METROLOGY
in a military aircraft maintenance organization

1° Reparto Manutenzione Velivoli

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1° Reparto Manutenzione Velivoli (RMV)

A brief introduction

Our chain of command

CSMA

COMLOG

2^ DIV.

Ce.Po.V.A.

COMANDO AEROPORTO

1° RMV

Our interfaces

GE

UK

SP

NETMA

panavia
managing tornado

LOCKHEED MARTIN

Eurofighter Typhoon

PRATT & WHITNEY
DEPENDABLE ENGINES

EUROJET

LEONARDO AIRCRAFT

Avio Aero
A GE Aviation Business

BAE SYSTEMS

6th Wing
Ghedi

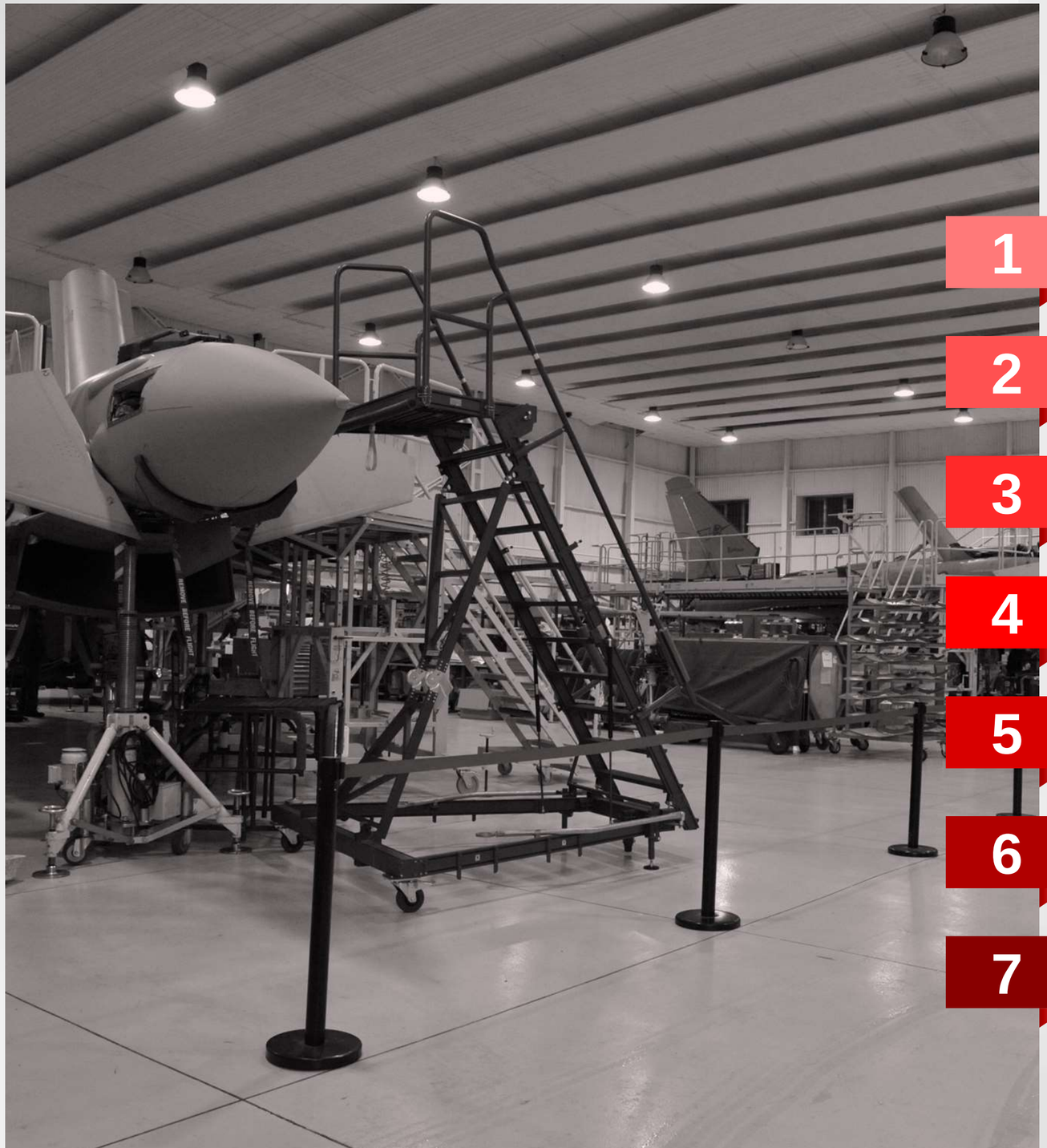
4th Wing
Grosseto

32nd Wing
Amendola

RSV
Pratica di Mare

36th Wing
Gioia del Colle

37th Wing
Trapani



Tasks and responsibilities

Deliveries (products and services)

