



# ANK315 AIRCRAFT MAINTENANCE

## SCHEDULED MAINTENANCE INSPECTION INTERVALS

Kamila Kustron, PhD

dr inż. Kamila Kustron



# Air Operator's Documentation

- **What is an Air Operator ?**

**“Air operator or Aircraft operator”** means any person which provides the service of transport of goods or passengers by aircraft;

- **What is an Air Operator Certificate?**

A Certificate authorizing as operator to carry out specified air transport operation.

# Air Operator's Documentation

## THE AIR OPERATOR CERTIFICATE - ICAO ANNEX 6,

- ▶ 4.2.1.1 An operator shall not engage in commercial air transport operations unless in possession of a valid air operator certificate or equivalent document issued by the State of the Operator
- ▶ 4.2.1.2 The air operator certificate.... shall authorize the operator to conduct commercial air transport operations in accordance with such conditions and limitations as may be specified
- ▶ 4.2.1.3 The issue of an AOC .....by the State of the Operator shall be dependent upon the operator demonstrating an adequate organization, method of control and supervision of flight operations, training programme and maintenance arrangements consistent with the nature and extent of the operations specified

# Air Operator's Documentation

- 4.2.1.3 The issue of an AOC .....by the State of the Operator shall be dependent upon the operator demonstrating an adequate organization, method of control and supervision of flight operations, training programme and maintenance arrangements consistent with the nature and extent of the operations specified

**AOC-  
USA**



US Department  
of Transportation  
Federal Aviation  
Administration

## Air Carrier Certificate

This certifies that

**AIR DIRECT, LLC**  
3850 FM 2648  
POWDERLY, TEXAS 75473

has met the requirements of the Federal Aviation Act of 1958, as amended, and the rules, regulations, and standards prescribed thereunder for the issuance of this certificate and is hereby authorized to operate as an air carrier and conduct common carriage operations in accordance with said Act and the rules, regulations, and standards prescribed thereunder and the terms, conditions, and limitations contained in the approved operations specifications.

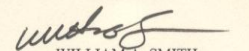
This certificate is not transferable and, unless sooner surrendered, suspended, or revoked, shall continue in effect indefinitely.

By Direction of the Administrator

Certificate number: EDAA125K

Effective Date: SEPTEMBER 23, 2002

Issued at: SW-05

  
WILLIAM A. SMITH  
(Signature)

ACTING MANAGER  
(Title)

SOUTHWEST/DALLAS FSDO  
(Region/Office)

AOC-  
UK



AOC No. GB 2236  
AOC Issue No. 8  
Page No. 1 of 4

UNITED KINGDOM  
NATIONAL AIR OPERATOR'S CERTIFICATE

GRANTED BY THE CIVIL AVIATION AUTHORITY UNDER ARTICLE 12  
OF THE AIR NAVIGATION ORDER 2009 TO

HELICENTRE AVIATION LIMITED

of

Leicester Airport

The Civil Aviation Authority (the CAA) certifies that **Helicentre Aviation Limited** has satisfied the CAA under Article 12 of the Air Navigation Order 2009 that it is competent to secure the safe operation of helicopters for the purpose of public transport subject to the conditions contained in this certificate.

This certificate is not transferable and is valid from the **date of signature** and remains in force unless varied, suspended or revoked.

Issued at: Gatwick

Date: 3 June 2019



Signature: *[Handwritten Signature]*

Name: Captain Giles Porter

Title: Head of Flight Operations  
Inspectorate (2) Department

for the Civil Aviation Authority

# AOC- THAI

ตัวอย่าง



เลขที่ 099/2551

No. 099/2551

กรมการขนส่งทางอากาศ  
ประเทศไทย  
DEPARTMENT OF CIVIL AVIATION  
THAILAND

ใบรับรองผู้ดำเนินการเดินอากาศ  
AIR OPERATOR CERTIFICATE  
ใบรับรองนี้แสดงว่า  
THIS CERTIFIES THAT

บริษัท SAM AIR CHARTER CO., LTD.

ที่อยู่ 199 VIBHAVADI-RANGSIT 99, LAKSI, BANGKOK 10210, THAILAND

มีคุณสมบัติตามพระราชบัญญัติการเดินอากาศ พ.ศ. 2497 และข้อบังคับว่าด้วยการปฏิบัติการที่เกี่ยวข้อง และกฎระเบียบว่าด้วยการออกใบรับรองนี้ จึงได้รับอนุญาตให้ดำเนินการขนส่งทางอากาศเพื่อการพาณิชย์ การปฏิบัติการจะต้องเป็นไปตามพระราชบัญญัติ ข้อบังคับและกฎระเบียบที่ระบุไว้ และตามข้อกำหนด เงื่อนไข และข้อจำกัดที่ระบุไว้ในข้อกำหนดการปฏิบัติการแนบท้ายใบรับรองนี้  
has met the requirements of the Air Navigation Act B.E. 2497 and related operating regulations and rules prescribed there under for the issuance of this certificate, and is hereby authorized to operate commercial air transportation. Operations will be in accordance with the said Act, operating regulations and rules prescribed there under, and with the terms, conditions, and limitations contained in the attached operations specifications

ใบรับรองจะโอนให้แก่กันมิได้และจะมีผลบังคับต่อเนื่องจนถึง 29 พฤศจิกายน 2552 เว้นแต่เข้ามาคืน ถูกพักใช้หรือเพิกถอน

This certificate is not transferable and shall continue in effect until 29 November 2009 unless  
suspended, suspended or revoked.

DATE: 30 November, 2007

สำเนาถูกต้อง



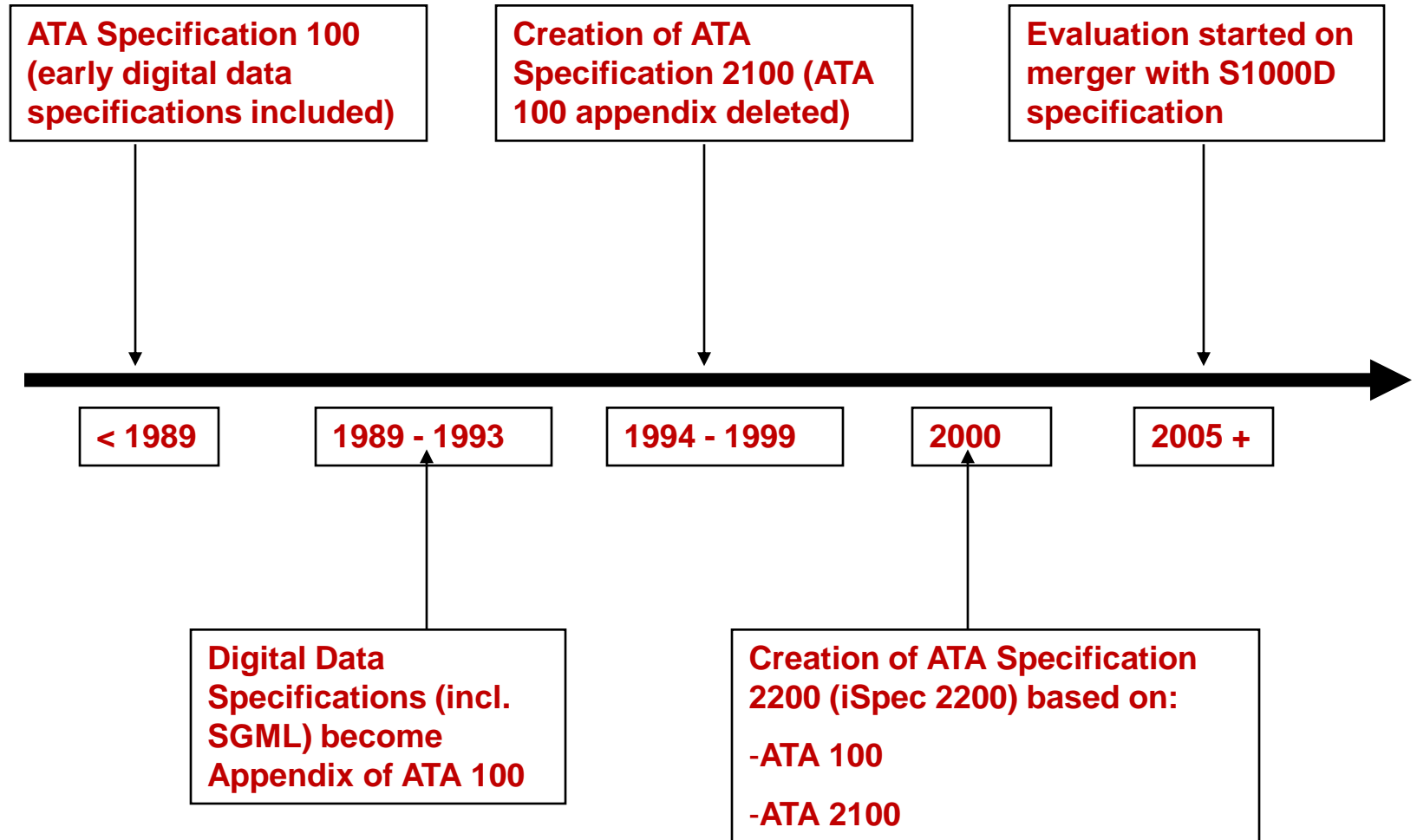


# international Air Operator's Documentation

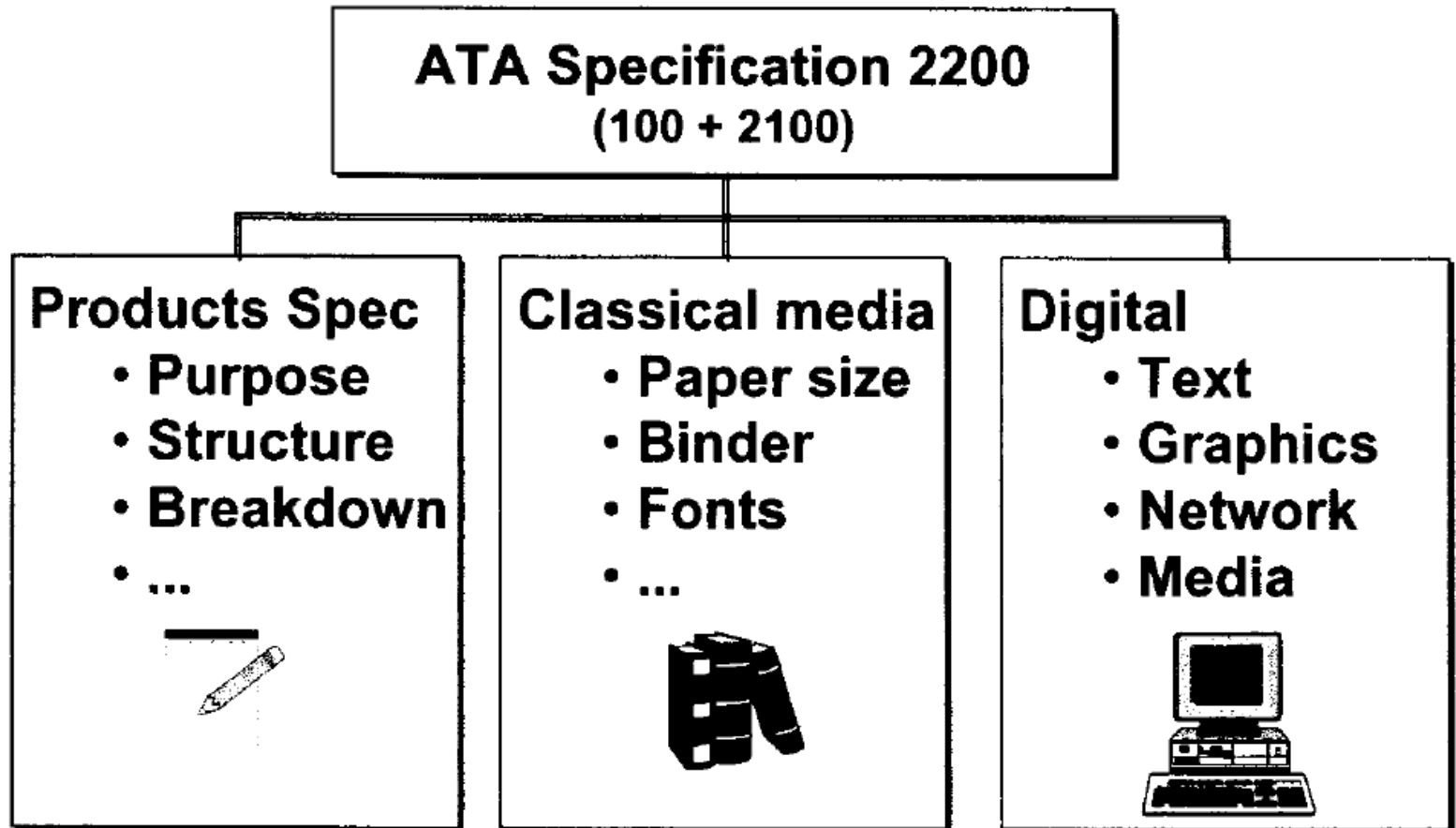
- **Air Operator Certificate-procedure**
- The procedure for application and granting of an AOC is best organized in phases and will normally take following sequence;
  - 1. Pre-application phase
  - 2. Formal application phase
  - 3. Document evaluation phase
  - 4. Demonstration and inspection phase
  - 5. Certification phase



# Documentation Standard



# Documentation Standard

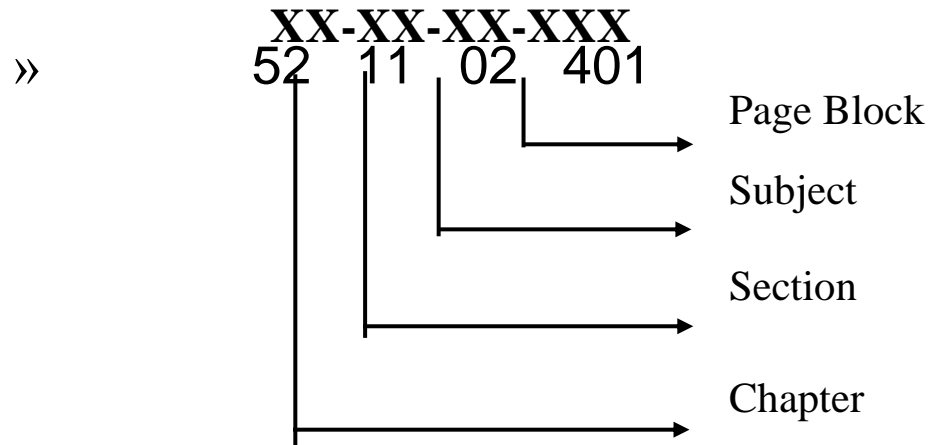


# Documentation Standard ATA

- **ATA Spec 100**
- **Air Transport Association of America (ATA)** standardized the overall format of the maintenance manuals
- Each system or system type was assigned a chapter number. For example,
  - Hydraulic systems are in ATA Chapter 29
  - Radio equipment is ATA Chapter 23.

# ATA Spec 100

## Format



### Example:

- 52            Doors
- 52-11       Passenger Doors
- 52-11-02    Passenger Door Handle
- 52-11-02-401    R/I Procedure for Pax Door Handles

# ATA Specification 100

## •AIRFRAME GENERAL

- 05 TIME LIMITS MAINTENANCE CHECKS
- 06 DIMENSIONS and AREAS
- 07 LIFTING and SHORING
- 08 LEVELING and WEIGHTING
- 09 TOWING and TAXIING
- 10 PARKING and MOORING
- 11 PLACARDS
- 12 SERVICING

## •AIRFRAME SYSTEMS

- 20 STANDARD PRACTICES AIRFRAME
- 21 AIR CONDITIONING
- 22 AUTOPILOT
- 23 COMMUNICATIONS
- 24 ELECTRIC POWER
- 25 EQUIPMENT and FURNISHINGS
- 26 FIRE PROTECTION
- 27 FLIGHT CONTROLS
- 28 FUEL
- 29 HYDRAULIC POWER
- 30 ICE and RAIN PROTECTION
- 31 INSTRUMENTS
- 32 LANDING GEAR
- 33 LIGHTS
- 34 NAVIGATION
- 35 OXYGEN
- 36 PNEUMATIC
- 37 VACUUM
- 38 WATER / WASTE
- 49 AIRBORNE AUXILIARY POWER

## •GROUP STRUCTURE

- 51 STRUCTURES
- 52 DOORS
- 53 FUSELAGE
- 54 NACELLES / PYLONS
- 55 STABILIZERS
- 56 WINDOWS
- 57 WINGS

## •GROUP PROPELLER / ROTOR

- 60 STD.PRACTICES - PROP / ROTOR
- 61 PROPELLERS

## •GROUP POWER PLANT

- 70 STANDARD PRACTICES ENGINE
- 71 POWER PLANT - GENERAL
- 72 ENGINE
- 73 ENGINE FUEL and CONTROL
- 74 IGNITION
- 75 AIR
- 76 ENGINE CONTROLS
- 77 ENGINE INDICATING
- 78 EXHAUST
- 79 OIL
- 80 STARTING
- 81 TURBINES
- 82 WATER INJECTION
- 83 ACCESSORY GEAR BOXES
- 91 CHARTS

# ATA Spec 100

Block	Title	Description
001-099	Description and operation	Identifies the various operational modes of the system and describes how the system and its essential components work
101-199	Fault isolation	Fault trees used to perform fault isolation for various problems occurring within a system
201-299	Maintenance practices	An R/I procedure followed by a BITE test, a functional test, an adjustment procedure, or servicing instructions
301-399	Servicing	All servicing tasks: check, fill and replacement of oil, hydraulic fluid, water, fuel, etc.
401-499	Removal/installation	Detailed, step-by-step instructions on how to remove a line replaceable unit (LRU) and replace it with a like item
501-599	Adjustment/test	Procedures for making adjustments or performing tests to the systems whenever a component or system has just been replaced or after normal maintenance when such adjustments or tests are required
601-699	Inspection/check	Zonal inspections of aircraft
701-799	Cleaning/painting	Procedures for cleaning and painting of the aircraft
801-899	Approved repairs	Repairs to structure and aircraft skin approved by FAA for airline maintenance organization incorporation



## Documentation for Aircraft Maintenance

# Manufacturer's Documentation

dr inż. Kamila Kustron





# Manufacturer's Documentation

- Airplane maintenance manual AMM
- Storage and recovery documents SRD
- Fault isolation manual FIM
- Schematic diagram manual SDM
- Task cards TC
- Wiring diagram manual WDM
- Illustrated parts catalogs IPC
- Fault reporting manual FRM
- Component maintenance manual CMM
- Vendor manuals VM
- Structural repair manual SRM
- Maintenance planning data document MPD
- Master minimum equipment list MMEL
- Dispatch deviation guide DDG
- Configuration deviation list CDL
- Service bulletins SBs
- Service letters SLs
- Maintenance tips MT

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# Manufacturer's Documentation

- Airplane maintenance manual AMM
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- Configuration deviation list CDL
- Service bulletins SBs
- Service letters SLs
- Maintenance tips MT

# Manufacturer's Documentation:

- **AMM : Aircraft Maintenance Manual**
  - Basic information on the operation and maintenance of the aircraft and its on-board equipment.
    - Description and operation of each system
    - Basic maintenance and servicing actions
    - Functional tests and operational tests
    - Adjustments
    - Replenishing of various fluids
    - Other servicing tasks

# Manufacturer's Documentation

## Aircraft Maintenance

### AMM : Aircraft Maintenance Manual (Sample)

**A340**

**AIRCRAFT MAINTENANCE MANUAL**

(2) Transmission of the CMC 1 avionics configuration to the CMC 2  
(Ref. TASK 45-10-00-610-804).

Subtask 45-13-34-010-050

C. Get Access to the Avionics Compartment

- (1) Put the access platform in position at the access door 811.
- (2) Open the access door 811.

