Introduction

This paper has been prepared in an attempt to define a standard set of parameters that could be used in data exchange programmes between aircraft operators and all manufacturers. It is not intended that the paper should become a data specification, but that it should be the starting point for discussion when operators are setting up their data exchange programmes.

In recent years, attempts have been made to formulate a system for reliability data feedback from airlines to airframe, engine and equipment manufacturers. These attempts have not been universally acceptable, probably because the quantity and depth of data requested would have exceeded practical limitations of data collection and transmission.

These limitations, set by economic and technical considerations, are compounded by communication problems within some airlines' organisations, and between airlines and manufacturers. The step from primitive and incompatible forms of data feedback to an internationally agreed comprehensive system was too great at the time of the earlier attempts. Furthermore, little justification for requiring the data had been submitted, and the requirement was therefore of doubtful validity in the eyes of an airline.

When monitoring the performance of equipment in service numerical data can be used to compare the in-service reliability of aircraft, systems and components with targets established in the design stage. Where the comparison is adverse, engineering data is used as a guide in determining why this situation exists in order that corrective action may be taken. Similarly, the reliability performance of one aircraft type with a number of individual operators may be compared, and relative successes and failures can be investigated, to the mutual benefit of all operators of that type.

In the longer term, design input data for new types of aircraft, engines and equipment is required to improve reliability on a quantitative basis. Numerical data will be used to establish reliability targets with more confidence than has been possible in the past, and engineering data identifies the effectiveness or otherwise of detail design features.

SECTION 1. Technical Operation Data

1.1. Objective

Although this paper specifies a standard which may be generally applied, it is expected that the detailed list of data parameters to be reported in the context of a particular operator, manufacturer and aircraft type would be the subject of discussion in each individual case. An equipment manufacturer should establish liaison with the airframe manufacturer in order that a common approach to the problem can be established.

The object of any reliability programme is to provide information leading to the safest and most economical method of using the product. Broadly, then, manufacturers need data for monitoring the performance of equipment in service as a means of hastening product improvement.

1.2. Data

The data which is needed by the manufacturer is divided into the following 4 groups:

Group 1: Aircraft Utilization Data

Group 2: Incident Data

Group 3: Maintenance Data

Group 4: Reliability Data

4.1: Numerical Aircraft Reliability Data

4.2: Numerical Engine Reliability Data

4.3: Numerical Systems and Component Reliability Data

4.4: Systems Engineering Data

4.5: Structure Engineering Data

4.6: Workshop Data

Group 4.6: Data is needed only on the most «troublesome» items, except that where an operator retrieves this data for its own convenience, this should also be reported.

The «troublesome» items will need to be agreed between each operator and manufacturer, and should be continually reviewed.

Although the data requirements have been listed in four groups, this has been done for ease of definition, and does not imply that the data should be submitted in that form. The data may be transmitted in any format and by any method that proves mutually acceptable to operator and manufacturer. The manufacturers are prepared to accept the task of arranging and analysing the data, irrespective of the manner in which it is received.

1.2.1. *Aircraft Utilization data*

These data group all information relative to the activity of a fleet during a reporting period. It is needed for determining age distribution, and for calculating the relevant rates from information contained in other data groups.

1.2.2. *Incident Data*

This data is used in safety assessments, from information collected following accidents and incidents, in order to initiate remedial action, and to advise other operators of potential safety hazards.

1.2.3. *Maintenance Data*

These data should include technical information derived from scheduled maintenance actions.

The data will be used to amend and up date the maintenance program (i.e. changes to maintenance periods, procedures, tooling, etc...).

1.2.4.1. *Numerical Aircraft Reliability Data*

These numerical data allows the assessments of reliability and of the intrinsic availability of the aircraft.

1.2.4.2. *Numerical Engine Reliability Data*

These numerical data allows the assessments of reliability and of the intrinsic availability of the engines.

1.2.4.3. *Numerical Systems and Component Reliability Data*

These numerical data allows the assessments of reliability and of the intrinsic availability of systems and components.

1.2.4.4. *Systems Engineering Data*

These data permit identification of symptom, circumstance and effect of a technical occurrence, using parameters which are generally known at the time of the occurrence. The data enables reliability parameters to be computed in more detail.

1.2.4.5. *Structure Engineering Data*

T.B.D.

1.2.4.6. *Workshop Data*

These data are needed by design organisations, as a technical follow-up to Group 4.4, Engineering Data, in order to identify cause and effect, and to assist engineering action.

1.3 Data Specification

1.3.1 Group 1. Aircraft Utilization Data

Reference	Parameters	What to Report	Justification
1.3.1.1	Airborne flying hours	Fleet totals for reporting period	Required for age distribution and for calculating relevant rates from information in other data groups
1.3.1.2	Revenue hours		
1.3.1.3	Revenue departures		
1.3.1.4	Airborne flying hours	Individual aircraft totals since new (by aircraft serial number)	
1.3.1.5	Supersonic hours		
1.3.1.6	Aircraft operating cycles (landings)		
1.3.1.7	Touch-and-go landings		
1.3.1.8	Supersonic Cycles		
1.3.1.9	A.P.U. hours		
1.3.1.10	A.P.U. starts		

1.3.2. Group 2. Incident Data

Reference	Parameters	What to Report	Justification
1.3.2.1	Incident	A full description and the results of the investigation of each occurrence are needed. The occurrence should be reported as soon as possible after it has occurred, and further information as soon as it becomes available.	To initiate remedial action and to advise other operators of potential safety hazard.