1. **Annual planning**
   Flight hours and induction plan
2. **Maintenance**
   Aircraft MR&U
3. **Spare parts availability**
   Supply chain mgmt
4. **Engine maintenance**
   MR&U of engines and their components
5. **Engineering support**
   National and int.l technical info, directives and pubs
6. **Delegated Authority for contracts**
   Mgmt of contracts signed by the Supreme Command
7. **Skilled personnel**
   Training provided to maintenance engineers

Summary

OVERVIEW

Definitions and role within QMS framework

REGULATIONS & IAF FRAMEWORK

International Standards

Airworthiness Regulations

IAF framework

1° RMV’s METROLOGICAL CAPABILITES

Current capabilities
Future targets and challenges

1° RMV’s Metrological shops

Section 1

Overview

Metrological Confirmation

Set of the operations required to ensure that a measuring equipment complies with the requirements for its intended use within the organization.

Metrological confirmation

Calibration \ verification

Adjustement / repair

New calibration

Comparison with the metrological requirements for the intended use of the equipment

Use of the equipment

Metrological Confirmation

Why?

- It is an ISO 9001:2015 requirement.
- Reduces the measurement uncertainty\error introduced by the measuring equipment\tool itself.
- Increases the confidence that the organization’s product complies with the requirements for its intended use.

Metrological Confirmation

Section 2

Regulations & IAF framework

Regulations

International Standards

- ISO 9001:2015
- ISO 10012
- ISO 17025

Airworthiness Regulations

AER-P-2005

⇧

AER-00-00-5

⇩

AER-P-12

I A F f r a m e w o r k

AGE – Aerospace Ground Equipment

An equipment:

- designed, developed and qualified to perform one or more specific maintenance tasks;
- defined within a technical specification;
- agreed upon with the supplier\SDR based on the desired maintenance level to be achieved.

Each AGE has a maintenance plan that is:

- issued by the supplier and validated by the SDR;
- part of the set of technical publications approved by the NDA.

…not available for standard equipment/tools….

…AER.P-12 provides guidelines

I A F f r a m e w o r k

Approved data


CLASSIFICA DI SEGRETEZZA

CODICE IDENTIFICATIVO S.E.

MINISTERO della DIFESA
ARMAEREO
ROMA

LOGO DITTA
CODICE DITTA

M.D.S. o P/N (N.d.R.)
dell'equipaggiamento/AGE

Immagine o disegno dell'aeromobile

PROTOCOLLO LETTERA DI ACCETTAZIONE

BARRA COLORATA INDICANTE LA CLASSIFICA DI SEGRETEZZA

DATA EDIZIONE S.E.

CLASSIFICA DI SEGRETEZZA

Set of technical publications:

- prepared by the Original Equipment Manufacturer (OEM) of a certain aircraft item;
- validated by the System Design Responsible (SDR) of the item;
- approved and released by the NDA;

They specify in detail:

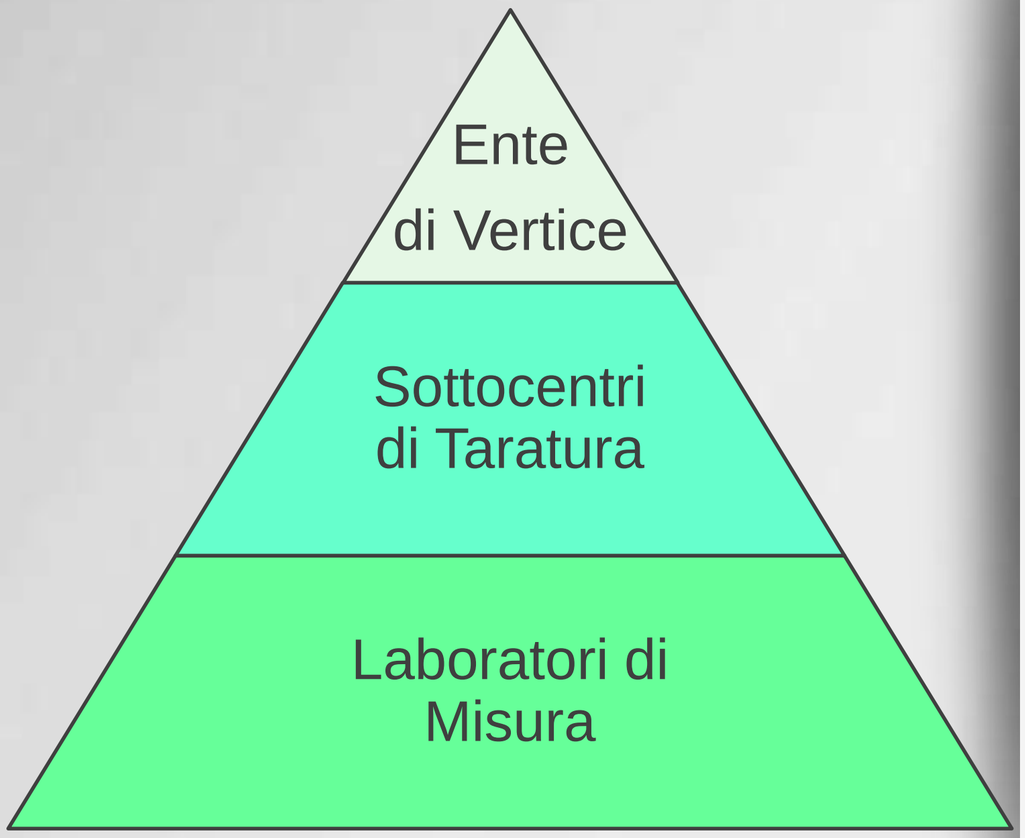
- the full set of AGE to be used in maintenance;
- the full set of standard equipment\tools to be used in maintenance;
- tolerances and accuracy required for the measurements taken in maintenance.

AER.P-12

New Organizational Structure	Personnel Requirements	Documentation Requirements
✓	✓	✓
Ente di Vertice	Training	Scheda Tecnica
Sottocentri di Taratura	New duties	Procedure di Taratura
Laboratori di Misura		Rapporto di Taratura