Subtask 45-13-34-865-050

D. Open, safety and tag this(these) circuit breaker(s):

PANEL	DESIGNATION	FIN	LOCATION
FOR 1TM1			
721VU	CMC 1 SWTG	4TM1	U07
742VU	CMC 1	3TM1	Q66
FOR 1TM2			
722VU	CMC 2	3TM2	D45
722VU	CMC 2 SWTG	4TM2	W35

4. Procedure

(Ref. Fig. 401/TASK 45-13-34-991-001)

Subtask 45-13-34-020-050

A. Removal of the CMC

- (1) Loosen the nuts (4).
- (2) Lower the nuts (4).
- (3) Pull the CMC (1) on its rack (3) to disconnect the electrical connectors (2).
- (4) Remove the CMC (1) from its rack (3).
- (5) Put blanking caps on the disconnected electrical connectors.

**NOTE** : If you removed the CMC 1 and if you transferred the memorized avionics configuration to the CMC 2, you can:  
- remove the CMC 2

EFF : ALL

THA

**45-13-34**

Page 403  
Oct 01/04

# Manufacturer's Documentation

## Aircraft Maintenance

# AMM : Aircraft Maintenance Manual (Sample)

File Edit View Go Document Window Help

Back Forward Previous Next Book List Contents Aircraft CMCS Search Print Equip #

EICAS Fault # CMC # Obs/Cab ATA # Task #

{ALL} [747-400] AMM, Rev 58, Oct 18/2006, D633U101-66

**BOEING**

**747-400**

**Maintenance Manual**

CENTRAL MAINTENANCE COMPUTER SYSTEM - DESCRIPTION AND OPERATION

1. General

A. The CMCS collects, stores, and displays maintenance information generated by line replaceable units (LRUs). The CMCS also provides a central location to initiate system BITE tests. The Central Maintenance Computer System (CMCS) interfaces with all major avionics, electrical, and mechanical systems installed on the airplane.

B. The CMCS provides fault consolidation to combine multiple fault indications when a single fault is reported by multiple subsystems.

Approximately 6500 CMCS fault messages can be generated, and up to 500 of these messages can be stored in CMCS memory.

C. The CMCS consists of two central maintenance computers (CMCs), two ground test switches, eight enable relays, and one printer (Figure 1).

D. The primary crew interface with the CMCS is through the control display units (CDUs) which are part of the Flight Management Computer System (FMCS) (PAGEBLOCK 34-61-00/001). The CMCS also works in close conjunction with the IDS Integrated Display System (IDS) (PAGEBLOCK 31-61-00/001). (Figure 2)

**TII 001-006 PRE SB 747-45-2013**

E. The data loader is used to load the CMC software and the CMCS airline data base (PAGEBLOCK 45-10-10/201).

**TII 007-999; TII 001-006 POST SB 747-45-2013**

F. The data loader is used to load the CMC software and the CMCS airline data base (PAGEBLOCK 45-10-10/201). The data loader can also be used to download CMC fault data onto a diskette for analysis at a later time (PAGEBLOCK 45-10-11/201).

**TII ALL**

G. Electrical power is supplied by the Electrical Power System (PAGEBLOCK 24-00-00/001). (Figure 3)

H. The CMCS interface with most airplane systems consists of test initiation commands being sent to the individual PLUs, and test results being sent

Effectivity: TII ALL

45-10-00/001  
Issue Date: Oct 18/2006

File Edit View Go Graphic Window Help

Prev Fig Next Fig Prev Sht Next Sht PrevView NextView Print PrinZoom Zoom In ZoomOut Full Page FullWidth

Magnify Global Move

**Figure 1. Central Maintenance Computer System - Component Location**

Sheet 1

Figure 1 consists of four diagrams illustrating the component locations of the Central Maintenance Computer System (CMCS) in the flight compartment:

- Diagram 1:** A perspective view of the flight compartment showing the location of the P1801 Panel, P1802 Panel, and P1803 Panel.
- Diagram 2:** A diagram of a ground test switch with 'GND TESTS' and 'ENABLE' positions.
- Diagram 3:** A diagram of a control display unit with 'LEFT, RIGHT, OR CENTER CONTROL DISPLAY UNIT' label.
- Diagram 4:** A diagram of a multiple-input printer with 'DATA PRINTER' label.

Effectivity: TII ALL

45-10-00/101  
Effectivity: TII ALL

# Manufacturer's Documentation

## Aircraft Maintenance

### FIM : Fault Isolation manual / TSM : Trouble Shooting Manual

“Fault isolation trees for the purpose of pinpointing and fixing problems”

The screenshot shows a page from the Boeing 777 Fault Isolation Manual. At the top center is the Boeing logo and the text "777 Fault Isolation Manual". Below this is the task identifier "TASK 23-11-00-810-818". The main content is task 818, titled "HF Transceiver Input Problems from left AIMS on DCMF INPUT 429 Bus - Fault Isolation". It is divided into four sections: A. Maintenance Messages, B. Description, C. Possible Causes, and D. Circuit Breakers. Section A lists two maintenance messages: 23-59940 and 23-59942. Section B describes the task's purpose. Section C lists three possible causes: HF Communication Transceiver (L or R), M23101, M23201; IOM(M009) in left AIMS; and Wiring. Section D lists circuit breakers related to the fault, specifically the Overhead Circuit Breaker Panel, P11. At the bottom of the page, there is a table with two columns: "Row Number" and "Name". The table contains one row: "G 2 (C23301) L HF COMM". The footer of the page includes "Effectivity: TII 015-999" on the left and "23-11 TASK 818 Issue Date: May 05/2006" on the right.

**BOEING**  
777  
Fault Isolation Manual

TASK 23-11-00-810-818

818.  
HF Transceiver Input Problems from left AIMS on DCMF INPUT 429 Bus - Fault Isolation

A. Maintenance Messages  
(1) This task is for maintenance messages: 23-59940, 23-59942.

B. Description  
(1) Use this task when the HF transceiver (L or R) has input problems from the left AIMS on DCMF INPUT 429 Bus.

C. Possible Causes  
(1) HF Communication Transceiver (L or R), M23101, M23201.  
(2) IOM(M009) in left AIMS.  
(3) Wiring.

D. Circuit Breakers  
(1) These are the circuit breakers related to the fault:

Overhead Circuit Breaker Panel, P11

Row Number	Name
G 2 (C23301)	L HF COMM

Effectivity: TII 015-999

23-11 TASK 818  
Issue Date: May 05/2006

# **Manufacturer's Documentation**

## **Aircraft Maintenance**

**SDM : Schematic diagram manual /**

**ASM : Aircraft Schematic Manual**

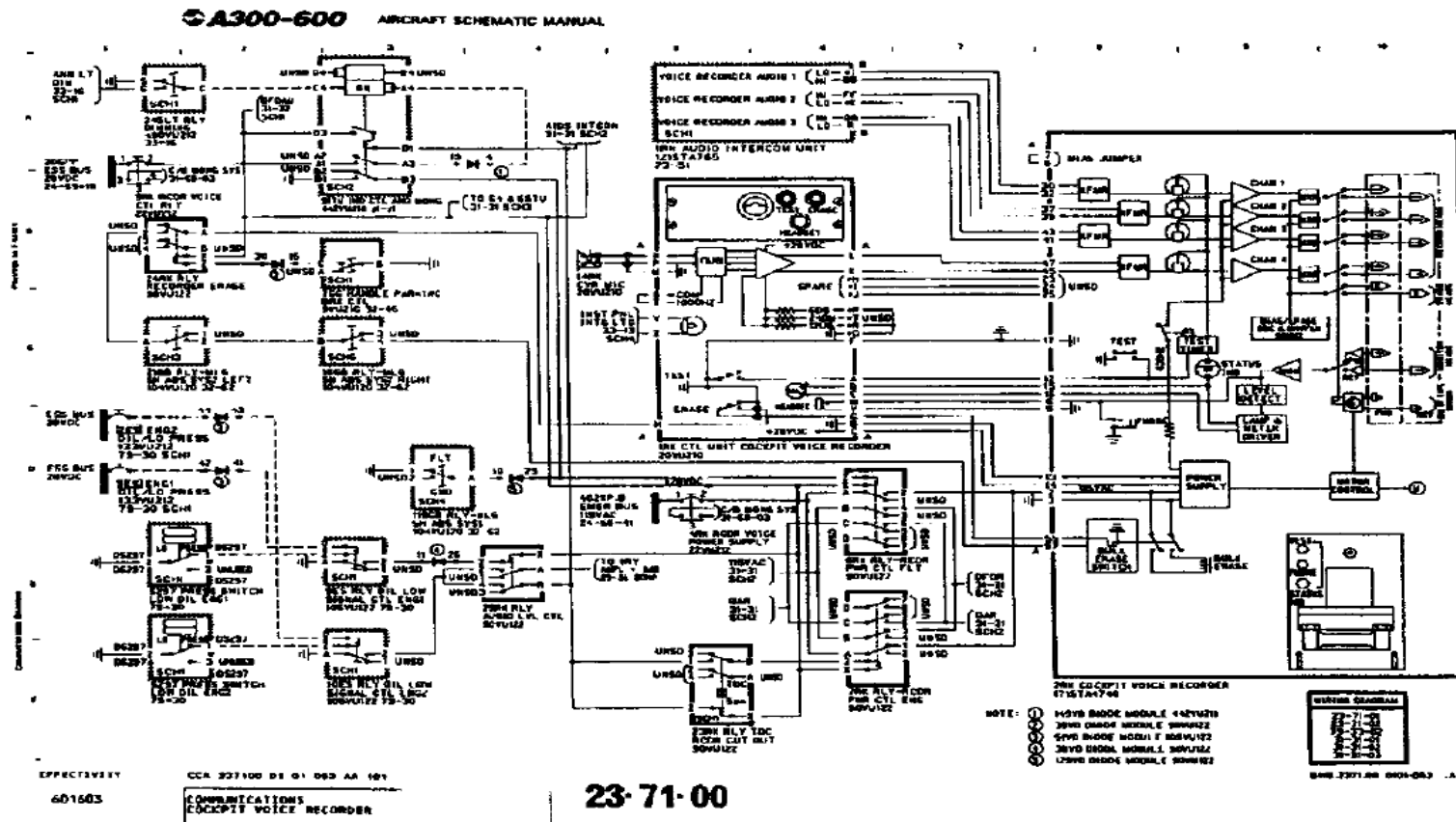
Schematic diagrams of electrical, electronic, and hydraulic systems on the aircraft as well as logic diagrams contains the detailed information and identifies wiring harnesses, connectors, and interfacing equipment.



# Manufacturer's Documentation

## Aircraft Maintenance

SDM : Schematic diagram manual /  
 ASM : Aircraft Schematic Manual



# Manufacturer's Documentation

## Engineering

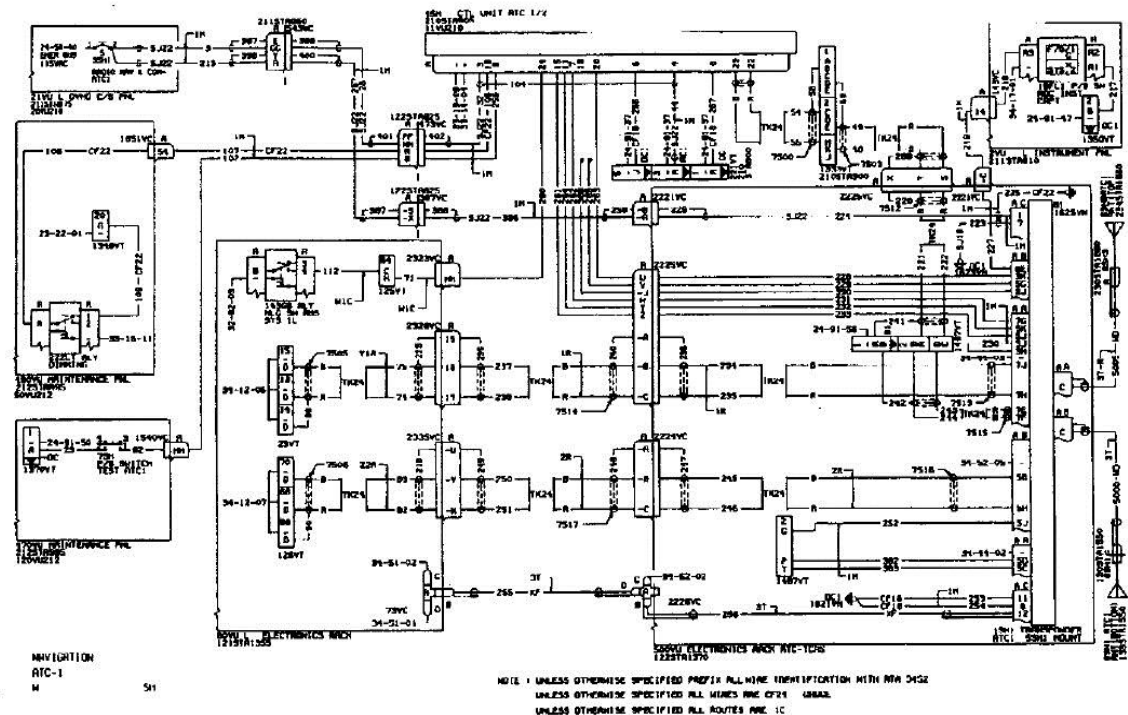
- To develop Aircraft changes and to assist in trouble shooting / Repairs
  - AWM (Aircraft Wiring Manual)
  - AWL (Aircraft Wiring List)
  - ELA (Electrical Load Analysis)
  - SB (Service Bulletins)
  - SL (Service Letters)
  - MT (Maintenance Tip)
  - SRM (Structural Repair Manual)
  - WBM (Weight and Balance Manual)
- To prepare maintenance, To plan maintenance
  - TEM : Tool Equipment Manual
  - MPD : Maintenance Planning

# Manufacturer's Documentation

## Engineering

### WDM : Wiring diagram manual / AWM : Aircraft Wiring Manual

- Complete run of wiring, including cable bundle numbers and routing, plug and connector numbers and locations, bulkheads, and other structural elements through which the wiring is routed



# Manufacturer's Documentation Engineering

## SRM : Structural Repair Manual

- Information needed to effect certain repairs of the aircraft structure.
- Repairs are simple and are approved by the FAA for operator completion.
- Other structural repairs must be done by the airframe manufacturer or some other FAA designated repair facility.

**A319/A320/A321**  
STRUCTURAL REPAIR MANUAL

**F 5. Skin Repair on Lateral Passenger Door Frame**

**A. General**

- (1) This repair principle is applicable for damage to the skin on lateral door frame.
- (2) The maximum permitted skin cutout is limited to a length of half a frame bay and a width of 170 mm (6.693 in.).
- (3) The applicability of this repair principle is limited to the repair areas given in Figure 203 (Sheet 1).

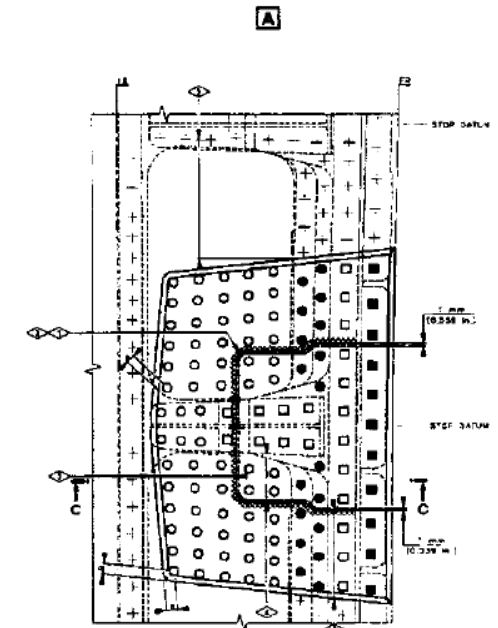
**B. Repair Materials**

ITEM	DESCRIPTION	QTY	MATERIAL/REMARKS
1 and 2			Ref. Fig. 203 (Sheets 2 and 3)
-	Sealant	-	Material No. 09-015 (Ref. 51-35-00)
-	Cleaning agent	-	Material No. 11-003 (Ref. 51-35-00)
-	Polyurethane primer	-	Material No. 16-001 (Ref. 51-35-00)
-	Polyurethane finish paint	-	Material No. 16-018 (Ref. 51-35-00)
-	Wash primer	-	Material No. 16-020 (Ref. 51-35-00)

**C. Repair Instructions (Ref. Fig. 203 Sheets 2 and 3)**

- (1) Remove the fasteners in the repair area.
  - (2) Remove the sealant from the repair area.
- WARNING :** CLEANING AGENT (MATERIAL NO. 11-003) IS DANGEROUS. OBEY THE MANUFACTURER'S INSTRUCTIONS WHEN YOU USE CLEANING AGENT.
- (3) Clean and degrease the repair area with cleaning agent (Material No. 11-003).
- CAUTION :** TAKE CARE NOT TO CAUSE DAMAGE TO THE STRUCTURE BELOW THE SKIN PANEL.
- (4) Cut out the damaged area of the skin and deburr the edges (for cutout limits, refer to Figure 203 Sheet 2).
  - (5) Check if the distance between the cutout and the skin pocket step is in accordance with Figure 203 Sheet 3.
  - (6) If necessary, rework the skin cutout in accordance with Figure 203 Sheet 3.
  - (7) Manufacture the repair parts (1) and (2) and break the sharp edges.
  - (8) Mark the position of the existing holes from the skin to the repair parts (1) and (2).
  - (9) Mark on the repair parts (1) and (2) the position of the holes for the additional fasteners in accordance with the existing fastener pitch (for rivet pitch and edge distance, refer to 51-47-00).
  - (10) Drill all the pilot holes on the repair parts (1) and (2).

