An International View of Maintenance Human Factors and Regulations

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A One-day Mini Workshop
Human Factors in Maintenance
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Federal Aviation Administration

Agenda

View of Regs from 3 Perspectives

EASA and Transport Canada Regs

Current FAA Guidance

The Rulemakers

- Federal Aviation Administration (www.faa.gov)

- Transport Canada (www.tc.gc.ca)


Transport Canada Transports Canada

- European Aviation Safety Agency (www.easa.eu.int)

FAA has the fewest Human Factors requirements

Topic	ICAO	EASA	TC	FAA
HF for Initial Certification	Annex 1	145.A.30(e) incl AMC&GM 145.A.30(i)	CAR 573.06	No
Continuation Training for HF	Annex 6	145.A.35 (d)	CAR 573.06	Recommended in ACs
Error Management System	Guidance	145.A.60	CAR 1	Rec, 145.211
Fatigue Management System	Guidance	145.A.30(d) incl. AMC	Proposed, now awaiting consul.	Guidance in Tech Pubs 121.377
Accountable Executive	No	145.A.30	CAR 106	145
Published HF Guidance Materials	Doc 9683-AN/950	GM145.A.30 (e) &Part 66 Appendix I M9	TP 13459	AC120-72, Ops Manual, FAA Website
Documentation Reporting Requirement	Guidance	145.A.45	CAR 573.08	145.109 121.369
Safety Culture/Safety Management System	Under development Annex 6	145.A.65	CAR 573.30	Continuing Analysis and Surveillance System
Procedural Non-compliance	Guidance	145.A.65 (c)	CAR 571.05	ASAP
Planning of tasks, equipment, and spares	Guidance	145.A.47	No	145.109
Shift and task handover	Guidance	145.A.47	CAR 573.08	121.369 (b) 9 135.427(b) 9
Error capturing (duplicate inspections)	Guidance	145.A.65 (b)3	CAR 571.10	121.371

ICAO Annex 6, Part I

"The design and application of the operator's maintenance programme shall observe human factors principles."

Human factors principles are:

"Principles which apply to aeronautical design, certification, training, operations and maintenance and which seek safe interface between the human and other system components by proper consideration to human performance"

Summary Table for US, Canada, and Europe

Table 1: Comparing the Personnel Certification Regulations			
	FAA	**EASA**	**Canada**
Regulations	FAR 65, JAR 147	ECAR 66, ECAR 147	STD 566, Div I & II
License Types	Airframe and/or Powerplant (A&P)	Cat A Task – Specific B1 – Airframe/Powerplant B2 – Avionics C - Base Maintenance	M1/M2 Comp. Aircraft E - Electronics S - Structures
Approved School (Hours)	1900	2400 - 3000	2000 - 2400
Work Experience Summary (with school)	None Required	Cat A – 1 year B1 or B2 – 2 years C – 3 years with Degree C – 5 years with B1 or B2	M1/M2 4 years
Type Ratings	No	Yes	Yes

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View of Regs from 3 Perspectives

EASA and Transport Canada Regs

Current FAA Guidance

Who is the European Union (EU)

- Started in the 50's with six countries
- Trade was the main reason for the Union
- The European Union has 25 Member countries with a population of 470M. That means the EU is 35% larger than the US (300M) in people.
- The US still has more aircraft. (40% of World Fleet)