AER.P-12

ORGANIZATIONAL STRUCTURE

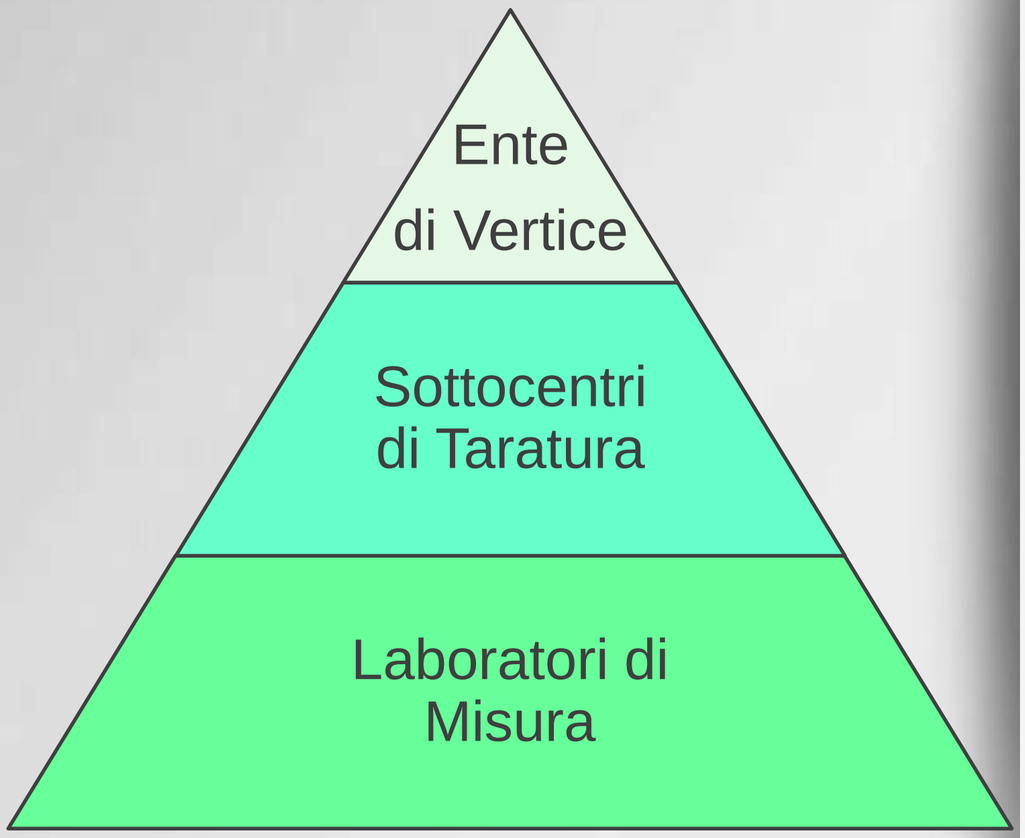


Similar to an Accredited Metrological Laboratory (AML):

- Owns and uses primary and secondary standards and standard equipment/tools;
- Provides the training requested by AER.P-12;
- Approves the calibration procedures issued by the SdTs\LdMs;
- Performs the calibration of the secondary standards;
- Tests and approves the new stock equipment.

The metrological traceability of the primary standards is assured by external AML.

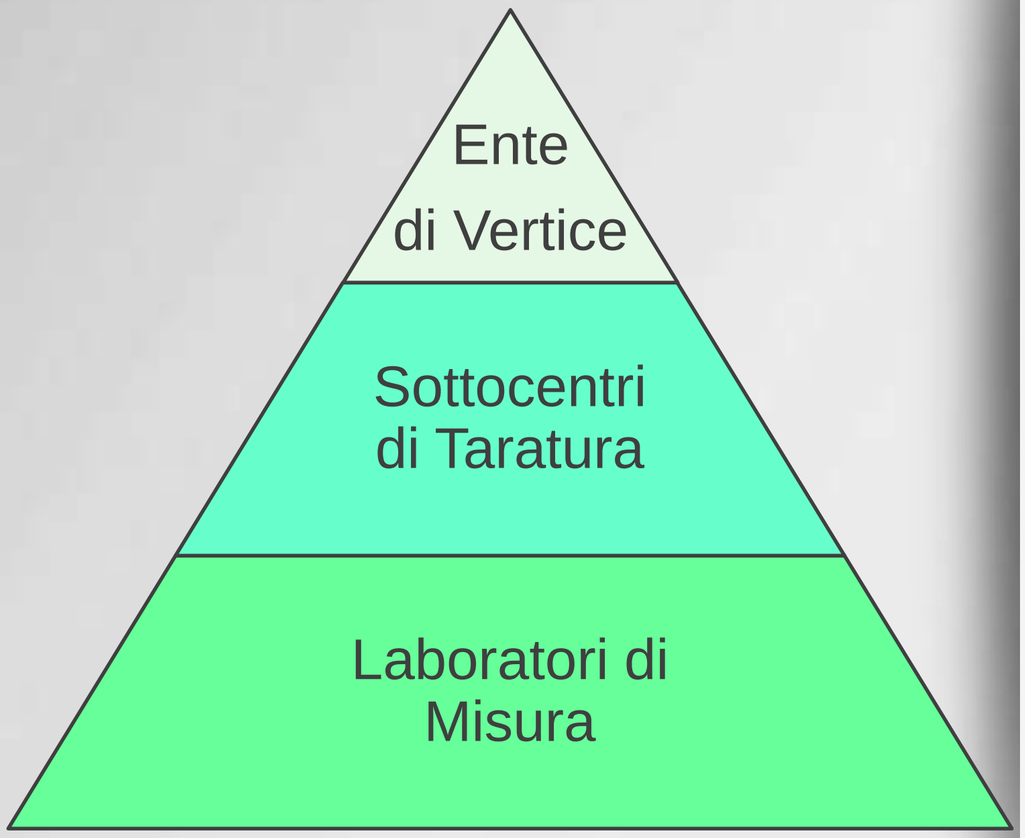
AER.P-12
ORGANIZATIONAL STRUCTURE



- Issue the calibration procedures;
- Perform the calibration of their own standard equipment\tools and the ones coming from the linked LdMs;
- Use secondary standards (also primary standards depending on the specificity of the Squadron\Depot) and standard equipment\tools;

The metrological traceability is assured by the EdV and\or an external ALM.