1.3.3 Group 3 Maintenance Data

Reference	Parameters	What to Report	Justification
1.3.3.1	Operator	Location, age, description of item, part number, serial number.	
1.3.3.2	A/C type, model serial number.		
1.3.3.3	Date occurred		
1.3.3.4	Identification of maintenance report		
1.3.3.5	Action taken	Check, description of action	Improvement of scheduled maintenance program.

1.3.4 Group 4 Reliability Data

1.3.4.1 Group 4.1 Numerical Aircraft Reliability Data

Reference	Parameters	What to Report	Justification
1.3.4.1.1	Number of aircraft in service	Total per type for reporting period	Required for computation of despatch reliability
1.3.4.1.2	Number of technical delays exceeding a defined period of time		
1.3.4.1.3	Number of technical cancellations		

1.3.4.2 Group 4.2 Numerical Engine Reliability Data

Reference	Parameters	What to Report	Justification
1.3.4.2.1	Engine hours	Total per type for reporting period	Required to compute engine in flight shutdown rate and removal rate
1.3.4.2.2	Number of engine removals	Category of removal including F.O.D. removals.	
1.3.4.2.3	Number of in-flight shutdowns	Total per type for reporting period	

1.3.4.3 Group 4.3. Numerical Systems and Components Reliability Data

Reference	Parameters	What to Report	Justification
1.3.4.3.1	Airline	Number in period	Identification Advise manufacturer of total reliability problem. The need for improved equipment stability may be recognised in conjunction with trouble data. Required for assessing new designs.
1.3.4.3.2	Aircraft Type and Model		
1.3.4.3.3	ATA 100 Reference		
1.3.4.3.4	Maintenance Reports		
1.3.4.3.5	Pilot complaints and cabin items	Number in period	Required for assessing existing aircraft operational behaviour including safety aspects and setting design targets on new aircraft

Reference	Parameters	What to Report	Justification
1.3.4.3.6	Delays & cancellations	Number in period	Required for dispatch reliability
1.3.4.3.7	Unscheduled removals	Number in period	Provides the ability to assess whether unscheduled removal rates are acceptable so that problem areas may be identified rapidly to the operators advantage. Required for setting design targets on new aircraft and for assessing new designs.
1.3.4.3.8	Scheduled removals	Number in period	Used for monitoring lifed components and refurbish times to unscheduled removal rate.

1.3.4.4. Group 4.4. *Systems Engineering Data*

Reference	Parameters	What to Report	Justification
1.3.4.4.1	Operator	Chapter/section/unit Model no., serial no. are only required when trouble is associated with engine or APU To include crew action where applicable	Identification
1.3.4.4.2	Aircraft type/model and serial number		
1.3.4.4.3	ATA 100 reference		
1.3.4.4.4	Engine/Module Type/Model		
1.3.4.4.5	Report or complaint		
1.3.4.4.6	Date occurred or found	Delay, cancellation, flight plan change, late out of maintenance, non-availability for technical reasons.	Indicates the effect of failure at aircraft level and highlights the need for remedial action used for safety assessment and for the design of future projects
1.3.4.4.7	Where occurred or found		
1.3.4.4.8	Effect on operation		
1.3.4.4.9	Delay time		
1.3.4.4.10	Out of service time		

1.3.4.4 Group 4.4. *System Engineering Data*

Reference	Parameters	What to Report	Justification
1.3.4.4.11	Rectification on aircraft	Replaced, adjusted, deferred action, in situ repair.	Measure of maintenance action required at aircraft level. Used for comparison with target levels.
1.3.4.4.12	Identification of replacement item	Description Part number Serial number	Essential for engine items and desirable for some other equipment

1.3.4.5 Group 4.5 *Structure Engineering Data*

Reference	Parameters	What to Report	Justification
	T.B.D.		

1.3.4.6 Group 4.6 *Workshop Data*

Reference	Parameters	What to Report	Justification
1.3.4.6.1	Operator	Chapter/section/unit Model no., serial no., are only required when trouble is associated with and engine or APU	Identification same data as Group 4.3 data for the same trouble. Links Groups 4.3 and 2 together
1.3.4.6.2	Aircraft Type / Model and Serial no.		
1.3.4.6.3	ATA 100 reference		
1.3.4.6.4	Engine/Module Type/Model		
1.3.4.6.5	Reason for removal	Report reference	Identification same as Group 4.4 data for the same trouble. Links Groups 4.4 and 4.5 together.
1.3.4.6.6	Component identifiers	Description Part number Serial number	
1.3.4.6.7	Modification status	Incorporation of modifications relevant to confirmed failure mode.	Used for monitoring effects of modification.