EASA Part 66: Information is Readily Available

Annex IV
Acceptable Means of Compliance to Part-66

For Picture value only

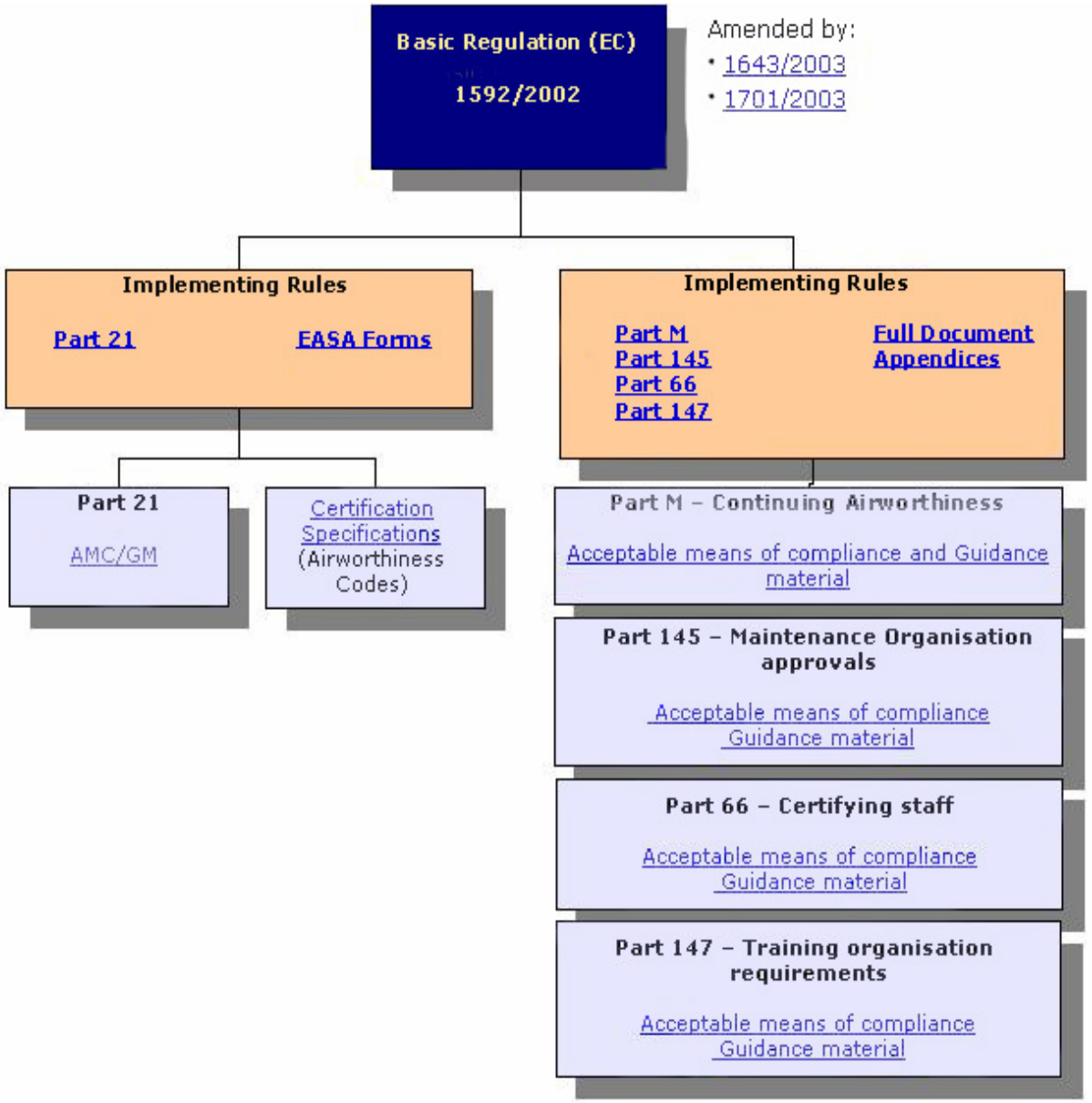
SECTION A
AMC 66.A.10 Application

1. Maintenance experience should be written up in a manner that the reader has a reasonable understanding of where, when and what maintenance constitutes the experience. A task by task account is not necessary but at the same time a bland statement "X years maintenance experience completed" is not acceptable. A log book of maintenance experience is desirable and some competent authorities may require such log book to be kept. It is acceptable to cross refer in the EASA Form 19 to other documents containing information on maintenance.