**A319/A320/A321**  
STRUCTURAL REPAIR MANUAL



Skin Repair on Lateral Passenger Door Frame

Figure 203 (Sheet 2)

# Manufacturer's Documentation

## Engineering/Planning

### MPD : Maintenance Planning

- List of maintenance and servicing tasks to be performed on the aircraft.
- All items of the MRB report along with other information.
- Certification maintenance requirements (CMRs)
- Tasks, which were developed by the MSG process

A330 MAINTENANCE PLANNING DOCUMENT								
TASK NUMBER	ZONE	DESCRIPTION	THRESHOLD INTERVAL SAMPLE	SOURCE	REFERENCE	MEN	M.H.	EFFECTIVITY
292000-01-1	210	AUXILIARY HYDRAULIC POWER OPERATIONAL TEST OF AUTOMATIC AND MANUAL START OF GREEN AND YELLOW ELECTRICAL PUMPS AND MANUAL START OF BLUE ELECTRICAL PUMP	I: 4 A	MRB B	292000-710-801 AMM 292000/5	2	2.00	ALL
292000-04-1	210	AUXILIARY HYDRAULIC POWER FUNCTIONAL TEST TO MONITOR INTERNAL LEAK RATE OF GREEN HYDRAULIC SYSTEM	I: 18 MO OR 8000 FH	MRB B	291900-720-802 AMM 291900/5	2	1.00	ALL
292000-05-1	210	AUXILIARY HYDRAULIC POWER FUNCTIONAL TEST OF GREEN, BLUE AND YELLOW LOW LEVEL WARNING SYSTEM	I: 12000 FH	MRB B	293100-720-804 AMM 293100/5	2	0.50	ALL
R 292400-01-1	210	RAM AIR TURBINE OPERATIONAL TEST OF RAM AIR TURBINE AUTOMATIC DEPLOYMENT DETAILED VISUAL INSPECTION OF THE RAM AIR TURBINE ONCE EXTENDED. ACCESS: 633HB	I: 18 MO OR 8000 FH	MRB B	292400-710-804 AMM 292400/5	2	2.00	ALL
R 292400-03-1	633	RAM AIR TURBINE OPERATIONAL TEST OF RAM AIR TURBINE MANUAL DEPLOYMENT *** CONTINUED ***	I: 18 MO OR 8000 FH	MRB B CMR**	292400-720-801 AMM 292400/5	2	0.75	ALL
SYSTEMS & COMPONENTS : HYDRAULIC POWER								
ISSUE : OCT 1/97 SECTION : 3-29/2 PAGE : 1								
Printed in France								

# Manufacturer's Documentation

## Maintenance/Planning/Stores

: To provision and identify spare parts  
 – **IPC : Illustrated parts Catalog**

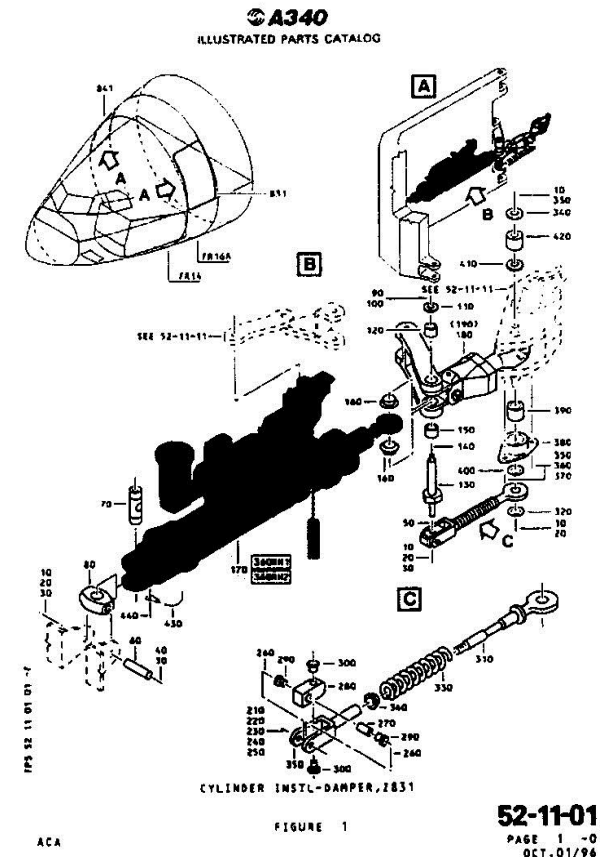
- Lists and location diagrams of all parts used on the aircraft model.
- Information on part numbers, vendors, interchangeability of parts

**A340**  
ILLUSTRATED PARTS CATALOG

FIG-TRK	PART NUMBER	DESCRIPTION	QUANTITY	UNIT PER ASSEMBLY
1	F5211010100060	CYLINDER INSL-DAMPER, 2831 (LH)	1	RF
2	F5211010100160	CYLINDER INSL-DAMPER, 2843 (RH)	1	RF
10	MS24665-153	.PIN-COTTER	4	
20	MSA5059-4	.NUT	3	
		OPT TO 737B9425 (V56878)		
		OPT TO RTE9868-4 (V72962)		
		OPT TO THCR354M (VFO224)		
		OPT TO MS14145L4		
30	A5217240220600	.WASHER	2	
40	MS1304-38	.BOLT	2	
50	A5217240220800	.WASHER	2	
60	A5211072220000	.BUSHING	1	
70	A52110722120000	.PIN-HINGE	1	
80	A52110722020000	.YOKE	1	
90	MS24665-302	.PIN-COTTER	1	
100	MSA5059-6	.NUT	1	
		OPT TO THCR354M (VFO224)		
		OPT TO RTE9868-6 (V72962)		
110	A5217240225200	.WASHER	1	
120	A5211070120000	.BUSHING	1	
130	A5211070220000	.BOLT	1	
140	MS20002C10	.WASHER	1	
150	A5211069920000	.BUSHING	1	
170	FE127-02-000	.ACTUATOR-DOOR, PASSENGER VFOZ21 SEE 52-11-14-01 FOR DET CMM 52-11-04		
190	F5211010100161	.ROD INSL (RH) SEE 52-11-01-02 FOR DET	1	
200	A5211139500000	.ROD-SPRING	1	
210	MS24665-B6	.PIN-COTTER	1	
220	MSA5059-3	.NUT	1	
		OPT TO THCR353M (VFO224)		
		OPT TO RTE9868-3 (V72962)		
230	AN960-10L	.WASHER	1	
		OPT TO MS1149F0332P		
240	MS1303-18	.BOLT	1	
250	MSA3061-3	.WASHER	2	
260	A5217240220000	.WASHER	1	
		RPLS A5217228520200		
270	A5211071820000	.SPACER	1	
280	A5211071700000	.YOKE ASSY RPLS A5211071720000	1	

ITEM NOT ILLUSTRATED  
 MISSING ITEMS AND VARIANTS ARE NOT APPLICABLE

**52-11-01**  
PAGE 1 - 1  
OCT.01/96



# Manufacturer's Documentation Operations

To operate in cockpit/cabin, To prepare the flight

- MMEL : Master Minimum Equipment List
- CDL : Configuration deviation list
- **DDG : Dispatch deviation guide**



# Manufacturer's Documentation

## Maintenance/Engineering/Planning

- Whenever the airframe manufacturer or the engine manufacturer have modifications or suggestions for improving maintenance and/or servicing, they will issue appropriate paperwork to the affected airlines.
  - **SB : Service Bulletins**

A service bulletin (SB) is usually a modification of a system that will provide improved safety or operation of a system and includes a detailed description of the work and parts required.
  - **SL : Service Letter**

A service letter (SL) usually provides information to improve maintenance actions without equipment modification.
  - **MT : Maintenance Tip**

The maintenance tip is a suggestion for maintenance personnel to assist in their work or improve conditions.

# Air Operator's Documentation

»» Air Operator's Documentation

# Air Operator's Documentation

- Operations specifications
- Technical policies and procedures manual TPPM
- Inspection manual IM
- Reliability program manual RPM
- Minimum equipment list MEL
- Task cards\* TC
- Engineering orders EOs

# Air Operator's Documentation

- **IM : Inspection manual**

May be a separate document distributed primarily to QC personnel, or it can be a chapter in the TPPM (usual approach).

- **Relate to all inspection activities within M&E:**

(a) mechanic inspection tasks from the MPD or the MRB report

(b) QC inspector's tasks

(c) special inspections (hard landings, bird strikes, etc.)

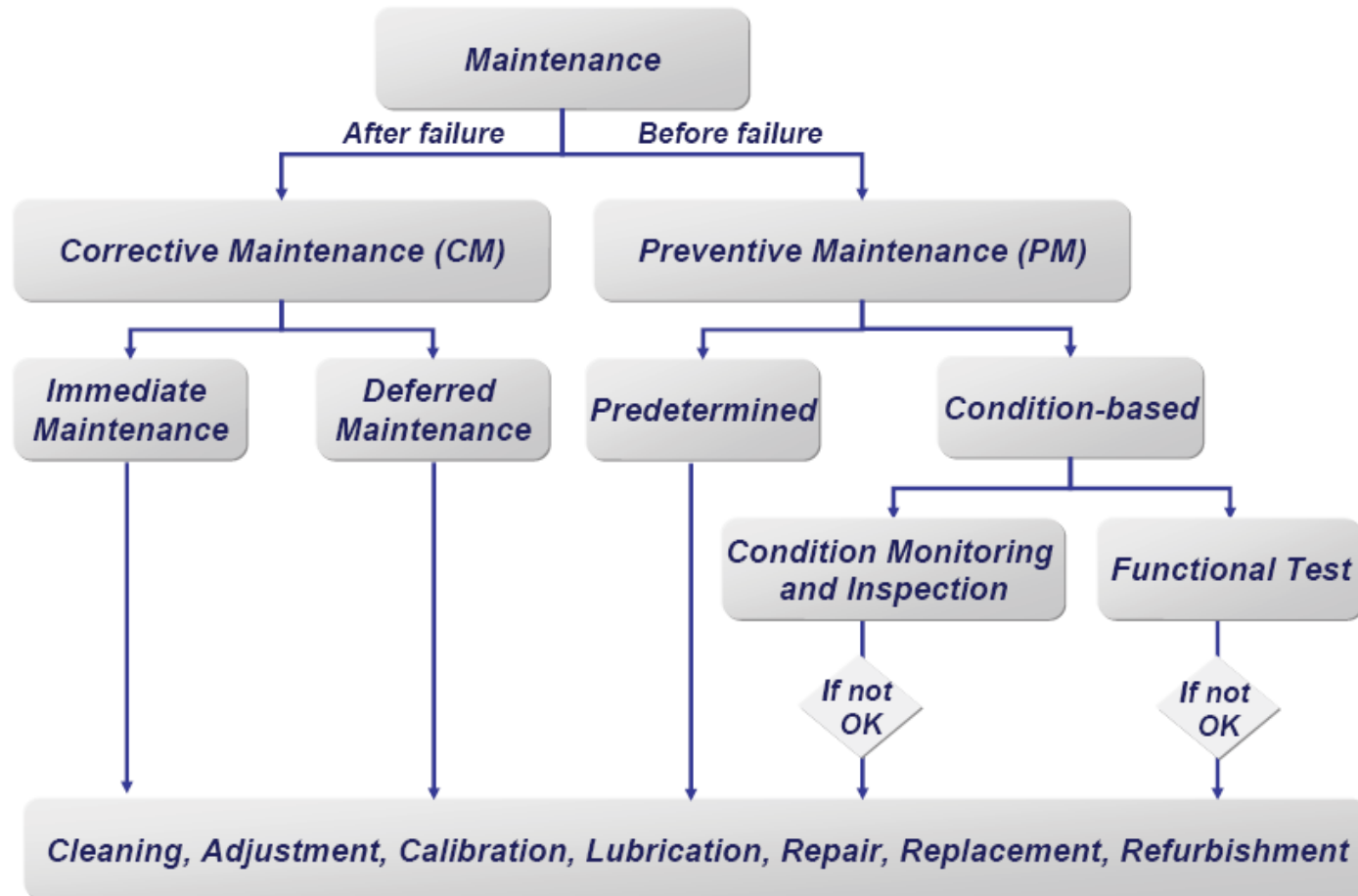
(d) the airline's Required Inspection Item (RII) program

(e) the paperwork, forms, and reports required to carry out these functions.

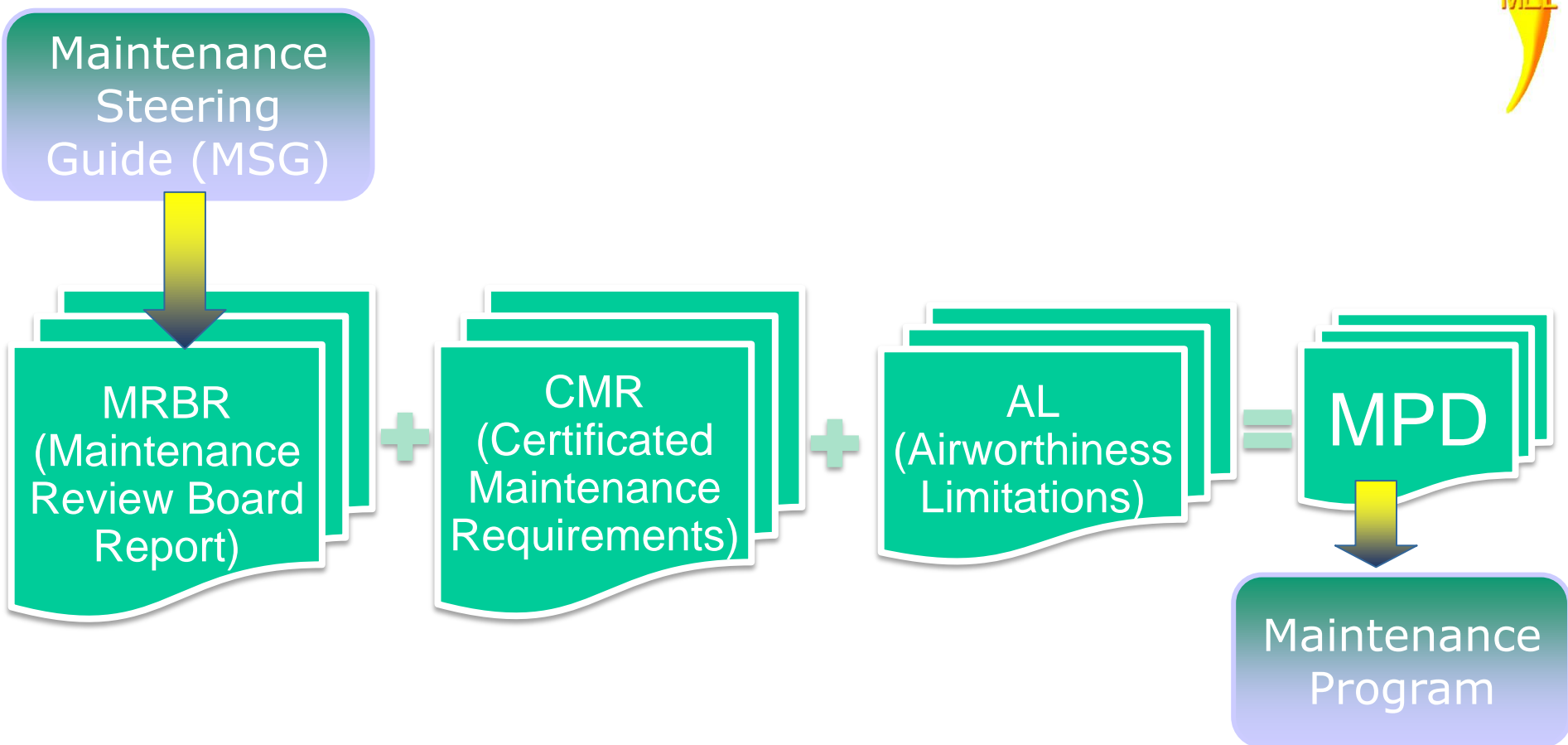
# Air Operator's Documentation

- **RPM : Reliability program manual**
  - Airline's reliability program **must be approved** by the regulatory authority
- **Minimum equipment list (MEL)**
  - **Customize the MMEL** for the operator particular airframe/engine configuration.
  - The operator must **carry copies of this MEL in each aircraft** for flight crew reference.
  - The applicable items in the DDG and the CDL should also be included with the MEL.
- **Task cards**
  - To **avoid unnecessary duplication** of certain actions, and the unnecessary opening and closing of the same panels, then the operator write their own task cards to spell out exactly what to do
- **Engineering orders (EO)**
  - **Official paper work**, issued by engineering and **approved by QA**
  - Some airlines called simply a **"Work Order."**

# TYPES OF MAINTENANCE TASKS

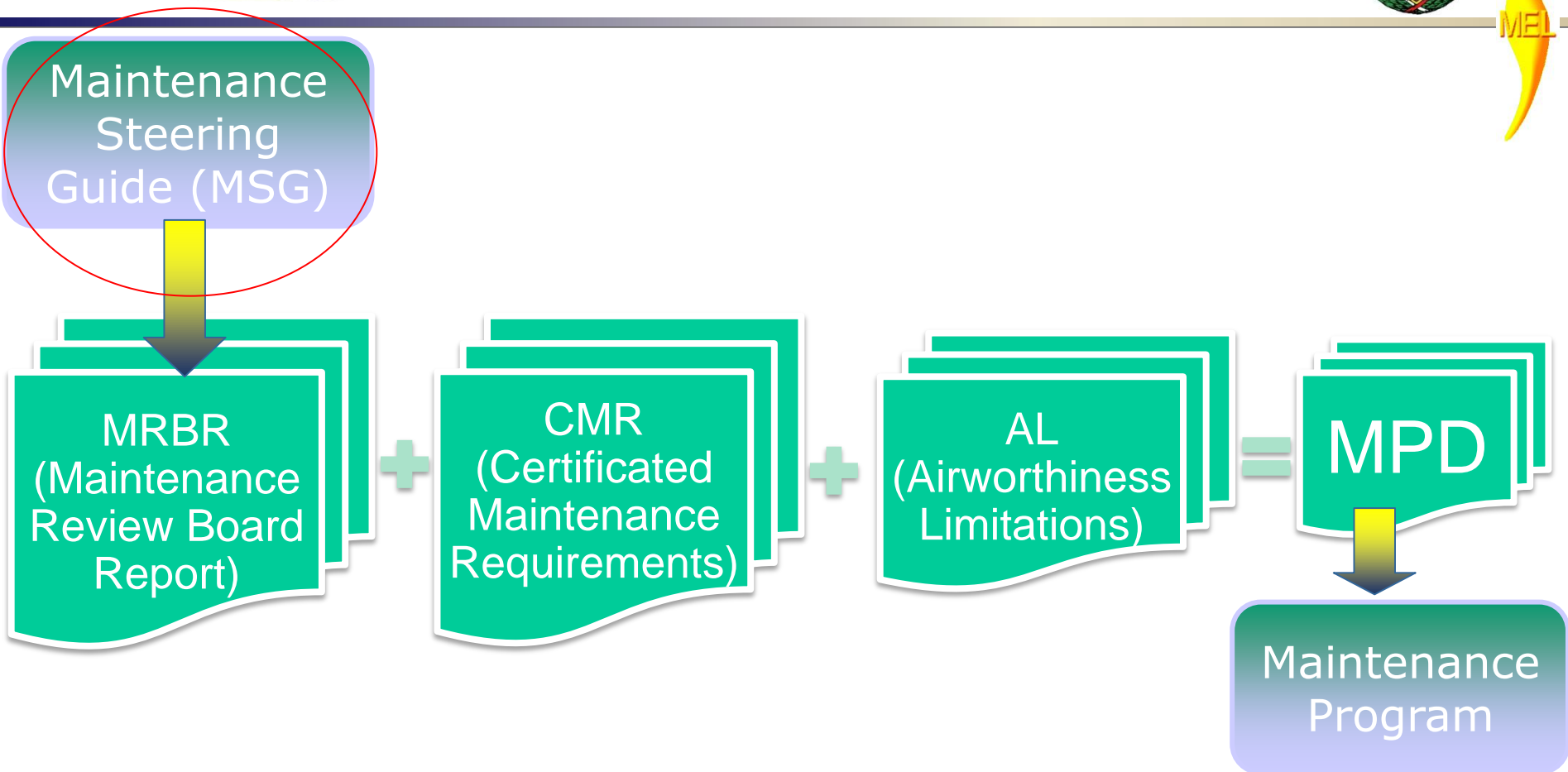


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### MSG - 3

#### Separation Analysis

- Systematic
- Structural
- Zonal

Task Oriented

Top-Down Approach

Airline  
System  
Component  
Unit

Maintenance Tasks;  
LU,SV,OP,VC,IN,FC,RS,DS



Task & Intervals

### MSG - 2

#### Separation Analysis

- Systematic
- Structural

Process Oriented

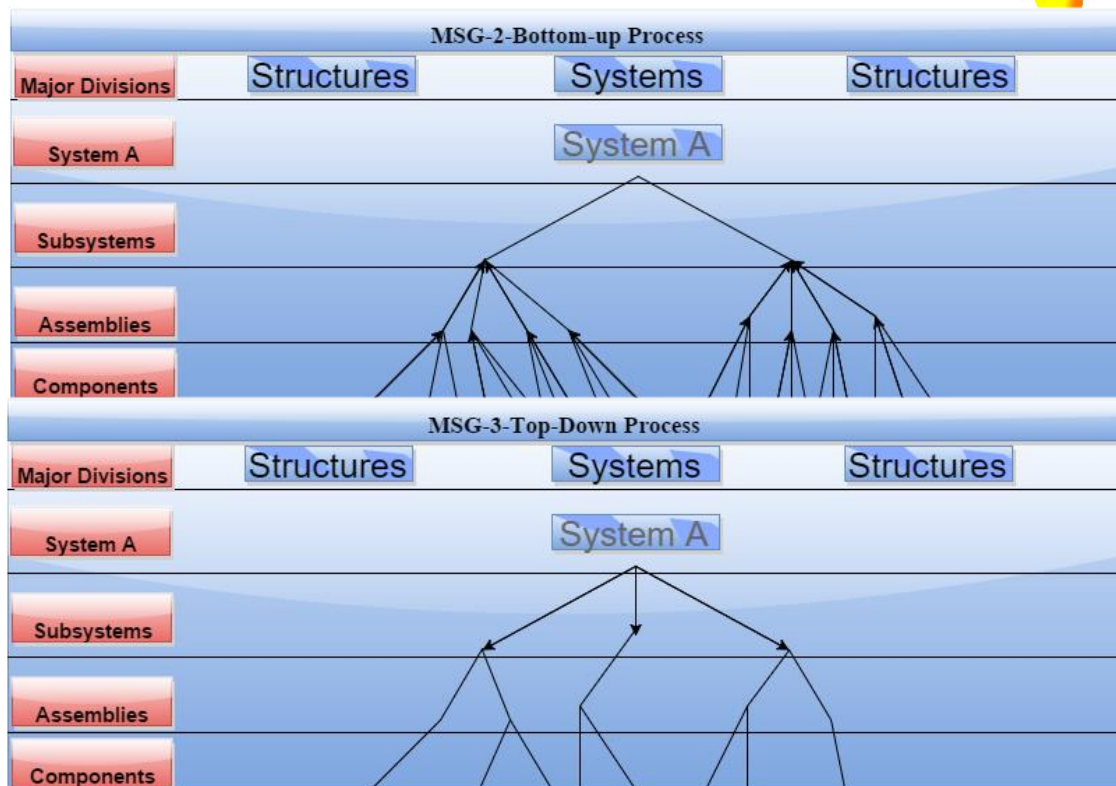
Down-Top Approach

Airline  
System  
Component  
Unit

Maintenance Tasks;  
HT,OV,CM



Tasks & Intervals



MSG-2 & MSG-3 Decision Logic Processes

**MSG - 3**

Separation Analysis

- Systematic
- Structural
- Zonal

Task Oriented

Top-Down Approach

Airline  
System  
Component  
Unit

Maintenance Tasks;  
LU,SV,OP,VC,IN,FC,RS,DS



Task & Intervals

**MSG - 2**

Separation Analysis

- Systematic
- Structural

Process Oriented

Down-Top Approach

Airline  
System  
Component  
Unit

Maintenance Tasks;  
HT,OV,CM



Tasks & Intervals

For each potential failure cause, the MSG-3 guidelines provide task-oriented logic to determine the appropriate scheduled maintenance tasks

A Task Oriented Program consists of specific tasks, selected for a given functional failure consequence based on actual reliability characteristics of the equipment they are designed to protect

Tasks are selected in a hierarchy of difficulty and cost, from lowest to highest

Depending on the on the consequence of failure (safety, operational, economic, hidden safety and hidden non-safety) a single or combination of tasks will be selected

### MSG - 3

#### Separation Analysis

- Systematic
- Structural
- Zonal

Task Oriented

Top-Down Approach

Airline  
System  
Component  
Unit

Maintenance Tasks;  
LU,SV,OP,VC,IN,FC,RS,DS



Task & Intervals

### MSG - 2

#### Separation Analysis

- Systematic
- Structural

Process Oriented

Down-Top Approach

Airline  
System  
Component  
Unit

Maintenance Tasks;  
HT,OV,CM



Tasks & Intervals

The following is the generic list of tasks to be selected:

1. **Lubrication / Servicing** (LU/SV or LUB/SVC) – for the purpose of maintaining inherent design capabilities.
2. **Operational / Visual Check** (OP/VC or OPC/VCK) – a failure finding task to determine if an item is fulfilling its intended purpose.
3. **Functional Check / Inspection** (FC /IN\* or \*/FNC) – functional checks are a quantitative checks to determine if one or more functions of an item perform within specified limits. There are three levels of inspections to determine if an item is fulfilling its intended purpose.
  - i. General Visual Inspection (GV or GVI)
  - ii. Detailed Inspection (DI or DET)
  - iii. Special Detailed Inspection (SI or SDI)
4. **Restoration** (RS or RST) – reworking, replacement of parts or cleaning necessary to return an item to a specified standard.
5. **Discard** (DS or DIS) – the removal from service of an item at a specified life limit.