AER.P-12
ORGANIZATIONAL STRUCTURE

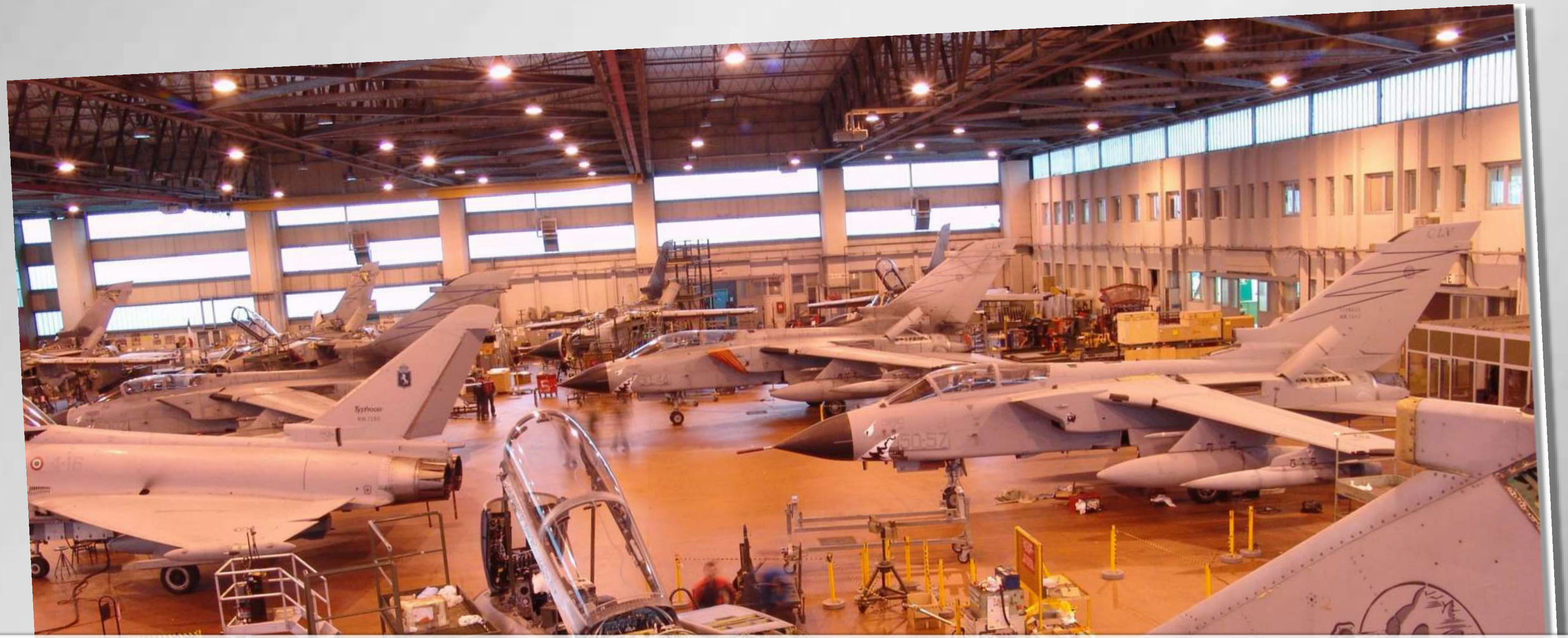


- Use standard equipment\tools;
- The metrological traceability is assured by the linked SdT by means of their primary and secondary standards.

Personnel Requirements

Training	
	Metrological Operator
	Standard Equipment Usage
	Standard Equipment Calibration
	Standard Equipment Supervisor

Duties	
	Mechanical Standard Equipment shop’s Responsible
	Electronic Standard Equipment shop’s Responsible
	Metrological Confirmation Process Responsible



Section 3

1° RMV’s METROLOGICAL CAPABILITIES

Current Capabilities

Two Metrological Shops performing:

- Metrological confirmations:
  - ❖ of standard equipment\tools from the 1°RMV itself (ML2/3 shops and aircraft maintenance bays) and other SdTs (6° RME, 10° RMV) and LdMs (4°, 6°, 36° Wings);
  - ❖ of the standard equipment\tools installed on the AGEs iaw the approved data;
  - ❖ sample blocks used for the calibration of NDT equipment.
- Dimensional checks iaw the approved data or national instructions released under NDA's delegated authority.

