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**Discussion Paper on the Subject
"PREDICTION OF MAINTENANCE COSTS"**

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AECMA - PSSWG
Discussion Paper on the Subject
"PREDICTION OF MAINTENANCE COSTS"

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TABLE OF CONTENTS

1. GENERAL
2. MAINTENANCE COSTS - WHAT ARE THEY ?
3. RELATIVE VALUE OF PUBLISHED MAINTENANCE COSTS
4. VALUE OF COST PREDICTION METHODS
5. WHICH COST PREDICTION METHODS SHOULD BE USED ?
6. CONCLUSION

APPENDIX: "A" SUMMARY OF A/C OPERATORS
MAINTENANCE COST QUESTIONNAIRE

1. GENERAL

1.1 Introduction

Due to the fact that aircraft operators, civil and military, are placing an ever increasing importance on the operating costs, respectively the life cycle costs, of their equipment, the manufacturers are forced to react.

To date there is no uniform approach to these subjects, therefore it is necessary for the manufacturers and aircraft operators to arrive at a common understanding.

The aspects of interpreting, estimating and compiling maintenance costs have been discussed within the AECMA Product Support Services Working Group (PSSWG).

This paper contains a summary of views, opinions and suggestions expressed during these meetings. Its purpose is to start discussions within the European aviation industry on the subject of maintenance cost prediction, not to present new methods of prediction. Without doubt this paper will raise, rather than answer, questions on maintenance cost aspects. Views on these questions as well as any other suggestions are welcomed by the AECMA PSSWG.

1.2 Survey

Many differing methods are in use for the determination of maintenance costs, each having its own specific application as is illustrated in figure 1.2.

When studying new projects empirical methods are used by manufacturers for the prediction of maintenance costs; as the design materializes, more detailed data becomes available, allowing them to predict these costs more accurately, and finally, actual maintenance cost data from operators is used.

The many differing methods used to determine maintenance costs and the results, which deviate considerably from one another, lead to a number of questions, such as:

- What are maintenance costs ?
- What is the relative value of maintenance costs when published by aircraft manufacturers and operators ?
- Do maintenance cost predictions based on analytical/empirical methods, such as: ATA 67, AEA DOC Method, GIFAS Formulae for Maintenance Costs etc., reward the manufacturer's efforts to reduce maintenance costs through purposeful aircraft design (continuously improved maintainability, reliability, standardization etc.) ?
- Which parameters should be used for the prediction of maintenance costs ?