**Maintenance Program Groupings** - Under the MSG-3, maintenance tasks are categorized into three program groupings consisting of:

a.) Systems & Powerplant, b.) Structural, and c.) Zonal

The purpose of the **systems & powerplant program**

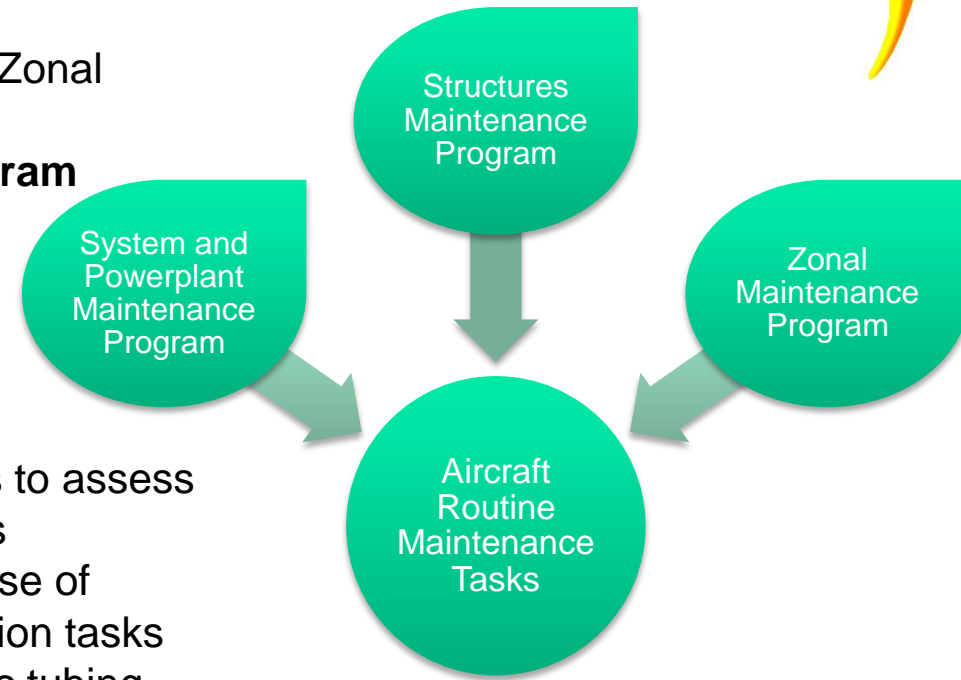
Is to perform functional and/or operational checks on typical airplane systems i.e. flight controls, pneumatics, electrical power, etc.

The purpose of the **zonal inspection program** is to assess

the general condition of attachment of all systems and structures items contained in each zone by use of defined zonal inspection tasks. The zonal inspection tasks include visual checks of electrical wiring, hydraulic tubing, water/waste plumbing, pneumatic ducting, components, fittings, brackets, etc., associated with the systems which are included within the zone boundaries.

The **structural inspection program** is designed to provide timely detection and repair of structural damage during commercial operations. Detection of corrosion, stress corrosion, minor damage and fatigue cracking by visual and/or NDT procedures are considered.

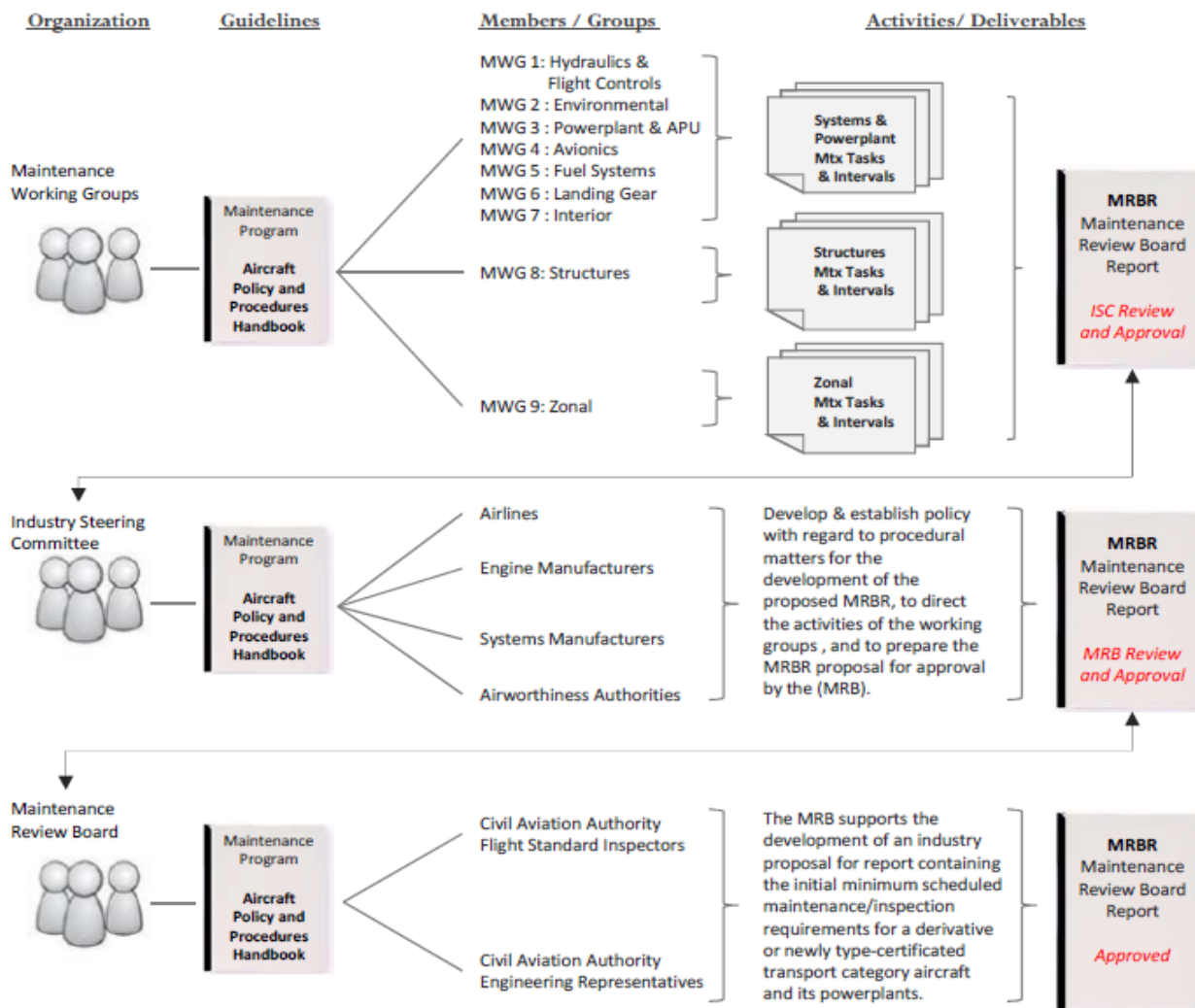
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Maintenance  
Steering  
Guide (MSG)

MRBR  
(Maintenance  
Review Board  
Report)



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# MRB Report

Guidelines

Members / Groups

Activities/ Deliverables

## 1st Phase - Preparation Phase

Establishment of the organization (ISC, WG, MRB)

Development of procedures and interval frame (PPH)

Meetings of the ISC and MRB - Planning

Maint  
Work



## 2nd Phase - Working Phase

ISC/MWG/MRB members training

Manufacturer MSIs and SSIs selection

ISC agreement with the selection of the MSIs and SSIs

Manufacturer preparation of the MSG - 3 analysis for MSIs, SSIs and Zonal

Review of the MSG - 3 analysis during MWG meetings

Harmonization of MSI & SSI tasks with Zonal

MWG results are presented to the ISC

Preparation of the MRBR Proposal by the ISC

Submission of the MRBR Proposal to the MRB

Indu  
Comm

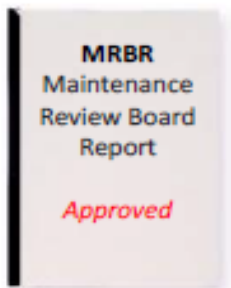


Maintenance

## 3rd Phase - Approval Phase

- Final review on the MRBR Proposal by the MRB
- Approval of the MRBR
- Publication of the MRBR

The MRB supports the development of an industry proposal for report containing initial minimum scheduled maintenance/inspection requirements for a derivative newly type-certificated transport category aircraft and its powerplants.



Maintenance  
Steering  
Guide (MSG)

MRBR  
(Maintenance  
Review Board  
Report)



CMR  
(Certificated  
Maintenance  
Requirements)

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Maintenance  
Steering  
Guide (MSG)

MRBR  
(Maintenance  
Review Board  
Report)

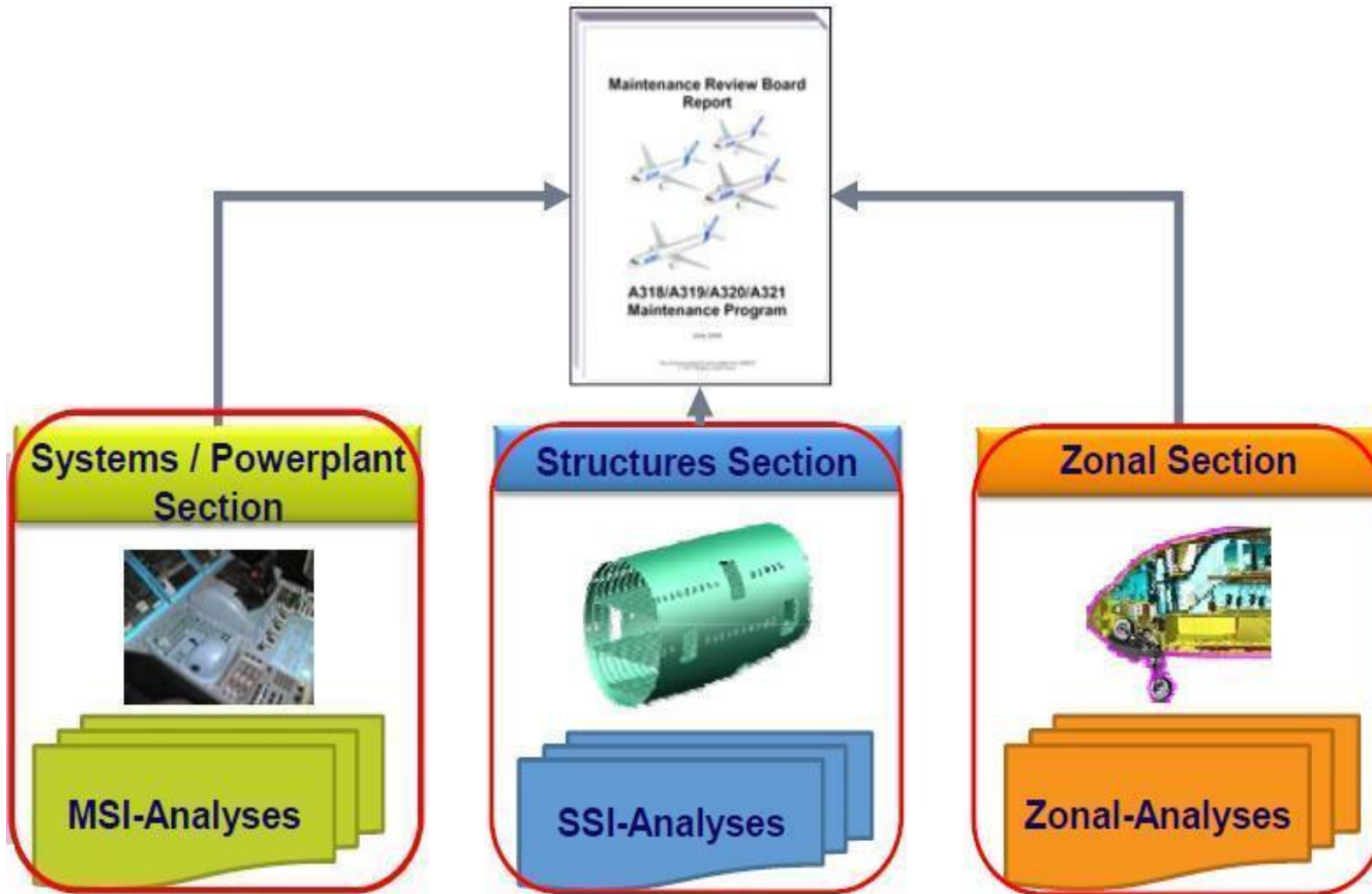
+

CMR  
(Certificated  
Maintenance  
Requirements)

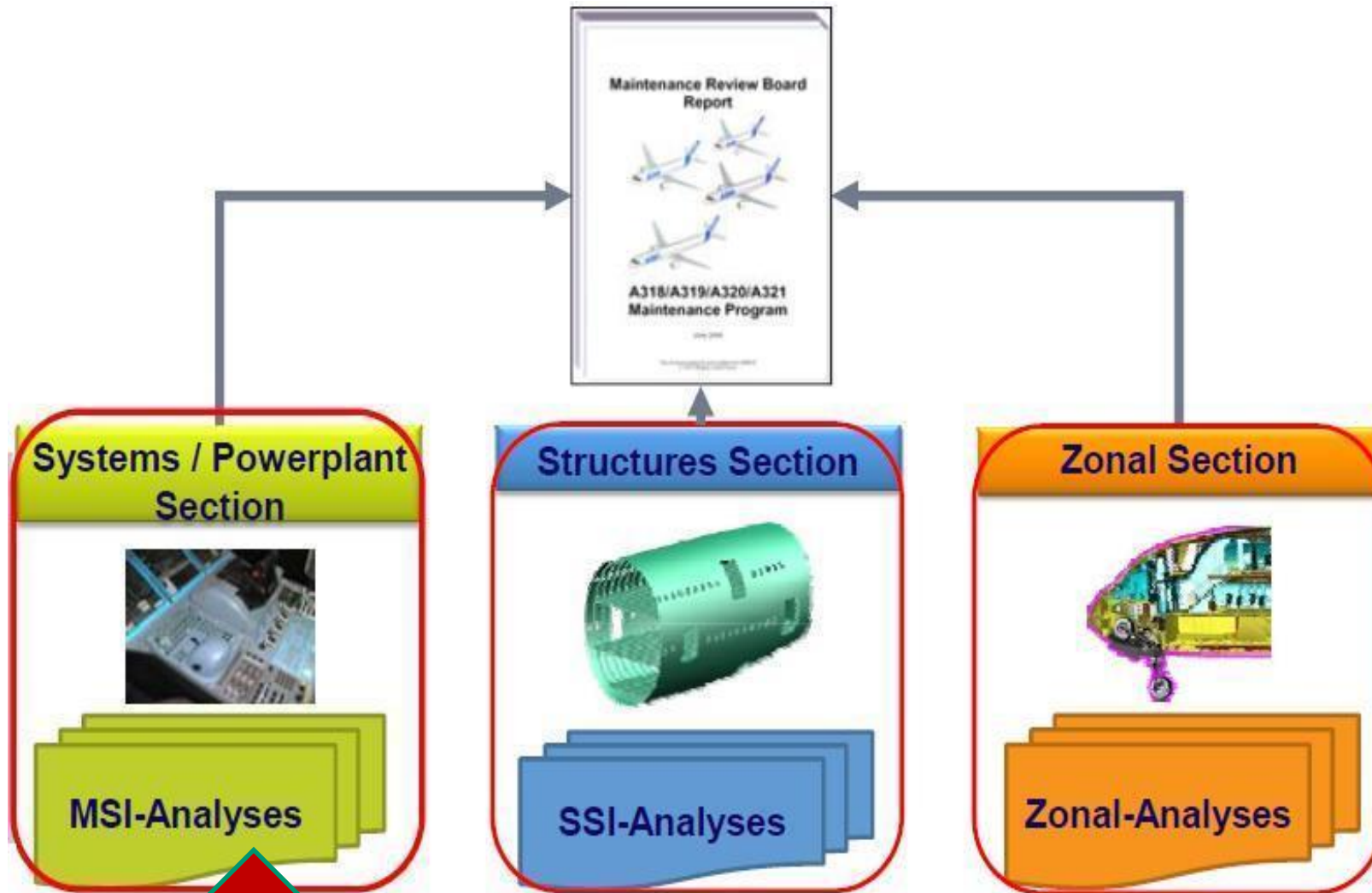
+

AL  
(Airworthiness  
Limitations)