2. Applicants claiming the maximum reduction in 66.A.30(a) total experience based upon having successfully completed 147.A.200 approved basic training, should include the Part-147 certificate of recognition for approved basic training.

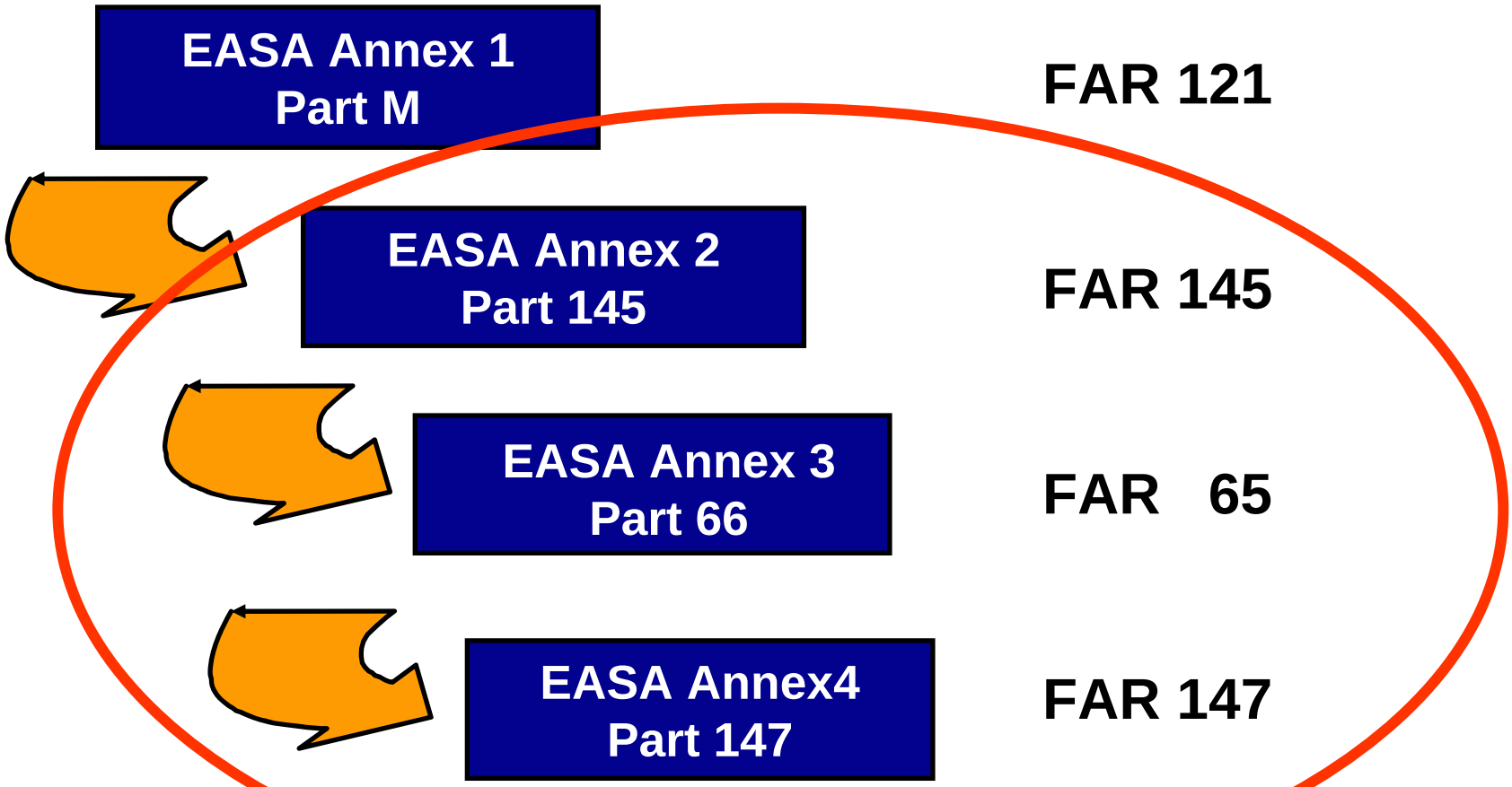
3. Applicants claiming reduction in 66.A.30(a) total experience based upon having successfully completed technical training in an organisation or institute recognised by the competent authority as a competent organisation or institute, should include the relevant certificate of successful completion of training.