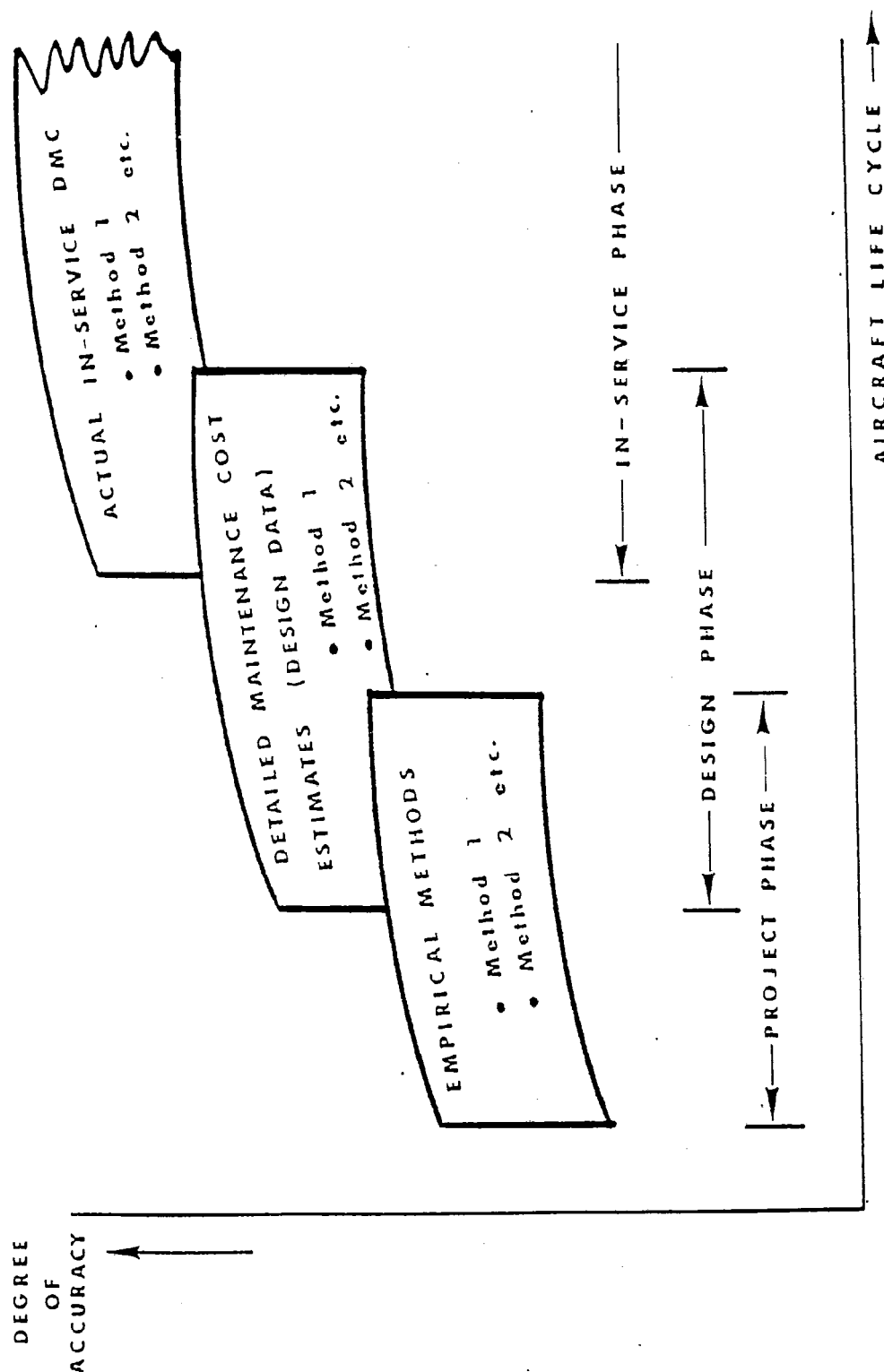


Figure 1.2

2. MAINTENANCE COSTS - WHAT ARE THEY ?

The question seems to be superfluous but tempers always rise when discussing the question of the best method for an analytical prediction or monitoring of actual maintenance costs:

- Method A no longer meets the state-of-the-art; the values produced by method B fall short by X%
- When considering the operating costs published by the CAB for US aircraft operators, maintenance costs for the same aircraft under comparable operating conditions differ by up to 100%
- Competing aircraft manufacturers offering comparable products underbid one another when stating probable accruing maintenance costs

Therefore, the question "What are maintenance costs ?" seems to be absolutely justified.

2.1 Definitions

Without doubt maintenance costs are part of the direct operating costs (DOC), but clear definitions as to which particular costs are classed under the general term of "maintenance costs" are not given.

According to the WATOG (World Airlines Technical Operations Glossary), the overall maintenance costs result from:

- DIRECT MAINTENANCE COSTS (DMC)

Those maintenance labor and material costs directly expended in performing maintenance on an item or aircraft.

NOTE: Does not include those indirect maintenance labor and material expenditures which contribute to the overall maintenance operations, line station servicing, administration, record keeping, supervision, tooling, test equipment, facilities, etc.

and from:

- INDIRECT MAINTENANCE COSTS (IMC)

Those maintenance labor and material costs not considered to be direct maintenance costs, but which contribute to the overall maintenance program costs through overhead operations, administration, record keeping, supervision, tooling, test equipment, facilities, etc.

These relatively open definitions leave further scope regarding the interpretation of maintenance costs so that any cost forecast seems to be plausible, irrespective of the type of computation method used.

More detailed definitions have been compiled in the "CAB (FORM 41)" and in the "IATA Maintenance Accounting System", however these only serve to confuse and not to clarify the matter. Differing cost items and differing allocations result in a number of additional questions:

- Is "line station expenditure" a part of the maintenance costs ?
- Are maintenance and servicing expenditure for ground support equipment considered maintenance costs ?
- Does expenditure for modifications fall under maintenance costs ?
- Do maintenance costs include expenditure for the upkeep of spares, such as:
 - ° Subsequent procurement of spares (rotables, consumables, expendables),
 - ° Discarding, reworking or testing of parts with limited shelf lives ?
- Is cabin refurbishment and aircraft repainting included in the maintenance costs ?
- etc.

Therefore it would appear necessary to have a clear definition as to which specific cost items may be classed under the general term of "maintenance costs".

2.2 Breakdown of Civil Aircraft Maintenance Costs

To achieve a clear definition as to which specific cost elements may be classed under the general term of "maintenance cost" AECMA PSSWG contacted European aircraft operators. Following the request from AECMA most of these operators completed a questionnaire "Breakdown Model of Civil Aircraft Maintenance Costs". The results from this action, details shown in Appendix "A", could be seen as a first step towards achieving a common "European Breakdown of Civil Aircraft Maintenance Costs".