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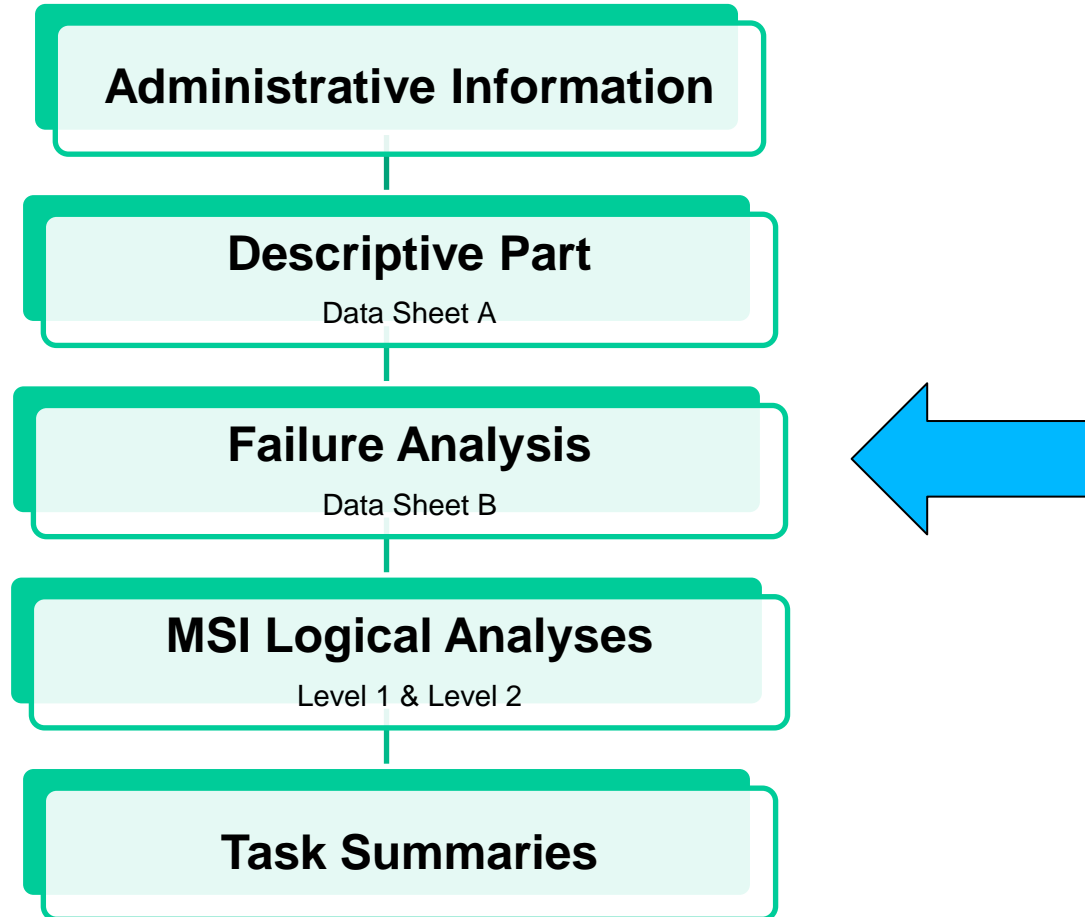


## MSI (Maintenance Significant Item) Analyses

An MSI analysis must be performed if at least one of the following 4 questions are answered “Yes”:

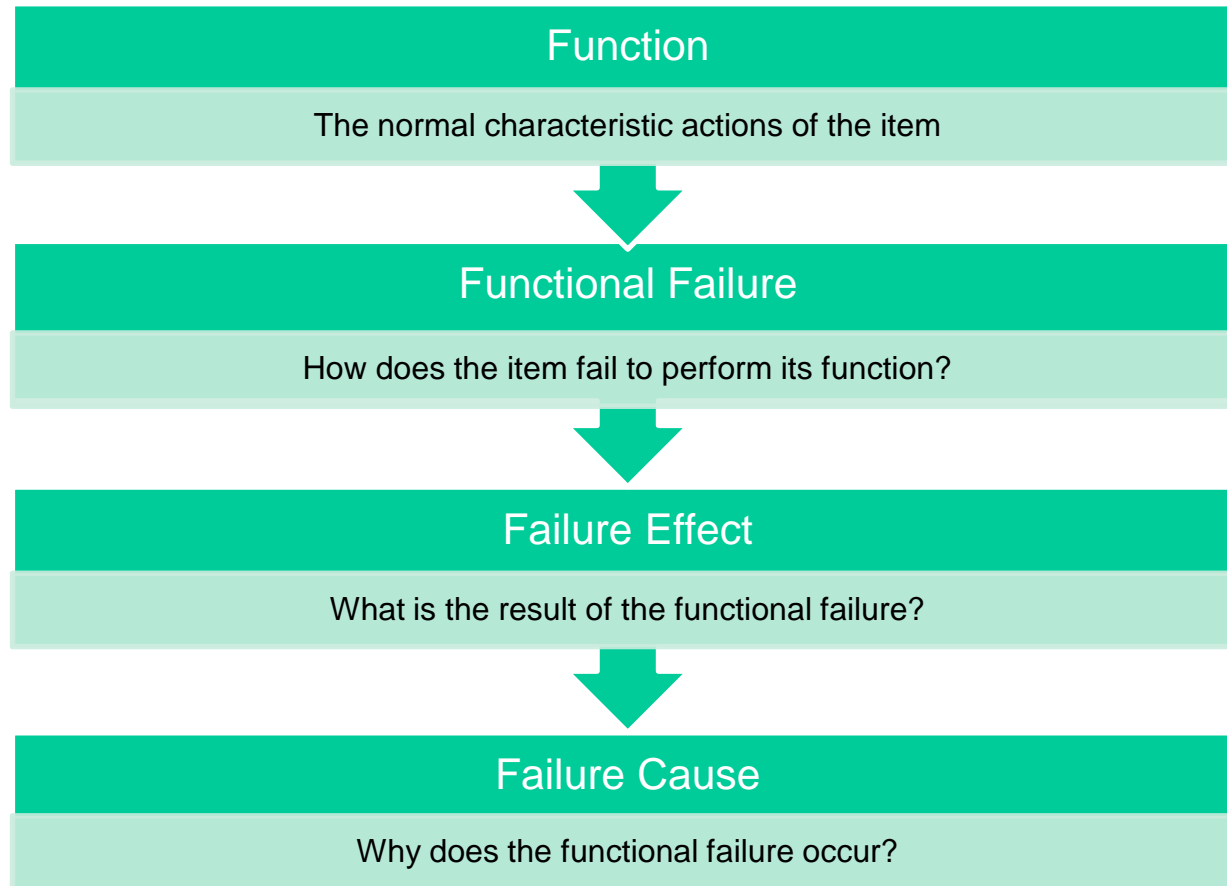
1. Could a failure affect the safety (flight or ground)?
2. Could a failure be undetectable during operations?
3. Could a failure have a significant operational impact?
4. Could a failure have a significant economical impact?

# The process of the MSI analysis is divided into 5 phases:



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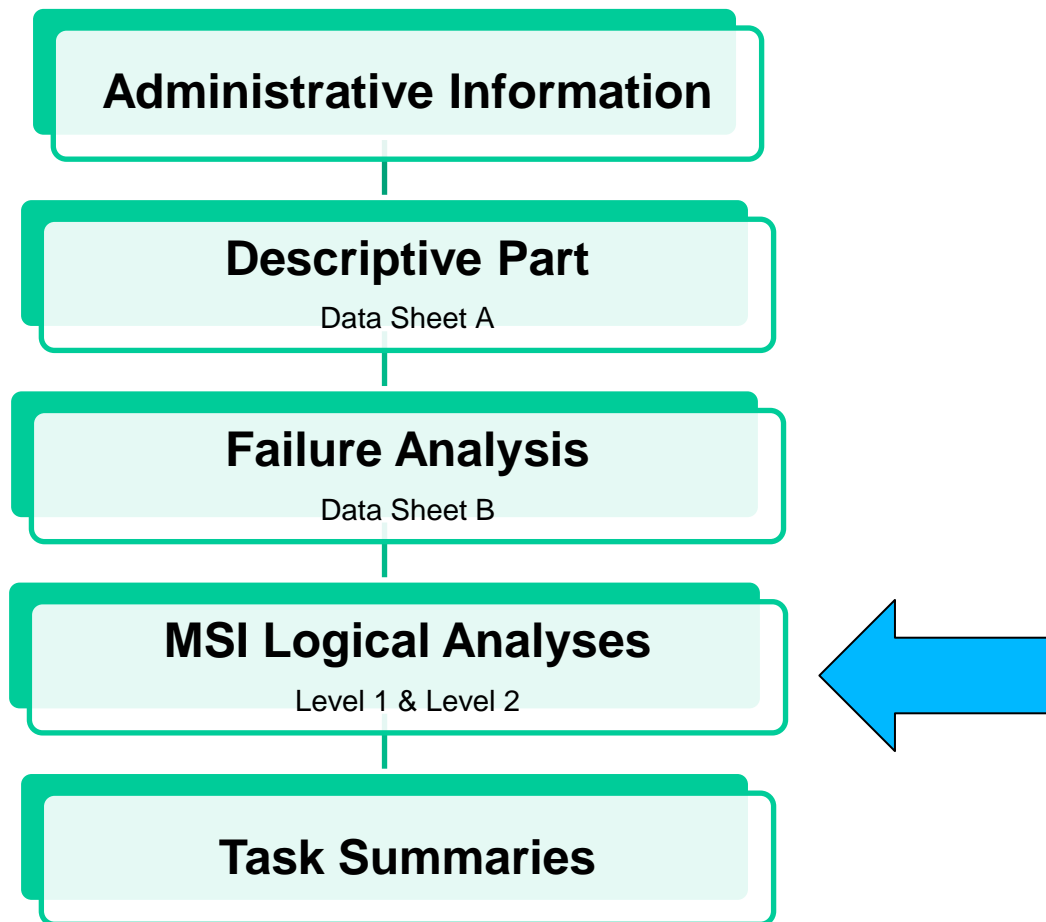
## 4 steps of developing Data Sheet B



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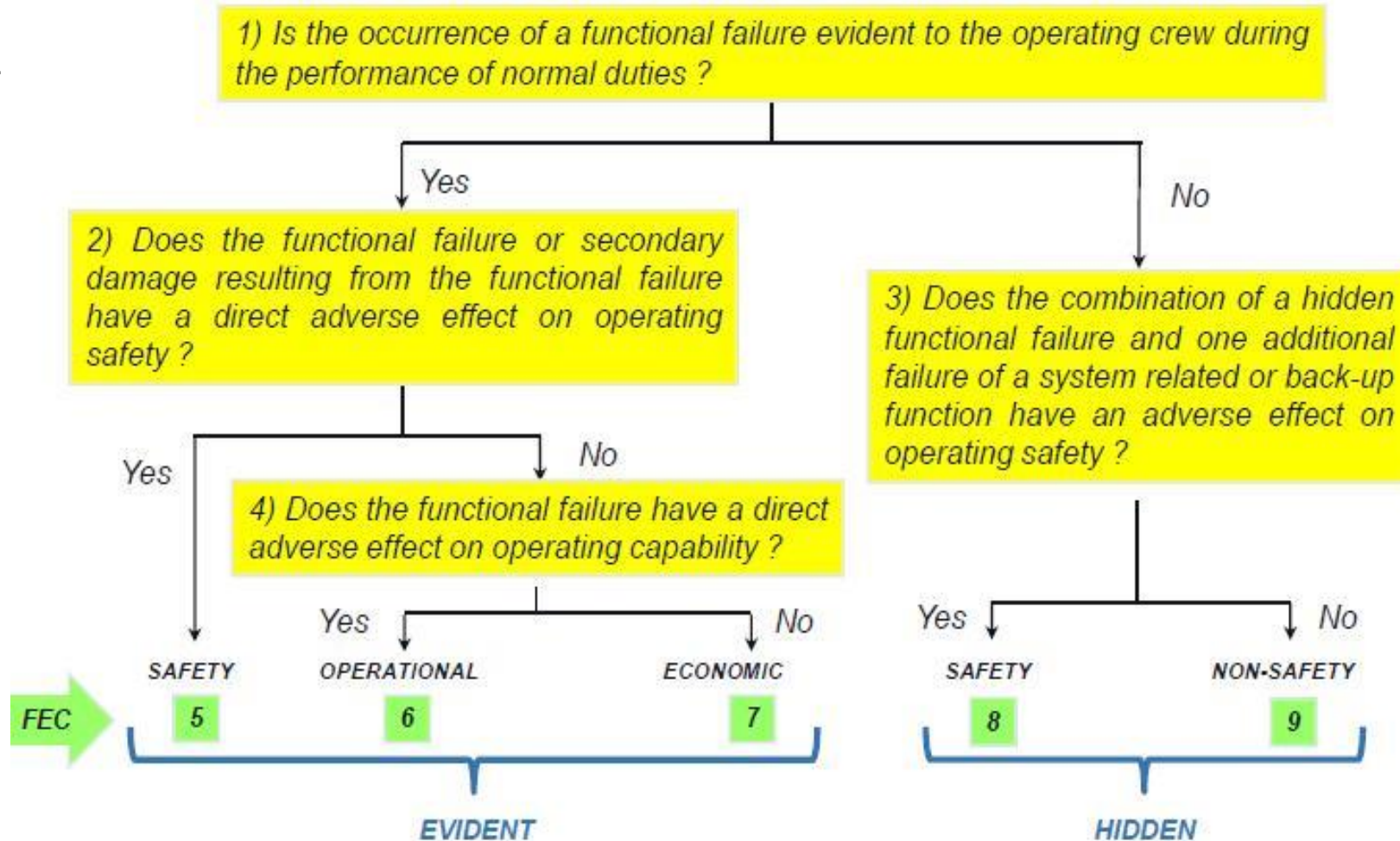
## The process of the MSI analysis is divided into 5 phases:



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## MSI Logical Analyses:

### Level 1:



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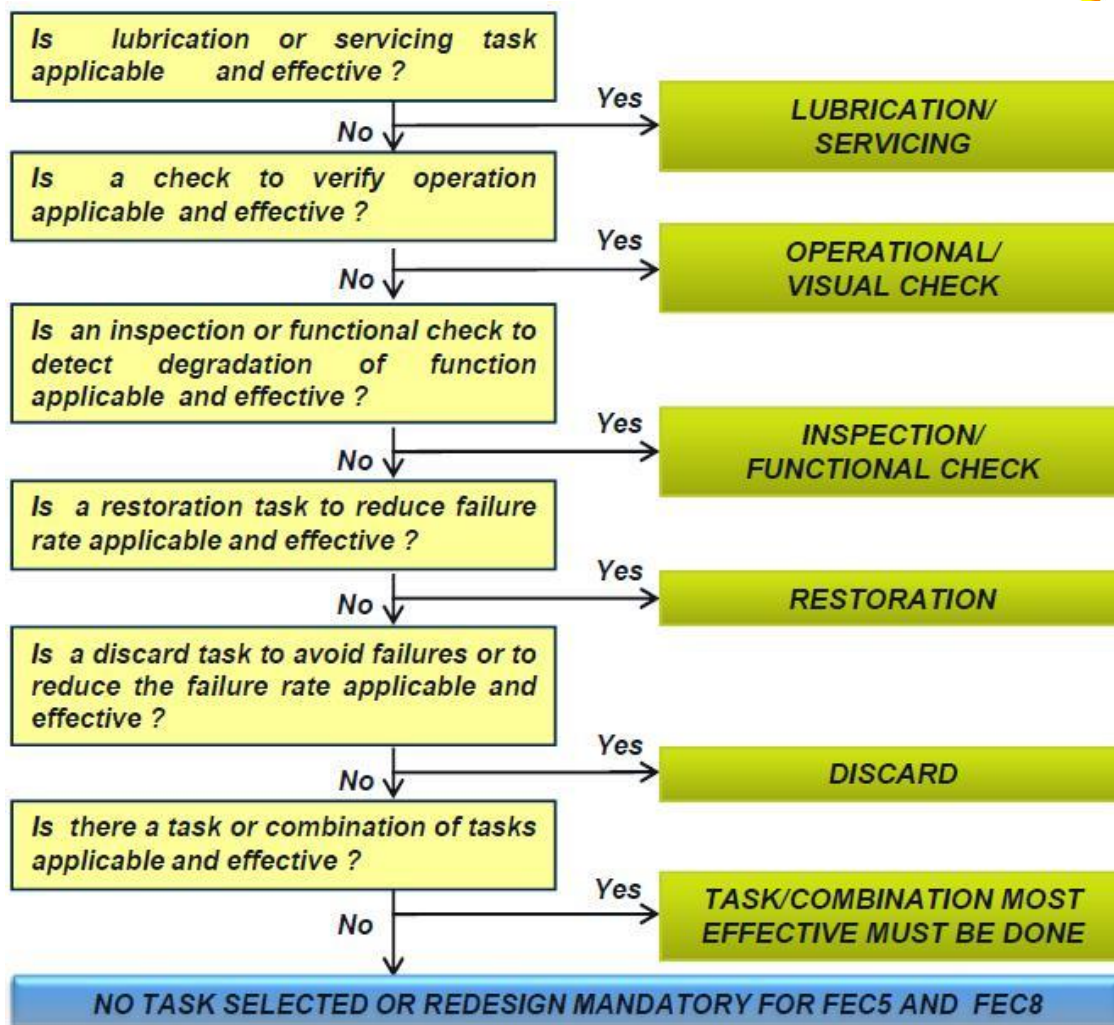


## MSI Logical Analyses:

### Level 2:

Due to the MSG – 3, the following 5 maintenance tasks can be selected:

- Lubrication (LUB)/Servicing (SVC)
- Operational (OPC)/Visual Check (VCK)
- Inspection/Functional Check (FNC)
- Restoration (RST)
- Discard (DIS)



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TASK	APPLICABILITY	SAFETY EFFECTIVENESS	OPERATIONAL EFFECTIVENESS	ECONOMIC EFFECTIVENESS
LUBRICATION OR SERVICING	The replenishment of the consumable must reduce the rate of functional deterioration.	The task must reduce the risk of failure.	The task must reduce the risk of failure to an acceptable level.	The task must be cost effective.
OPERATIONAL OR VISUAL CHECK	Identification of failure must be possible.	The task must ensure adequate availability of the hidden function to reduce the risk of a multiple failure.	Not applicable.	The task must ensure adequate availability of the hidden function in order to avoid economic effects of multiple failures and must be cost effective.
INSPECTION OR FUNCTIONAL CHECK	Reduced resistance to failure must be detectable, and there exists a reasonably consistent interval between a deterioration condition and functional failure.	The task must reduce the risk of failure to assure safe operation.	The task must reduce the risk of failure to an acceptable level.	The task must be cost effective; i. e., the cost of the task must be less than the cost of the failure prevented.
RESTORATION	The item must show functional degradation characteristics at an identifiable age, and a large proportion of units must survive to that age. It must be possible to restore the item to a specific standard of failure resistance.	The task must reduce the risk of failure to assure safe operation.	The task must reduce the risk of failure to an acceptable level.	The task must be cost effective; i.e., the cost of the task must be less than the cost of the failure prevented.
DISCARD	The item must show functional degradation characteristics at an identifiable age and a large proportion of units must survive to that age.	The safe life limit must reduce the risk of failure to assure safe operation.	The task must reduce the risk of failure to an acceptable level.	An economic life limit must be cost effective; i.e., the cost of the task must be less than the cost of the failure prevented.

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## Task Summaries

The Task Summaries are divided into 3 sheets:

**Task Summary Sheet (TSS):** The goal of this sheet is to summarize all tasks selected during the Level 2 analysis, including the intervals, Failure Effect Categories and Failure Causes. It is not the purpose of the TSS to combine tasks from the Level 2 analysis

**Maintenance Review Board Report Interface Sheet (MRBR IS):** The Maintenance Review Board Report Interface Sheet is the source document for the Maintenance Review Board Report (MRBR). All TSS tasks can be directly transferred to the MRBR IS, where it is allowed to combine TSS tasks in order to combine tasks, which should be performed together due to technical reasons. Each task combination must be approved by the Industry Steering Committee (ISC), before it can be integrated into the MRBR proposal.

There are certain criteria, which have to be maintained in order to combine TSS tasks:

The task types have to be similar (OPC, FNC, GVI, etc.)