AMC 66.A.20(a) Privileges



From EASA Website

Hierarchy of Regs affecting Maintenance



Information is on: www.easa.eu.int

ED Decision No 2003/19/RM
28/11/2003

Annex I Acceptable Means of Compliance to Part-M

Annex II Acceptable Means of Compliance to Part-145

Annex III Guidance Material to Part-145

Annex IV Acceptable Means of Compliance to Part-66

Annex V Guidance Material to Part-66

Annex VI Acceptable Means of Compliance to Part-147

Annex VII Guidance Material to Part-147

EASA Part 145 and FAR 145: Selected Comparisons

- *EASA 145.A.25 Facilities* is more detailed about working environment and secure storage.

- *EASA 145.A.30 Personnel Requirements* is more detailed than FAR 145.151
  - Greater detail about “Accountable Manager” duties
  - EASA talks about Quality Monitoring of Personnel
  - Refers to many aspects of “Human Factors”
  - B1 & B2 Engineer Ratings (Must be equivalent to EASA system and acceptable to authority.)

EASA Part 145 and FAR 145: Selected Comparisons
(Continued 1)

- *FAR 145.163 Training Requirements require that all personnel be trained by September 28, 2006*

- *EASA Part 145.A.35 Certifying Staff*
  - Minimum age for certifying staff is 21 in Part 145. It is 18 by FARs. AML age remains 18.
  - Continuation training (d)
    - Relevant Technology
    - Organizational Procedures
    - Human Factors

- *EASA Part 145.A.45 Maintenance Data* is more detailed and prescriptive than *FAR 145.109*
  - Establish procedures to notify author when data is problematic.
  - Specific rules on back-up of electronic work cards.

EASA Part 145 and FAR 145: Selected Comparisons
(Continued 2)

- *EASA Part 145.A.47 Production Planning* "must take into account human performance limitations …" during shift turnover"… is just one example.

- *FAR 145.211 Quality Control System* calls for QC system leaving the details to the operator.

- *EASA Part 145.A.50 Certification of maintenance* requires an EASA Form 1 tag for component parts.

- *EASA 145.A.65 Safety and quality policy….and quality system* requires:
  - Take account for human factors and human performance
  - Display an "Attitude for Safety"
  - Specific system to notify Accountable Manager about Quality issues

EASA Part 66.A.25 Basic Knowledge Requirements

1. Mathmatics
2. Physics
3. Electrical Fundamentals
4. Electronic Fundamentals
5. Digital techniques Electronic Instrument Systems
6. Materials and Hardware
7. Maintenance Practices
8. Basic Aerodynamics
9. Human Factors (Not Required by FARS)
10. Aviation Legislation
11. Turbine Aircraft Aerodynamics, Structures, and Systems
12. Helicopters
13. Aircraft Aerodynamics, Structures, and Flight
14. Propulsion
15. Gas Turbine Engines
16. Piston Engines
17. Propellers

EASA Part 147: Requirements Regarding Quality Program

EASA Part 147.A.130 Training Procedures and Quality System

(a) The organization shall establish procedures acceptable to the competent authority to ensure proper training standards and compliance with all relevant requirements in this part

(b) The organization shall establish a quality system including

1. An independent audit function to monitor training standards, the the integrity of knowledge examinations and practical assessments. Compliance and adequacy of the procedures, and

2. A feedback system of audit findings to the person(s) and ultimately to the accountable manager referred to in 147.A. 105(a) to ensure, as necessary, corrective action.