The results from the "Questionnaire Action" confirmed, that:

- There is no common "Cost Breakdown Model" in use today.
- Most of the "Large Operators" use a more or less similar "Cost Breakdown Model" which is very detailed.
- Most of the "Small Operators" either use a very simplified "Cost Breakdown Model" or do not use one at all, however there is a trend to improve maintenance cost monitoring.
- Nearly all operators stated the requirements for more detailed cost information from the manufacturers than that already provided.

A feasible "Breakdown Model", based on previous discussions within the aviation industry and the "Questionnaire" results has been compiled in Figure 2.2-1.

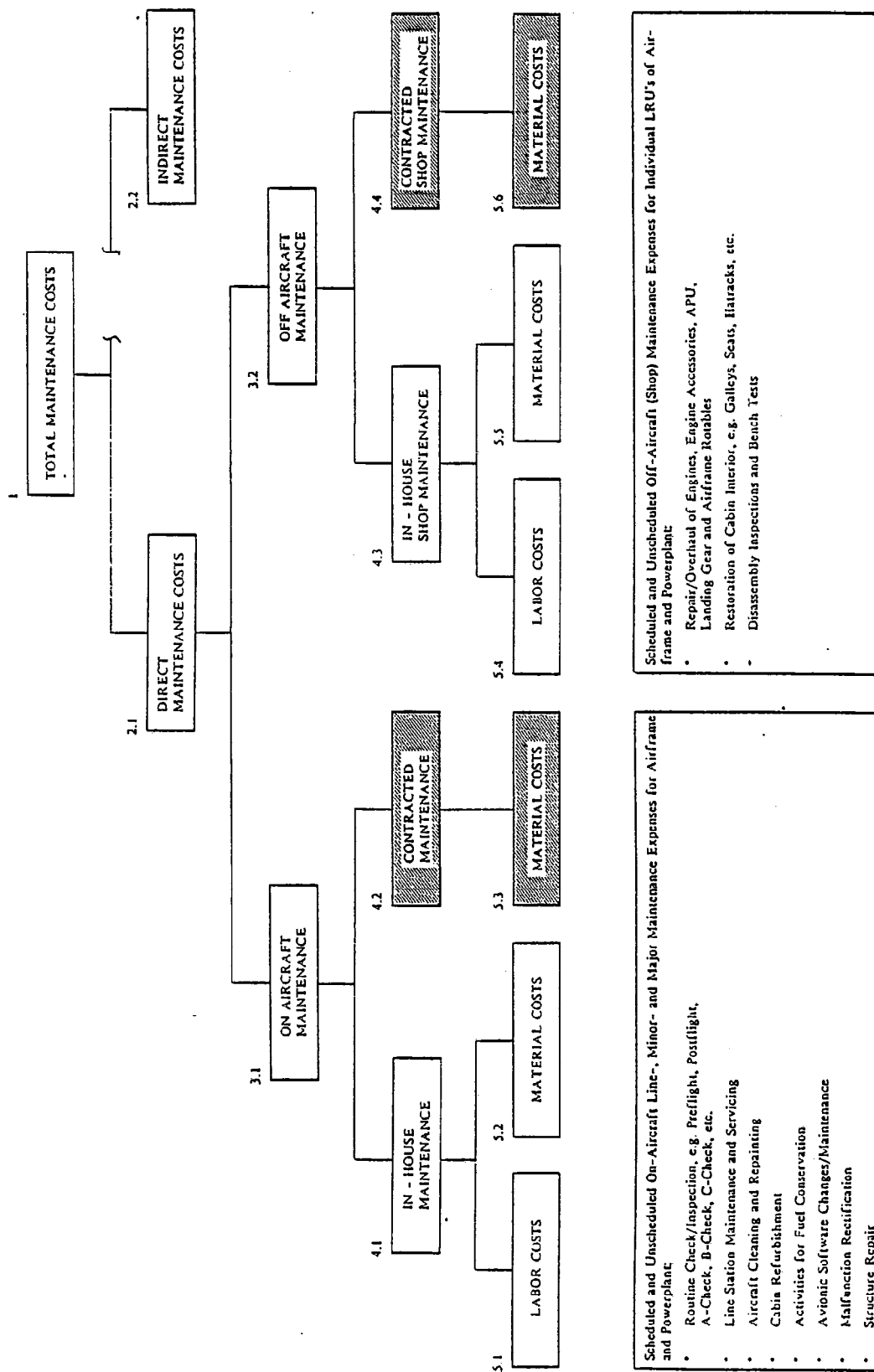
BREAKDOWN MODEL OF CIVIL A/C MAINTENANCE COSTS

Figure 2.2-1