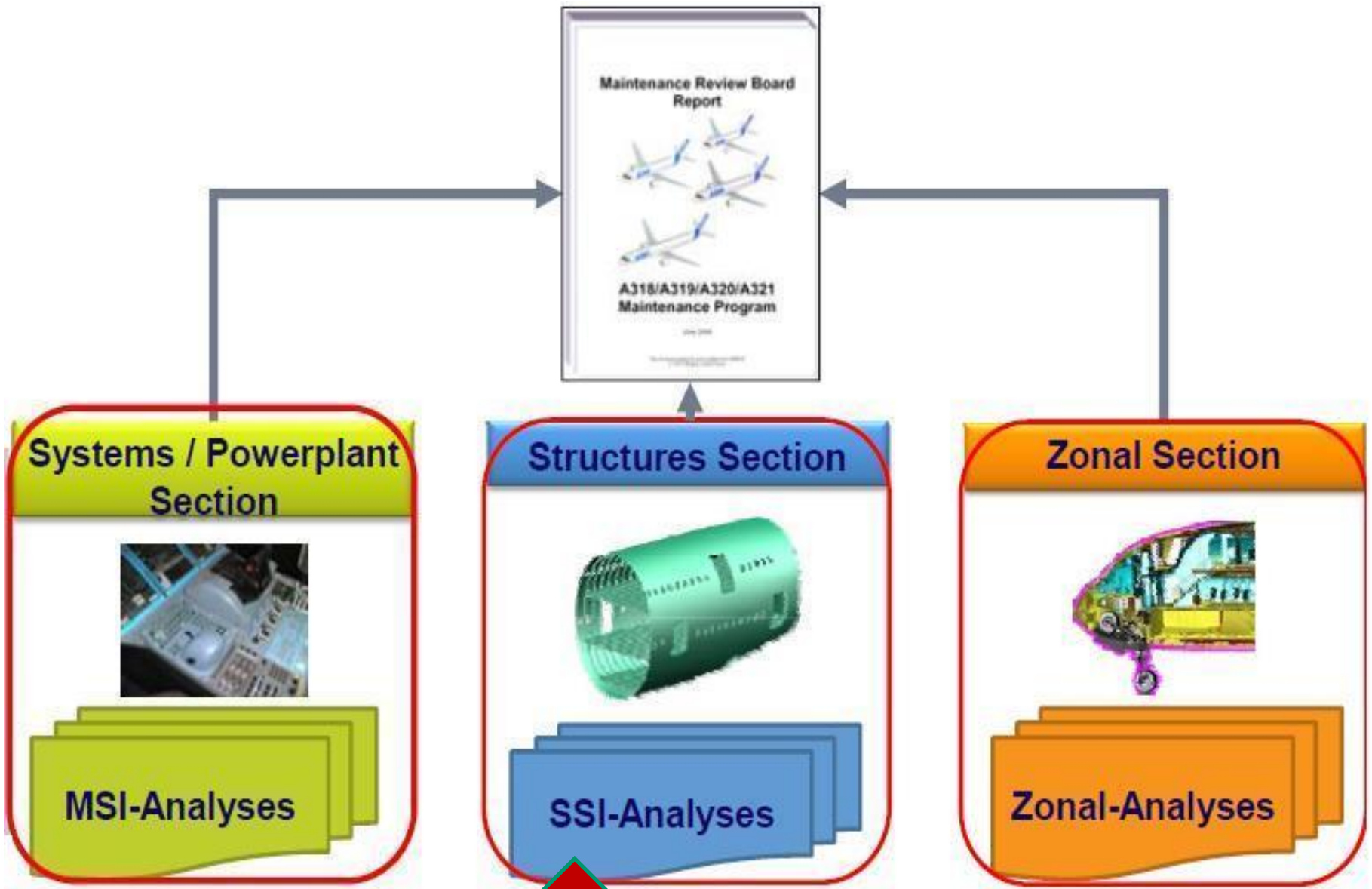
Compatibility of intervals

Failure Effect Categories (In order to combine two tasks with different FECs, the intervals have to be the same)

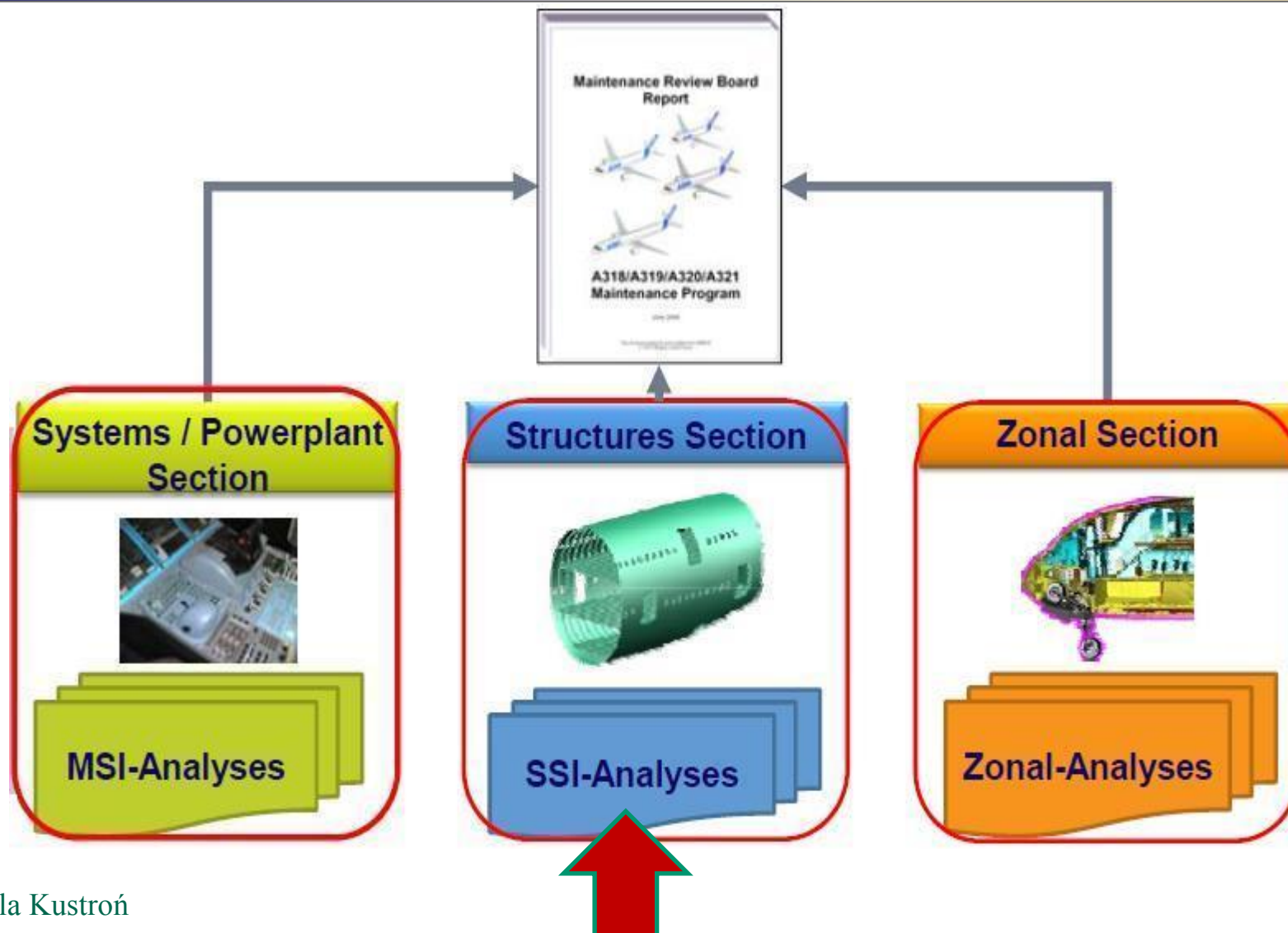
**Task Data Sheet (TDS):** The function of the Task Data Sheet is to provide procedural information for the accomplishment of a task and additional task planning data.

For each MRBR IS, one TDS must be established



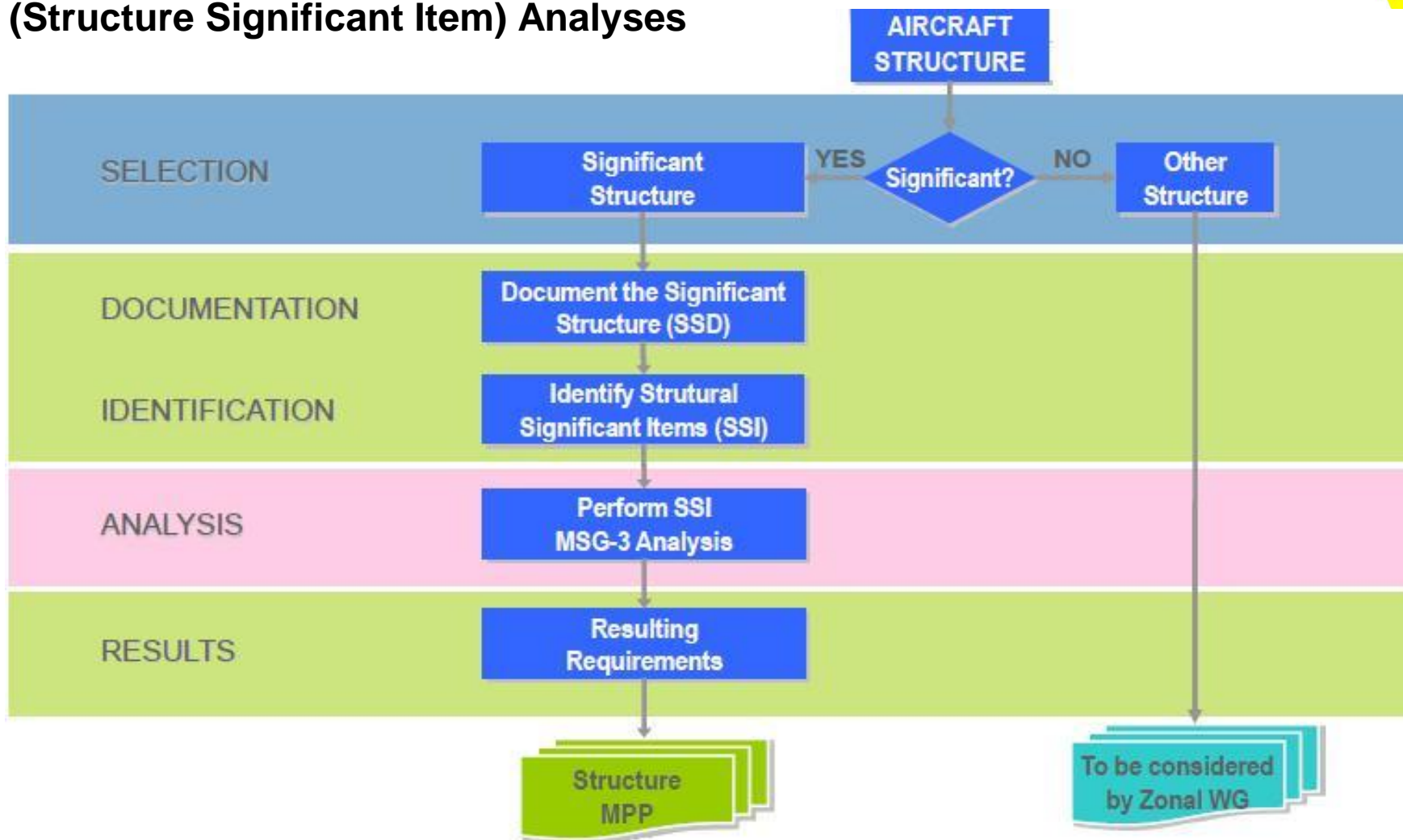


Aircraft Maintenance



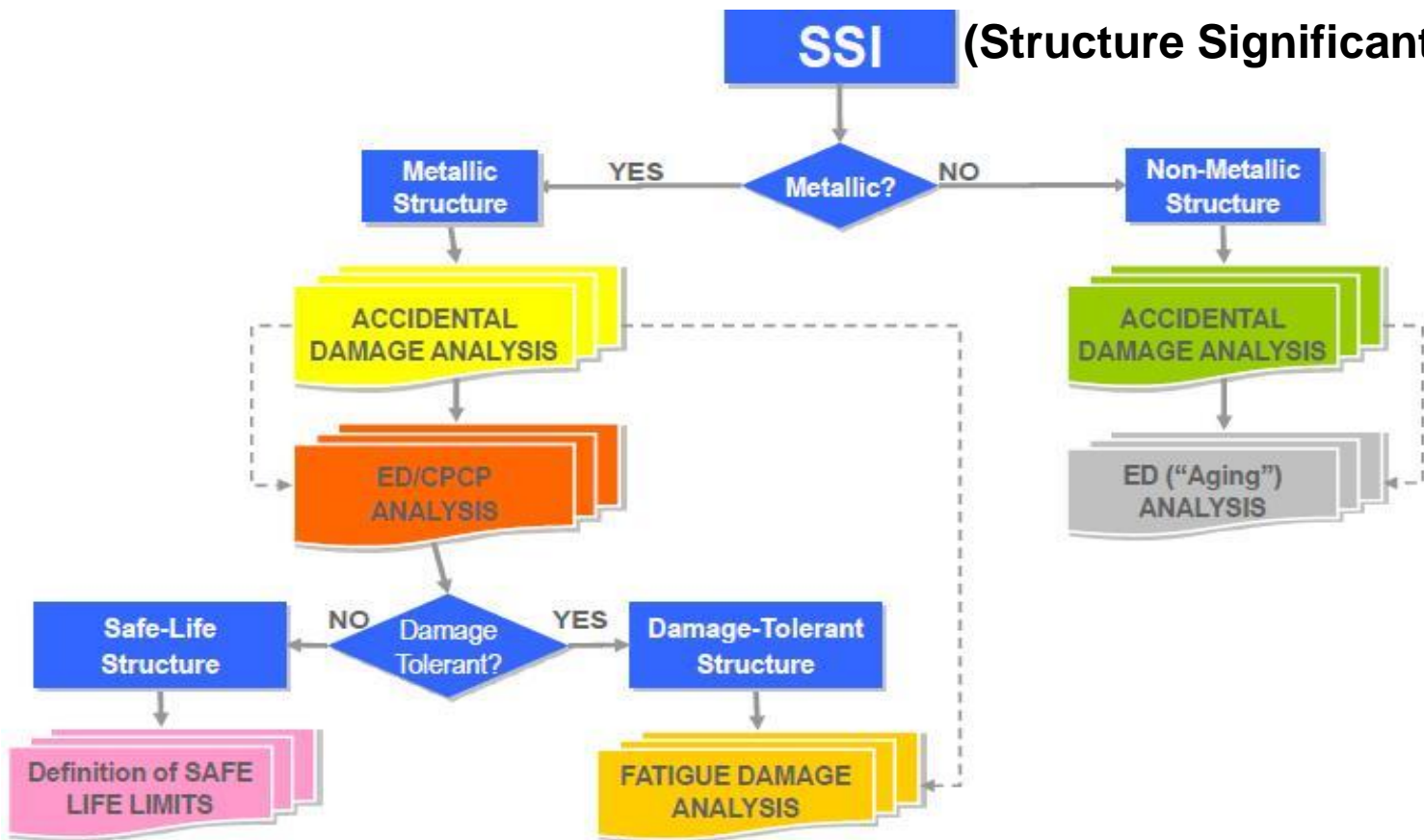
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# SSI (Structure Significant Item) Analyses



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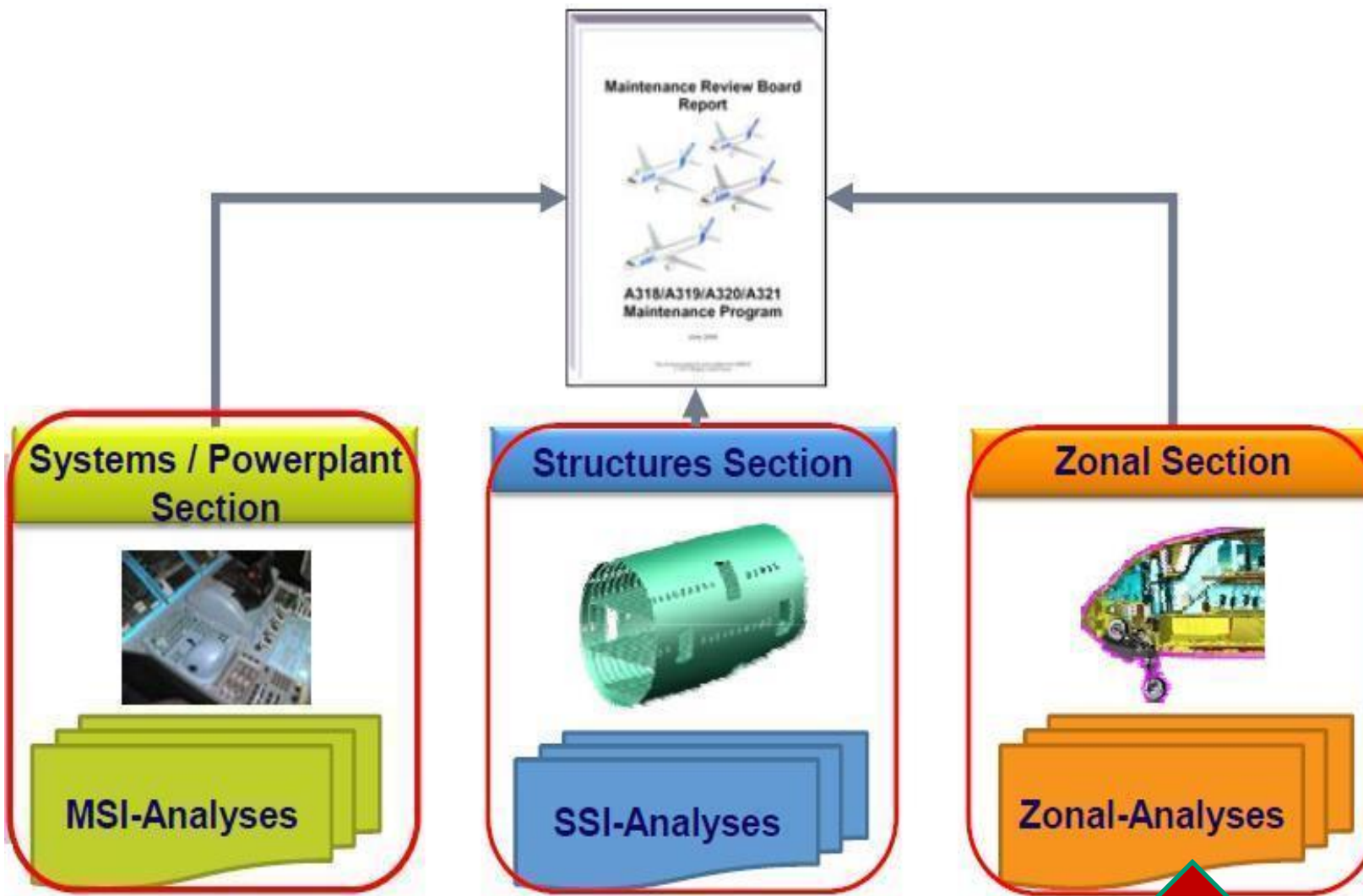
# SSI (Structure Significant Item) Analyses



**Accidental Damage (AD) - (metallic & non – metallic structures)**  
**Environmental Deterioration (ED) - (metallic structures)**  
**Fatigue Damage (FD) - (metallic structures)**  
**Ageing Deterioration (ED-compo) - (non – metallic structures)**  
**Wear Damage (WD) - (metallic & non – metallic structures)**