EASA 145 Maintenance
Human Factors Program Requirements

1. Safety Culture
2. **Incident investigation and internal/external reporting of findings**
3. **Design/maintenance Interface (poor maintenance data)**
4. **Maintenance Human Factors training**
5. Procedural non-compliance
6. Planning of tasks, equipment and spares
7. **Fatigue**
8. **Shift and task handover**
9. Error capturing (duplicate inspections, etc.)
10. Signing off tasks not seen nor checked

Guidance for Evaluation and Acceptance of Maintenance Human Factors Training Programs (HBAW 04-06)

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FAA HF Guidance for Part 145

- FAA AC 145-10, Ch. 3, §301(c)

> - The FAA **concurs** with European Authorities in that human factors training related to maintenance practices would provide an additional margin of safety to the repair industry;
> - A human factors training program should be related to **maintenance practices** where possible;

- At this time it is recommended. It is not an FAA regulation.
- EASA Certificate holder's must follow EASA rules

Purpose of HBAW

- ASIs needed guidance on accepting training programs
- Provide industry guidance on HF Training

Background

- NTSB has issued several safety recommendations involving human error in aviation maintenance.
- FAA inspections have revealed additional findings and systemic deficiencies.
- Current U.S. regulations do not require the approval of a human factors training program, however, efforts are underway to make human factors training required.
- Maintenance human factors training programs are required for European Aviation Safety Agency (EASA) 145 certification.

AREAS OF CONCERN WITH MAINTENANCE HUMAN FACTORS

A panel of FAA and industry experts has identified six key areas of immediate concern.

- A. Event Investigation.
- B. Documentation.
- C. Human Factors Training.
- D. Shift/Task Turnover.
- E. Fatigue Management.
- F. Sustaining and Justifying a Human Factors Program.

HBAW 06-04 Accepting an HF Training Program

(1) Attend an entire training session.

(2) Do training requirements match and company priorities (Ref. AC 120-72) ?

(3) Is the human factors training is a cooperative development between the workforce and management.

(4) Is training is provided to appropriate work groups?

(5) Is content and delivery techniques match the audience.

HBAW 06-04 Accepting an HF Training Program (Con't)

(6) Check for training evaluation. Verify that feedback is provided to the instructors and management.

(7) Key references in the Operator's Manual for Human Factors in Aviation Maintenance provide additional information helpful for evaluation.

(8) These same steps are applicable to acceptance or approval of an EASA Human Factors Training Program.

Plans for FAR 121 AC on Maintenance Training Programs

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Possible Language for HF Training Rules for Part 121.375

- Carriers shall establish, implement, and maintain, **an FAA-approved** maintenance personnel training program……

- Indoctrination Training…includes Human Factors and safety management procedures overview..

- Initial Technical Training….Human Factors

- Recurrent Training….includes Human Factors and safety management

More New Language for Part 121 Training

- Effective training programs must include:
  - Needs assessment
  - Course development
  - Training records
  - Training program reviews

- “Although training is important it is only one part of an HF program”

Suggested Human Factors Elements

(a) General/introduction to human factors;

(b) Statistics;

(c) Safety culture/organizational factors;

(d) Contributing factors and human error;

(e) Types of errors in maintenance task;

(f) Human reliability;

(g) Human performance and limitation;

(h) Vision and hearing;

(i) Stress and workload management;

More Suggested Human Factors Elements

(j) Situational awareness;

(k) Error investigating process;

(l) Personal error reduction strategies;

(m) Environment;

(n) Communication;

(o) Procedures, information, tools, and task signoff practices;

(p) Teamwork, professionalism, and integrity;

(q) Shift and task turnover procedures;

(r) Fatigue management and duty time limitations; and

(s) Undocumented maintenance.

Regulation Summary

- FAA has the fewest Human Factors regulations
- FAA learned a lot from the false start on Mx HF in Part 145
- First FAA will do FAR 121AC and start 121 rulemaking
- FAA will revise FAR 145 rule
- FAA will move towards 135, and others.