Future targets and challenges

- TORNADO & TYPHOON use more COTS & MOTS solutions as AGEs. This is definitely going to demand more metrological capabilities for peculiar and specific maintenance tasks.

- A more accurate understanding/evaluation of test requirements will allow to better identify the specs of the standard equipment\tools to be used.

- Improve the capabilities to develope AGEs by assembling standard equipments\tools iaw the approved data or special technical instructions provided by the SDRs.

- Improve the capabilities to develope specific tools to carry out peculiar tasks and directly perform dimensional checks on them (i.e. dimensional clearance caliber, profile check templates).

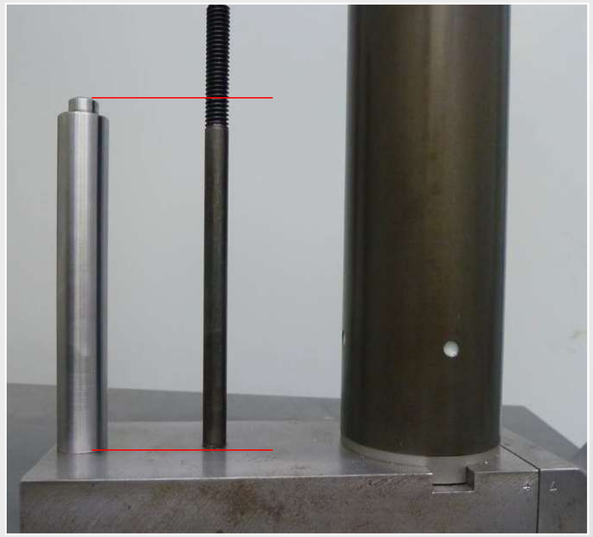
Mechanical Standard equipment & Tools shop

- Length
- Mass
- Force
- Pressure
- Torque
- Hardness
- Roughness

Mechanical shop

IAF’s point of exellence for dimensional checks and metrological confirmation of standard equipment\tools to be used for mass and length measurements.

Concentricity checks of the HP tubine’s PTO shaft installed on RB199 engine



Dimensional checks of the protusion gauge installed on an AGE to be used to maintain MK16 seats

Dimensional check of flap\slat rib track of Tornado & Typhoon WS

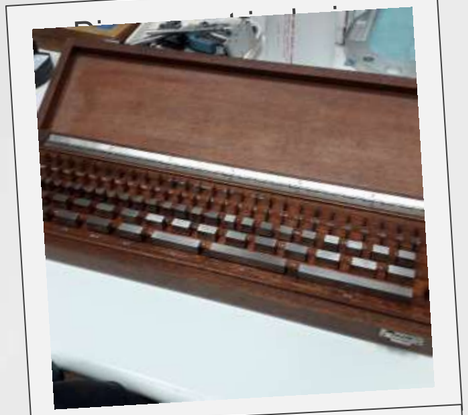
Mechanical shop

3D Measurements Device

Digital Calibrator (portable)

Mass Comparator

Dinamometric Device



Flatness\parallel Calibration Blocks – Secondary Standard

Roughness Tester

Torque-wrench Verification Device

Mass secondary standard

Electronic Standard equipment & tools shop

LONG RADIO WAVES
[DC – 1MHz]

RADIO WAVES
[1MHz – 1GHz]

MICROWAVES
[1GHz – 26GHz]

Electronic shop

Long radio waves

- AC\DC Calibrator
- Resistance and Condenser Standards;
- Multimeter Reference

Radio waves

- Standard Oscillator
- Standard Scope;
- Low & RF frequency generator
- Audio & RF signal analyzer

Microwaves

- Power meter
- MicroWave generator
- Spectrum and Signal Analyzer
- Standard Attenuator

The metrological confirmations are performed:

- in manual mode;
- in automatic mode by means of some interface systems (GPIB IEEE488 / LAN / USB / RS232) and dedicated software packages (METCAL)

Electronic shop

Secondary standard (V, I & R)

Primary standard (V, I & R)

Automatic Calibration Station
(Radio waves)

Automatic Calibration Station
(Long Radio waves)

Automatic Calibration Station (Microwaves)

Questions?