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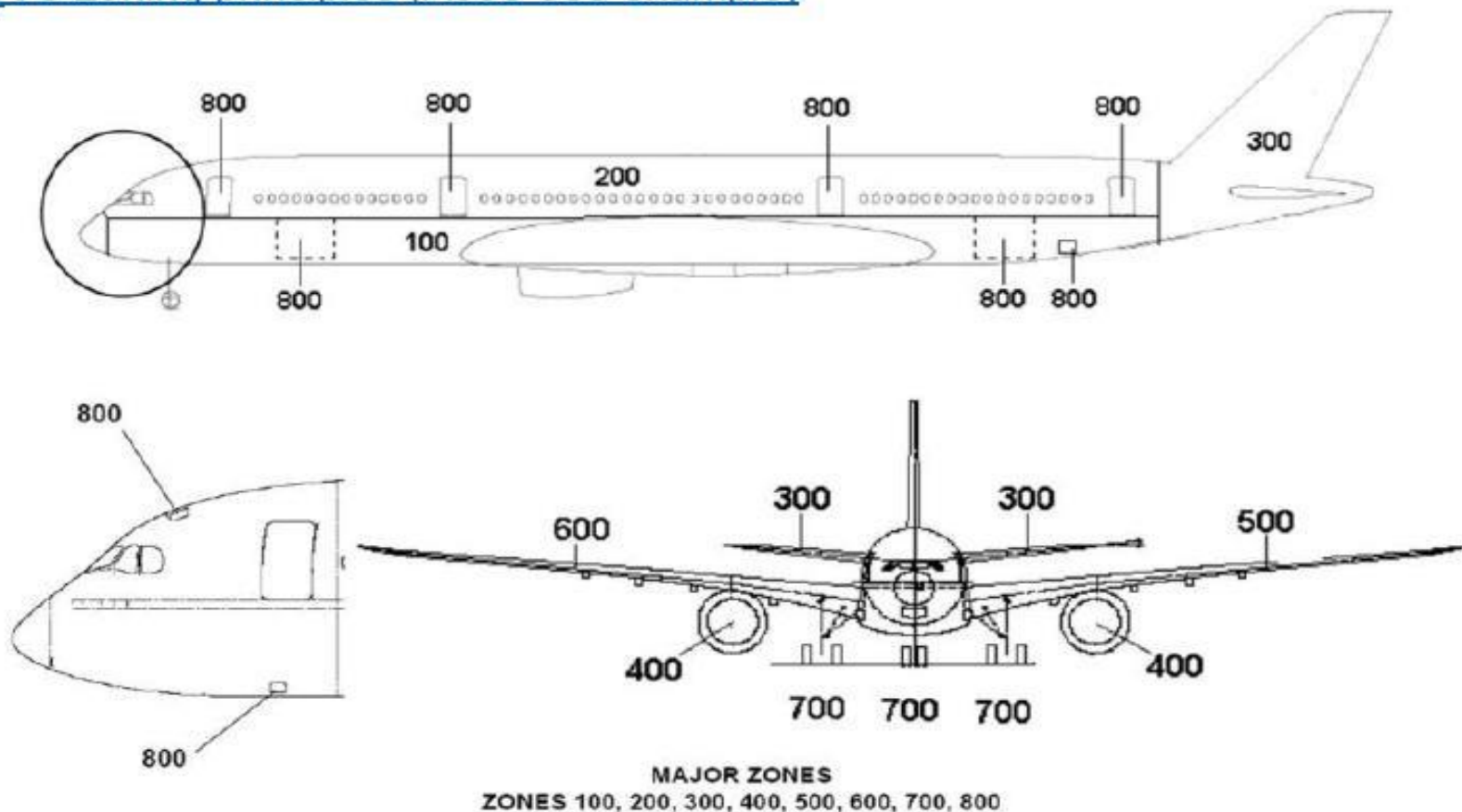


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## Zonal and L/HIRF Analyses

### A/C zoning principles (A350-900 example)

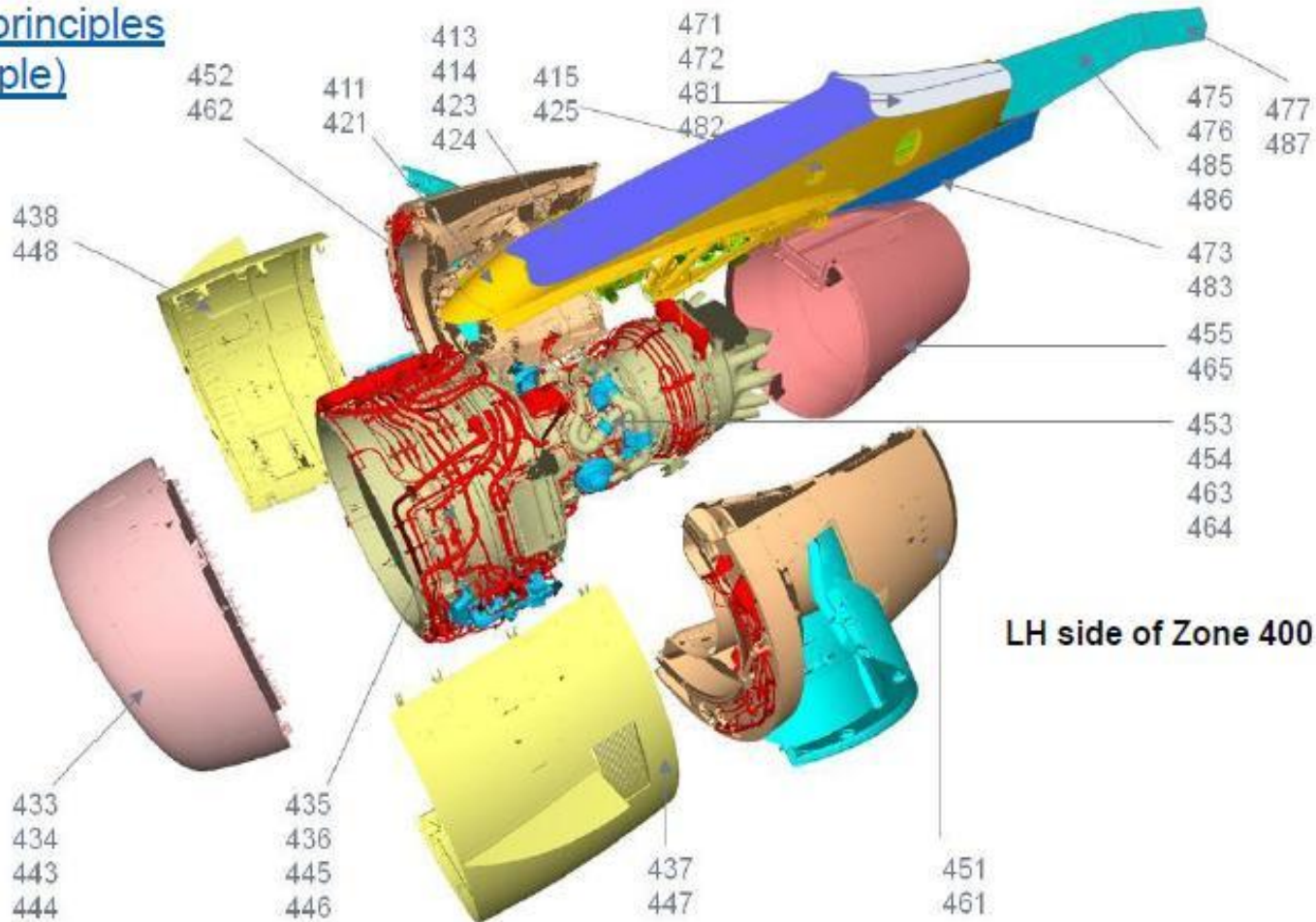


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Major zones of the A350 – 900 (authorized by Airbus S.A.S.)

# an example of the zoning principles of the power plant of the A318

## A/C zoning principles (A318 example)



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# There are three types of zonal analyses

1. Standard Zonal Analysis
2. Enhanced Zonal Analysis
3. L/HIRF Zonal Analysis (Lightning/High Intensity Radiated Field)

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Maintenance  
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MRBR  
(Maintenance  
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Report)

CMR  
(Certificated  
Maintenance  
Requirements)

AL  
(Airworthiness  
Limitations)

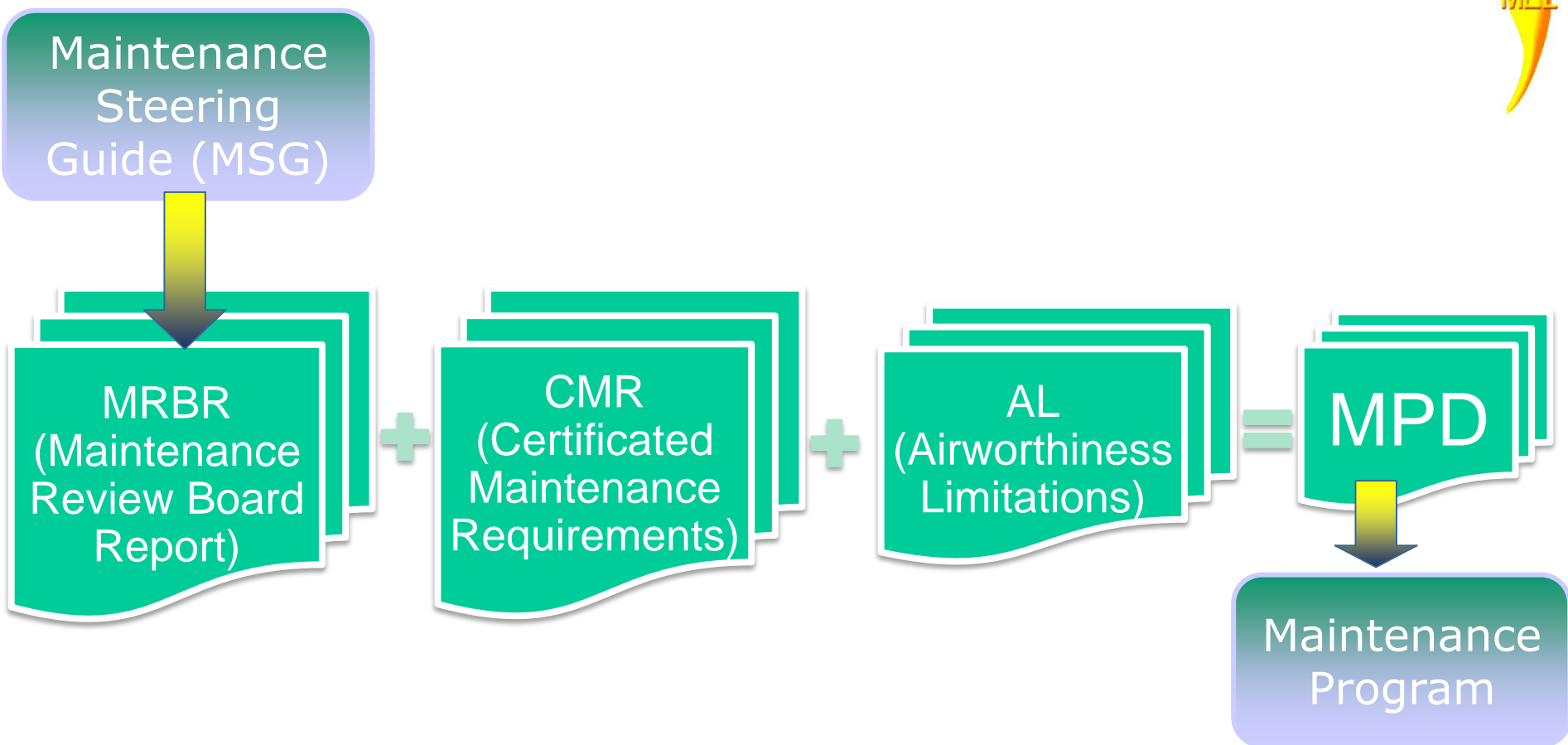
MPD



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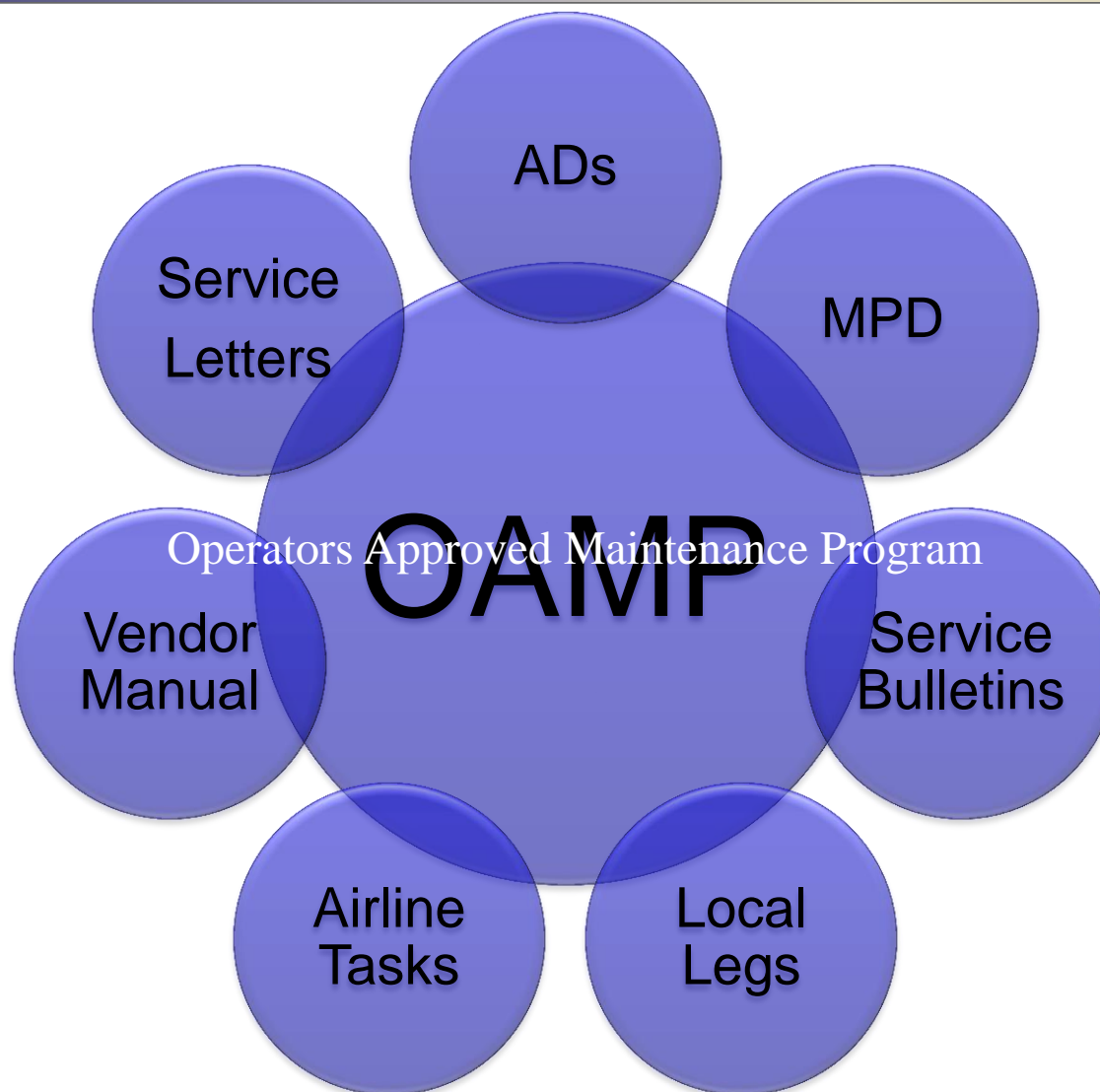
## A typical MPD content of Sections

Section Number	Topics
1	Introduction
2	Airplane Diagrams
3	Zone/Station Diagrams
4	Access Doors and Panels
5	Lubrication
6	Systems
7	Zonal
8	Structures
9	AWL & CMR
10	Corrosion Prevention and Control Program
-	<b>Appendices</b>



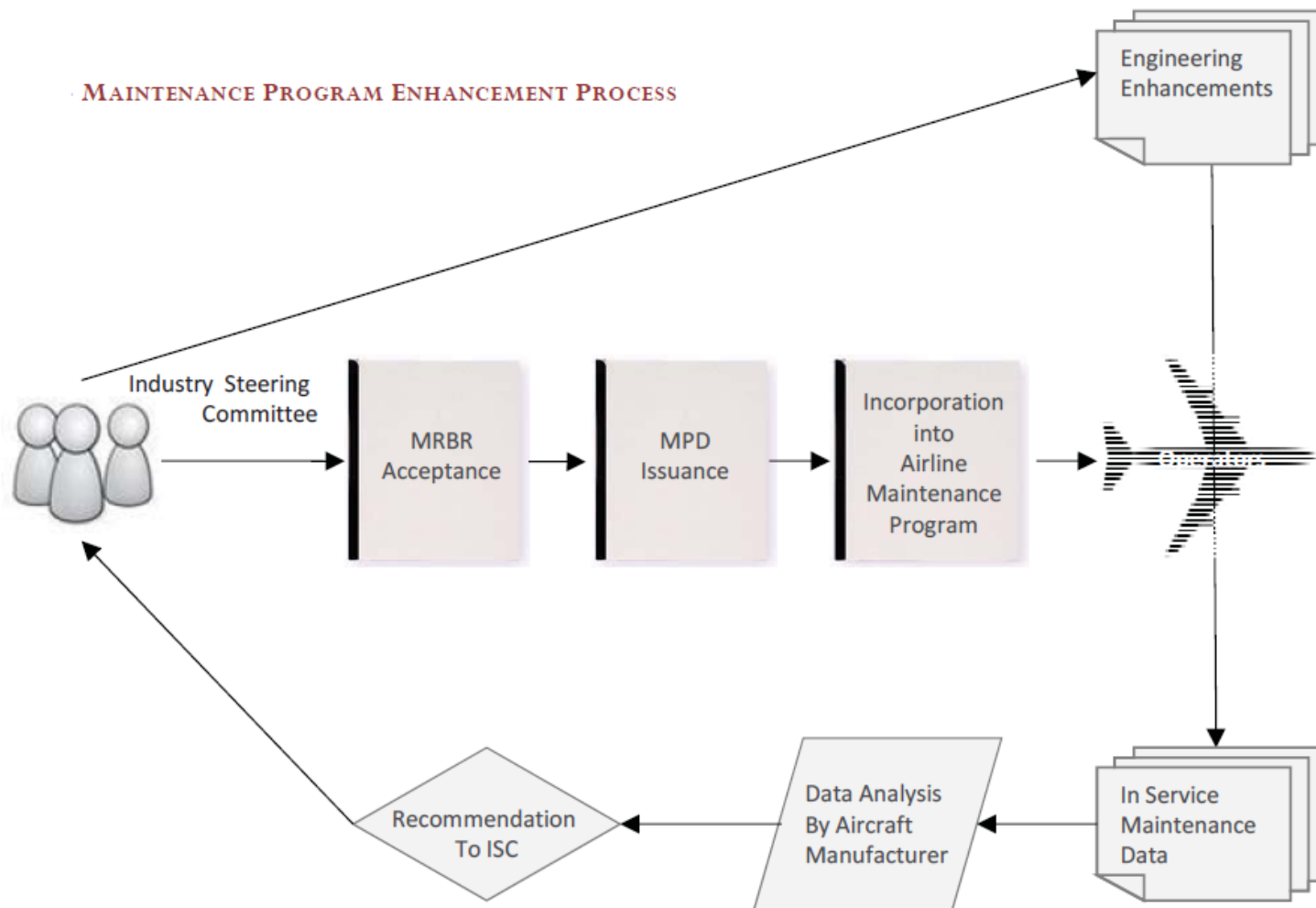
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### MAINTENANCE PROGRAM ENHANCEMENT PROCESS



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# Maintenance Program Supporting Documents

## Non-Routine/Unscheduled Maintenance

AMM (Aircraft Maintenance Manual)

SRM (Structural Repairing Manual)

WDM (Wiring Diagram Manual)

SSM (System Schematic Manual)

FRM (Fault Reporting Manual)

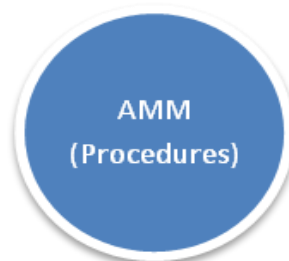
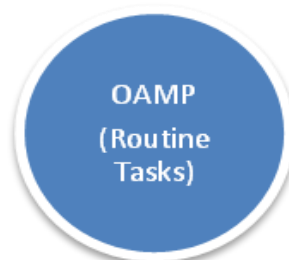
FIM (Fault Isolation Manual)

IPC (Illustrated Part Catalogue)

DDG (Dispatch Deviation Guide)



## Routine/Scheduled Maintenance



OAMP - Operators Approved Maintenance Program

AMM – Aircraft Maintenance Manual

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## MAINTENANCE CHECKS

**Maintenance Event Letter Checks** - All the tasks defined through the maintenance development process will ultimately need to be allocated into scheduled work packages. Tasks with similar intervals are then grouped into a number of maintenance packages, each with its own interval. For commercial aircraft these intervals range from daily walk-around checks, to service checks performed at line maintenance station, to major checks performed at maintenance bases. In the airline industry, a **letter check** is the alphabetic designation given to scheduled maintenance packages.

