Name: _____

Student Number: _____

Notes:

1. You have 1 hour to complete this exam.
2. Anyone caught copying or cheating will receive a mark of zero.
3. Please answer all the questions in the space provided.

Question 1:

Provide either formal definitions or clear statements of meaning, for the following words or terms, as they are used by the Canadian civil airworthiness community, the Canadian Aviation Regulations (CARs) or the Canadian Aeronautics Act:

(a) Airworthy (official regulatory definition);

A Canadian civil aircraft is deemed to be airworthy if –

Condition #1: The aircraft conforms to its type design; and

Condition #2: The aircraft is "in condition for safe operation".

(b) Aeronautical Product;

Under the Aeronautics Act, an "aeronautical product" is any:

- **aircraft,**
- **aircraft engine,**
- **aircraft propeller, or**
- **aircraft appliance –**

- Or the component parts of any of those things, including any computer system and software.

(c) Finding of compliance;

A Findings-of-Compliance is a determination – by a competent specialist – that a specific design item is compliant with the associated BOC standard. The determination is called a "Finding-of-Compliance". A "finding" must be made for each item in the BOC – and for the final total design.

(d) Basis of Certification (BOC).

The Minister shall establish, for an aeronautical product, a basis of certification consisting of:

- **the airworthiness standards for the category;**
  - **the applicable aircraft emissions standards;**
  - **any special conditions that are necessary to ensure that the type design of an aeronautical product having a novel or unusual design feature provides a level of safety equivalent to that provided by the airworthiness standards;**
  - **any finding of equivalent safety;**

any exemptions from the airworthiness standards for the category.

Question 2:

There are two basic types of standards in the Airworthiness Manual. What are they, and which type is *exclusively* Canadian?

Design

Procedural – exclusively Canadian

Question 3:

List the Canadian regulatory instruments in descending order of authority:

Aeronautics Act

Regulations

Standards

Advisories

Policies & Procedures

Question 4: (2 marks)

What document specifies the scope of authority of each delegate working within a delegated organization?

DAPM/EPM

Letter of Authorization – specific to the individual

Question 5:

State the requirements that must be met to be eligible to become a DE within a DAO/AEO.

- 505.409 – Engineer or equivalent
- 505.409(b)(3) – Thorough knowledge of Canadian airworthiness requirements in specialty
- 505.409(b)(4) – Position on staff with authority to ensure compliance of designs
- 505.409(b)(5) – Not less than 1 year working relationship with TCCA
- 505.409(b)(6) – Not less than 6 years related aeronautical experience
- 505.415 – DAPM/EPM – Limitation of privileges

Question 6: (3 marks)

What are the 5 phases of Aircraft Type Certification in the correct order?

1. Application and Basis of Certification

2. Establish Means of Compliance and Delegation

3. Demonstrate and Record Compliance in GCP

4. Type Design Approval

5. Post-Certification – issuing the flight authority (ICAs are in place)

Question 7: (8 marks)

The use of certification plans is a relatively new concept

a) What is the purpose of a certification plan? (2 marks)

To provide **early** and formal (documented) agreement on the detailed methods of compliance.

b) What advantages are gained by the use of certification plans? (3 marks)

- Improves overall efficiency of process
- Early and clear understanding of expectations
- Provides information necessary to allocate resources
- Early identification of certification problems
- Early agreement of details before foreign authorities involved (parallel cert. projects)
- Audit trail for foreign certification

c) List the contents of a certification plan. (3 marks)

- Brief system description
- Applicable requirements
- Detailed methods of compliance
- List of compliance documents
- Level of Involvement
- Primary and secondary delegates

Question 8: (3 marks)

In terms of a repair or modification, a classification of "major" has, in the opinion of the Minister, other than a negligible effect on…

- Weight and centre of gravity limits
- Structural strength
- Performance
- Powerplant operation
- Flight characteristics
- Environmental characteristics
- Other qualities affecting airworthiness

Question 9: (6 marks)

In the case of a not-significant design change, the regulations allow continued compliance with the existing certification basis without further approval by the Minister, except in the following three cases:

a) Where a design change is considered novel or unusual for the proposed or existing certification basis, and where the issuance of Special Conditions per subsections 511.13(7) or 513.07(7) of the CARs is warranted;

b) Where it is deemed that the existing certification basis is not adequate and the applicant did not volunteer to include a later amendment of a standard of airworthiness to make the certification basis appropriate for the design change. This situation reverts to the normal negotiation process with the applicant; or

c) Where the applicant elects to comply with later amendments to the existing certification basis under subsection 511.13(9) or paragraph 513.07(9)(a) of the CARs. The purpose of consulting the Minister is to ensure that the applicant also complies with any other regulations directly related or relevant to the selected later amendments (i.e. the applicant does not pick and choose without a full understanding of inter-related regulations).

Question 10: (10 marks)

What are the purpose and outputs of the following processes?

	Purpose	Outputs
Functional Hazard Analysis	To identify and classify potentially hazardous conditions -functional -operational	Determine acceptability of design concept. Problem areas requiring design change, additional analysis, and scope.
System Safety Analysis	Use results of FHA to identify and disposition all hidden failures. Show compliance with 525.1309, etc.	-Dormant failures -Inspection tasks need to detect those potential failures
Damage Tolerance Evaluation	To determine locations of damage (of various causes) and determine required residual strength in the structure (after failure).	-inspections -discard time *For all PSEs

Question 11: (2 marks)

As a junior engineer with a DAO that designs aircraft aftermarket modifications, you are tasked with designing the structural components for a new winglet design. You have chosen to use machined 2024-T3 aluminum components and a bolted design concept. What document(s) will you reference when completing your engineering structural analysis on the components and the joint, in order to ensure compliance with the applicable standards?

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Question 12: (6 marks)

List the contributions to the Instructions for Continued Airworthiness based on the areas of responsibility:

Engineering	Maintenance

• Airworthiness Limitations section
  • Mandatory replacement time intervals
  • Related structural & systems inspection procedures
• Structural Repair Manual
• Certification Maintenance Requirements
	• Description of product
	• Maintenance schedule
	• Removal/Installation instructions
	• Diagrams of structural access plates
	• Details for special inspection techniques
	• Information for protective treatment after inspection
	• Data re: structural factors
	• List of special tools
	• Servicing information