The three most commonly used letter checks consists of:

- 1.) A-Check
- 2.) C-Check, and
- 3.) D-Check

- The **A-Check** generally consists of a general inspection of the interior/exterior of the airplane with selected areas opened. The A-check is typically performed biweekly to monthly. Examples of A-check tasks are checking and servicing oil, filter replacement, lubrication, operational checks, and inspections
- The **C-Check** is typically scheduled every 12- 20 months depending on the operator, airplane type and utilization. Examples of C-check tasks include functional and operational systems checks, cleaning and servicing, attendance to minor structural inspections and Service Bulletin requirements
- The **D-Check**, or **Heavy Maintenance Visit (HMV)**, occurs every 6-12 years, depending on the airplane type and utilization. Usually the aircraft is taken out of service for several weeks. During this check the exterior paint is stripped and large parts of the outer paneling are removed, uncovering the airframe, supporting structure and wings for inspection of most structurally significant items. In addition many of the aircraft's internal components are functionally checked, repaired/overhauled, or exchanged

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## Typical inspection interval

Check type	Interval	Content
Pre-Flight	Pre-Flight	General visual from ground for signs of obvious discrepancies or damage such as fluid leaks, FOD, lightning strike.  Check logbook . Check engine oil levels and replenish if necessary
Terminal Check (Ramp)	Each terminal stop	Pre-flight plus tires, tire pressure, wheels and brakes. Cabin check.

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## Typical inspection interval

Check type	Interval	Content
Service Check	8 Cal. days	Hydraulic qty, escape slide gas pressure, oxygen pressure, brake wear, IDG oil, APU oil, oleo pressures. Visual check of engine inlet and exhaust. Optional check of CMS for degraded fault tolerance (to avoid potential No Go situation)
1A-Check	500 FH	Exterior general visual from ground. Interior general visual cockpit, cabin, cargo compartment, avionics, electrical, hydraulic and ECS equipment bays, landing gear, landing gear bays ad doors. IDG oil.

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## Typical inspection interval

Check type	Interval	Content
2A-Check	1000 FH	Simple operational checks (failure finding tasks) from cockpit which cannot be accomplished at 4A and above. Inspection of engine fan blades. Check engine chip detectors. Engine starter oil change. Landing gear lubrication.
4A – Check	2000 FH	Lubrication of some flight control items in accordance with past service experience. Simple operational checks (failure finding tasks) which cannot be accomplished at C and above.
8A – Check	4000 FH	Check fuselage drainage system

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## Typical inspection interval

Check type	Interval	Content
1C-Check	15 months	External general visual inspection of areas with moderate sensitivity to damage or deterioration such as lower and mid fuselage, windows, doors, wing lower surfaces, flight control surfaces, horizontal and vertical stabiliser leading edges and pylons. General visual inspection of power plant and engine with cowls open, landing gear and landing gear bays, wing fixed leading edge, rear fuselage and tail cone. Cleaning or replacement of air conditioning filters. Systems operational checks (failure finding tasks). Flight control general lubrication and gearbox oil replenishment. Hydraulic system internal leakage. Cabin check. Check drainage systems.

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## Typical inspection interval

Check type	Interval	Content
2C-Check	30 months	External general visual inspection of areas with low sensitivity to damage or deterioration such as upper fuselage, horizontal and vertical stabilisers and wing top surface. Internal general visual inspection installations in equipment bays and pylons.
Intermediate Layover (4C)	60 months	Internal general visual inspection of structure and installations in areas of moderate to high sensitivity to damage or deterioration such as cargo compartments, area below cargo and cockpit floors and below toilets and galleys. Internal general visual inspection of wing in sump areas. Systems operational and functional checks. Detailed cabin check including floors in high traffic areas, galleys and toilets.

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## Typical inspection interval

Check type	Interval	Content
Major Layover (8C)	120 Months	<p>General and detailed external and internal structural (sampling or 100%) inspection for corrosion and fatigue damage. Systems operational and functional checks.</p> <p><b><u>Remarks:</u></b> Aircraft on jacks</p> <p><b><u>Note:</u></b> some operators may wish to integrate items into C- Check packages.</p>

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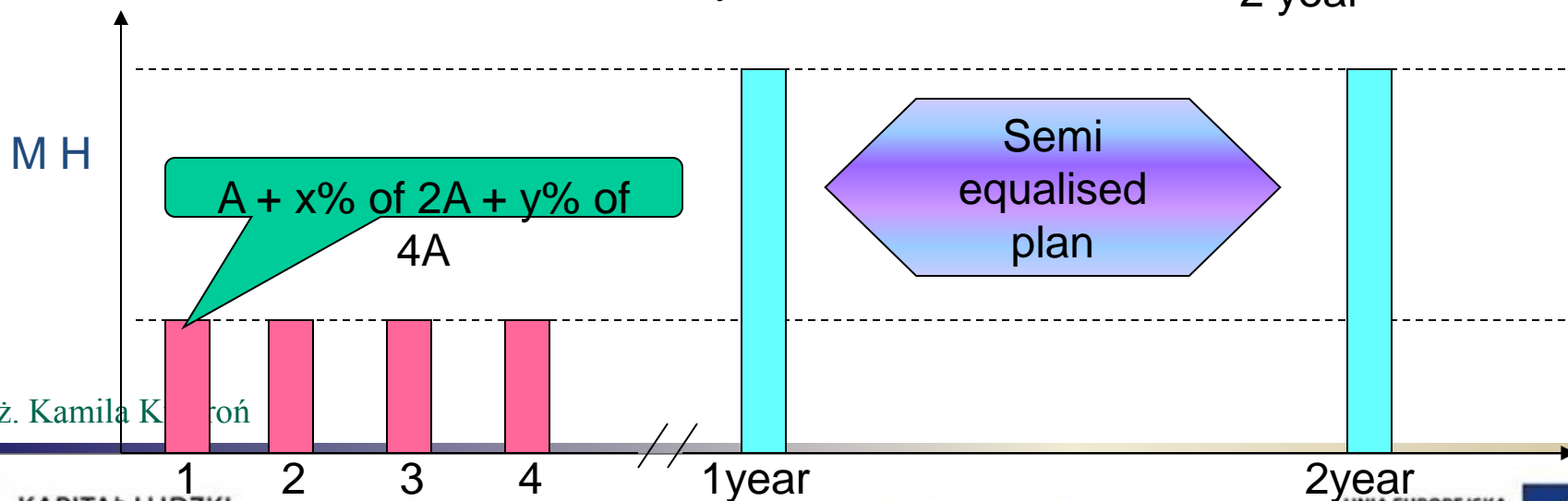
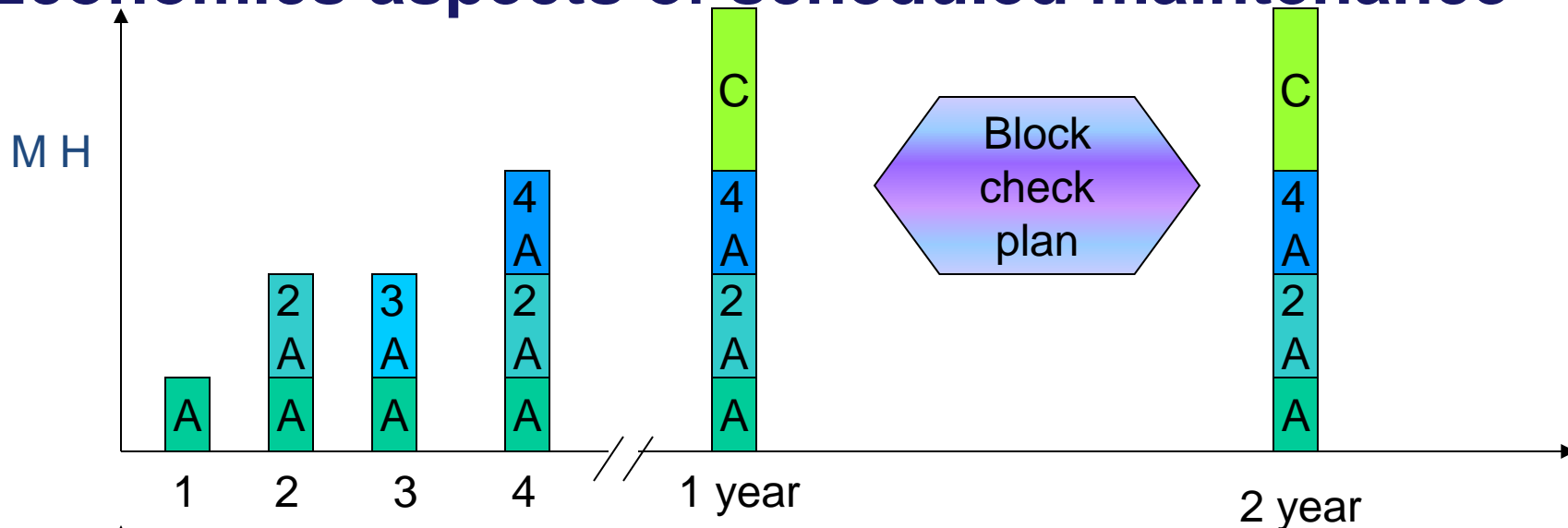
# Boeing Typical Inspection Interval

Letter check Aircraft	Recommended initial interval (FH)				World weighted fleet interval (FH)			
	A	B	C	D (Structural Inspection)	A	B	C	D (Structural Inspection)
<b>757</b>	<b>500 FH (Sys.) 300 FC (Stru.)</b>		<b>6,000 FH (Sys.) 3,000 FC (Struc.)</b>					
<b>737-100 737-200</b>	<b>125</b>	<b>750</b>	<b>3,000</b>	<b>20,000</b>	<b>170</b>	<b>700</b>	<b>2,840</b>	<b>21,000</b>
<b>737-300 737-400 737-500</b>	<b>200</b>		<b>3,200</b>	<b>20,000</b>	<b>220</b>		<b>3,300</b>	<b>21,500</b>
<b>727</b>	<b>80</b>	<b>400</b>	<b>16,000</b>			<b>5,000</b>	<b>18,500</b>	
<b>777</b> (Cathay Pacific)					<b>500</b> or <b>70</b> days	<b>150</b> days	<b>365</b> Days or <b>3000</b> hrs	<b>?</b>
<b>747-400</b> Cathay Pacific					<b>650</b>		<b>6,750</b>	<b>30,000</b>
<b>MD-80</b>	<b>450</b>		<b>3,500</b>	<b>15,000</b>				

# Airbus Typical Inspection Interval

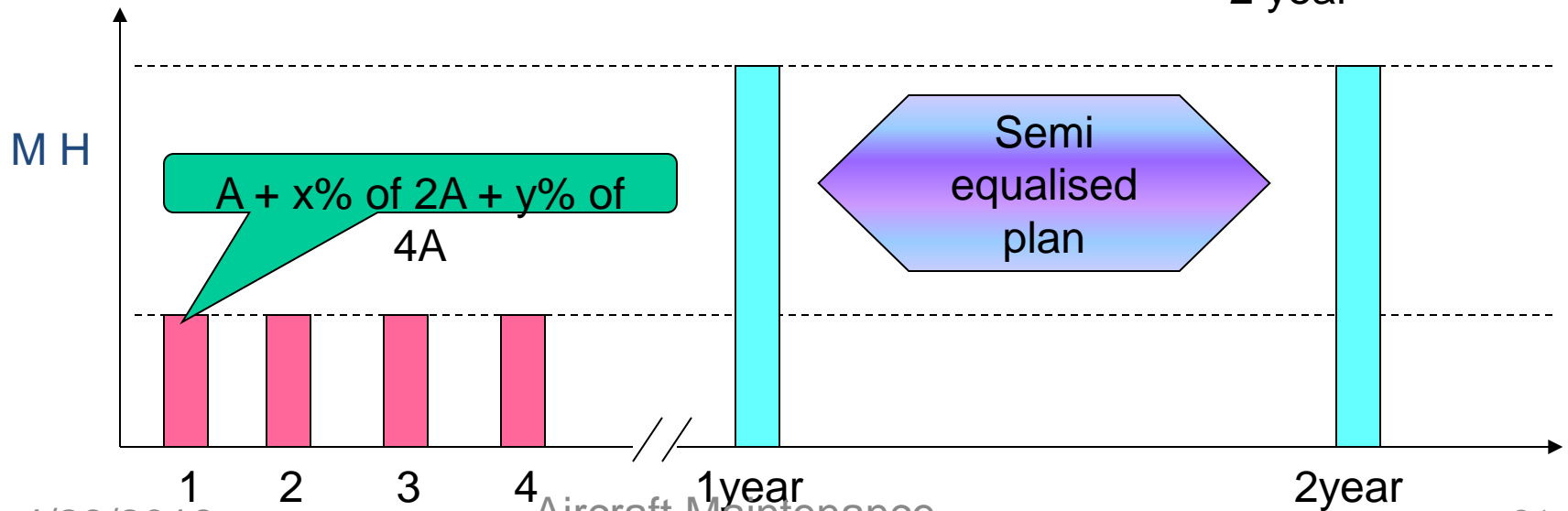
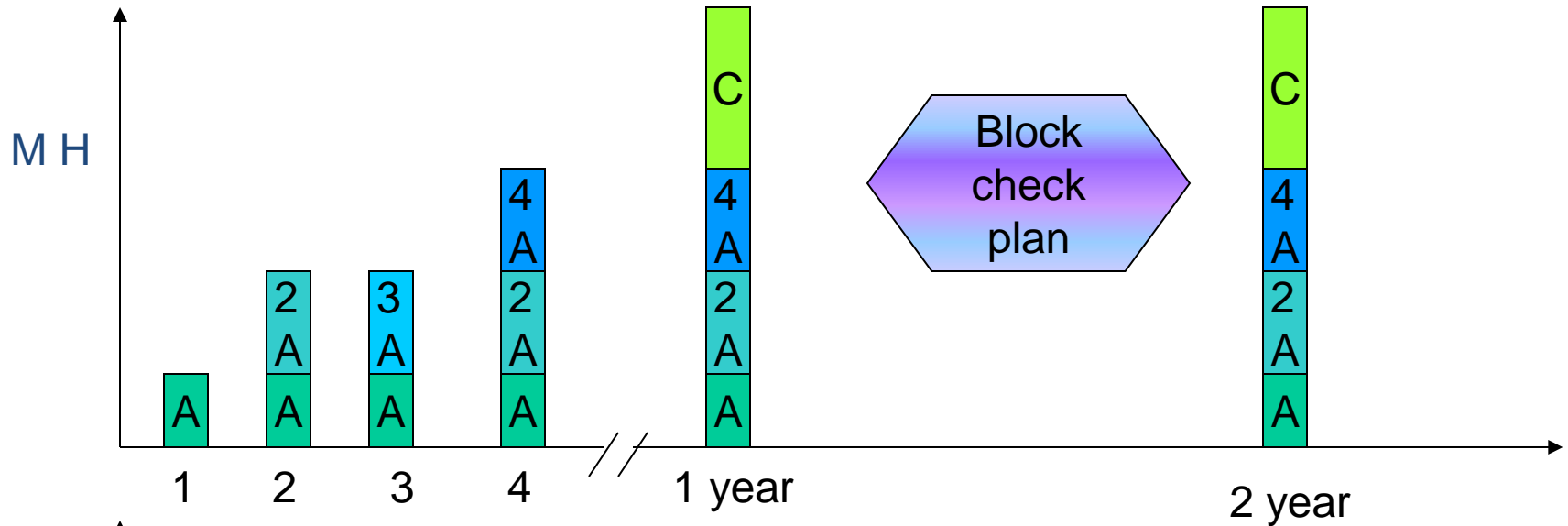
Letter check  Aircraft	Recommended interval			
	A	C	D = 4C	Structural inspection
<b>A310</b> <b>A300-600</b>	<b>400 FH</b> Initial: 250 FH	<b>15 Months</b> Initial: 12 months		FD threshold: 18,000 FC ED threshold: 10/7.5/5/2.5 years
<b>A319</b> <b>A320</b> <b>A321</b>	<b>500 FH</b>	<b>15 Months</b>	<b>5 Years</b> Cathay Pacific	FD threshold: 24,000 FC ED threshold: 9/5/2.5 years
<b>A330</b> <b>A340</b>	<b>700 FH</b> ↗ <b>500 FH</b>	<b>18 months</b> ↗ <b>15 months</b>	<b>5 Years</b> Cathay Pacific	FD threshold: 20,000/8,000 FC ED threshold: 10/5/2.5 years
<b>A380</b>	<b>Objective:</b> <b>750 FH</b>	<b>Objective:</b> <b>24 months</b>		

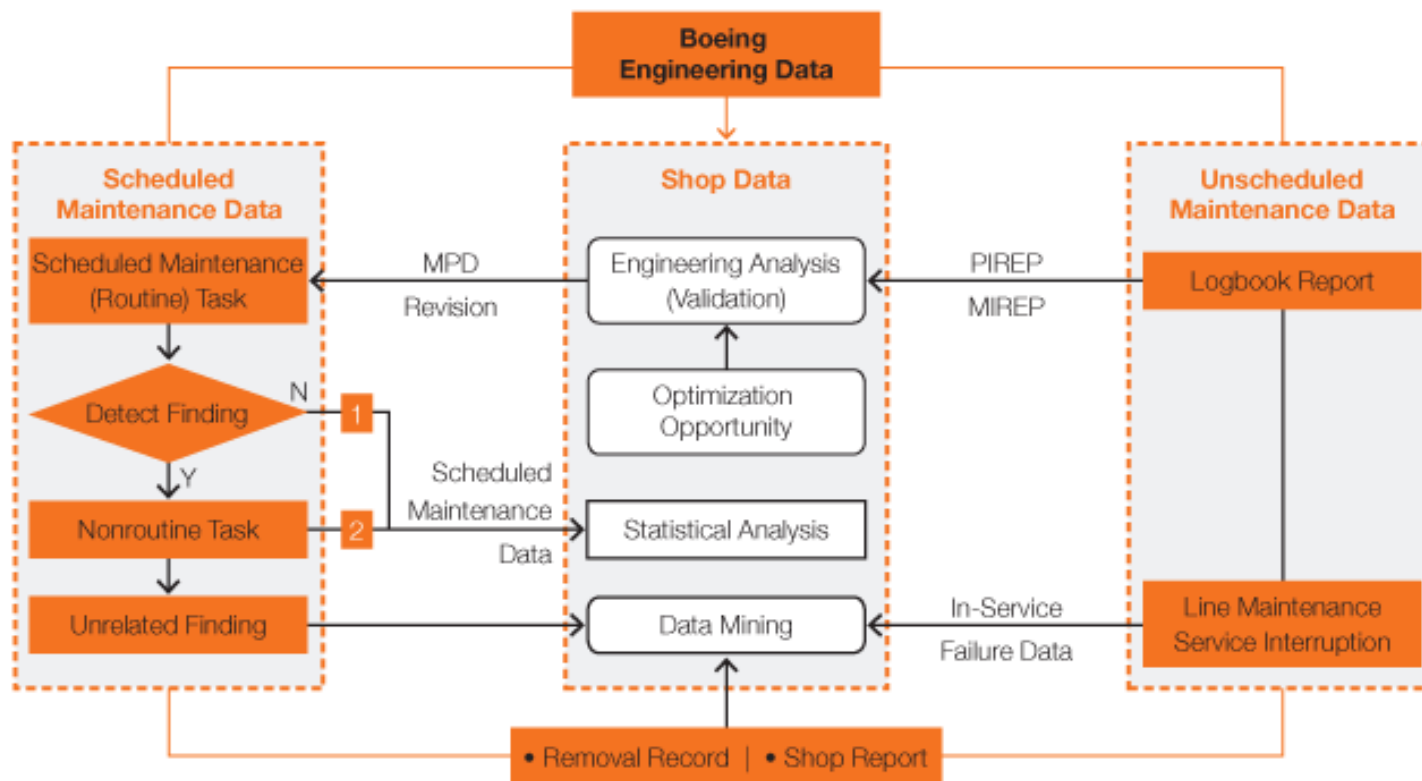
# Economics aspects of scheduled maintenance



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# Economics aspects of scheduled maintenance





Legend: MPD: Maintenance Planning Document      1 Clean Check  
 PIREP: Pilot Logbook                                      2 Defect  
 MIREP: Maintenance Logbook





# ANK315 AIRCRAFT MAINTENANCE

## HUMAN FACTOR FLIGHT SAFETY

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