

Technical Airworthiness Authority Advisory (TAA Advisory)	
Title	Technical Airworthiness Clearance of Surveillance Systems
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1 Purpose

- 1.1 This Technical Airworthiness Authority (TAA) Advisory provides guidance for obtaining airworthiness approval and Technical Airworthiness Clearance (TAC) of civil and military surveillance systems installed on Department of National Defence (DND)/Canadian Armed Forces (CAF) aircraft.
- 1.2 Specifically, this document provides advisory material for demonstrating compliance with the certification requirements applicable to:
- a. civil Mode A, C and S transponders; Automatic Dependent Surveillance – Broadcast (ADS-B) Out systems; and ADS-B In surveillance systems, in accordance with Parts 2 and 3 of the Technical Airworthiness Manual (TAM) (regulatory reference 3.2.1.a);
 - b. Military Identification Friend or Foe (IFF) Mode 1, 2, 3 and 5 systems, in accordance with Parts 2 and 3 of the TAM; and
 - c. obtaining a Technical Airworthiness Clearance (TAC) of a civil and/or military surveillance system.

2 Applicability

- 2.1 This advisory applies to all DND and CAF personnel, as well as their support contractors, who are seeking to obtain an airworthiness approval and Technical Airworthiness Clearance (TAC) for the installation of surveillance systems on DND/CAF aircraft.
- 2.2 This advisory addresses Canadian, United States and European requirements. Unless otherwise specifically stated, systems determined to be compliant with these requirements are suitable for worldwide operational use.
- 2.3 This guidance may be adapted for use in performing the Type Design Examination (TDE) of a surveillance capability that has been previously approved by a TAA-recognized airworthiness authority.
- 2.4 Throughout this document, the term 'Applicant' is used to refer to the organization applying for the design approval of a surveillance system. For a new DND/CAF aircraft fleet, this is normally the Systems Engineering Manager (SEM) in a Project Management Office (PMO). For design changes to existing DND/CAF aircraft, the Applicant is the Weapon System Management (WSM) organization.

3 Related Material

- 3.1 **Definitions.** With the exception of 3.1.b, the terminology adopted in this document originates in the Glossary of the TAM (regulatory reference 3.2.1.a).
- a. Aircraft. An aeroplane, helicopter or other machine capable of flight.

- b. Surveillance System. For the purposes of this advisory, a surveillance system is:
 - i. a civil Mode A, C and/or S transponder system;
 - ii. an Automatic Dependent Surveillance (ADS-B) Out system;
 - iii. an ADS-B In system; or
 - iv. a Military Identification Friend or Foe (IFF) Mode 1, 2, 3, and 5 system.
- c. Unmanned Aircraft (UA). An aircraft that is designed to operate with no human pilot on board and which does not carry personnel. Moreover, an UA is:
 - i. capable of sustained flight by aerodynamic means;
 - ii. remotely piloted, or automatically flies a pre-programmed flight profile;
 - iii. reusable; and
 - iv. not classified as a guided weapon or similar one shot device designed for the delivery of munitions.

3.2 References

3.2.1 Regulatory References

- a. C-05-005-001/AG-001 – *Technical Airworthiness Manual (TAM)*
- b. C-05-005-001/AG-002 – *Airworthiness Design Standards Manual (ADSM)*
- c. A-GA-005-000/AG-001 – *DND/CF Airworthiness Programme*
- d. B-GA-104-000/FP-001 – *Operational Airworthiness Manual (OAM)*, Chapter 3, Section 312.

3.2.2 Non-Regulatory References

- a. North Atlantic Treaty Organization (NATO) *Identification Friend or Foe (IFF) Mode 5 National Origin (NO) Codes – AC/322(CP/2)N(2019)0016-COR1 (INV)* (available internally, within DND, at AEPM RDIMS #2010539)
- b. United States Department of Defense (U.S. DoD) **Air Traffic Control Radar Beacon System, Identification Friend or Foe, Mark XII/XIIA Systems (AIMS) Program Office (PO)**, AIMS 03-1000B, *Technical Standard for the ATCRBS/IFF/MARK XIIA Electronic Identification System and Military Implementation of Mode S*, Amendment 1, 1 July 2015
- c. NATO Standardization Agreement (STANAG) 4193, Edition 3 – *Technical Characteristics of IFF MK XA and MK XII Interrogators and Transponders*
- d. European Commission, Commission Implementing Regulation (EU) No. 1207/2011, Brussels: *Official Journal of the European Union*, 2011, as amended by EU 2020/587, 2020
- e. Transport Canada Civil Aviation (TCCA) Advisory Circular (AC) 700-004, *Airborne Collision Avoidance System Advisory Material*
- f. TAA Advisory 2006-04 – *Installation of Miscellaneous Non-Required Equipment*
- g. European Union Aviation Safety Agency (EASA) European Decision 2019/011/R, *Certification Specifications (Book 1) and Acceptable Means of Compliance (Book 2) for Airborne Communication, Navigation and Surveillance Issue 2 (CS-ACNS)*, 26 April 2019
- h. TCCA AC 700-009, *Automatic Dependent Surveillance – Broadcast*
- i. ADS-B Out Update for Royal Canadian Air Force (RCAF) Flying Units – *Clarifying the Exemption of Canadian State Aircraft Conducting DND Flight Operations in the U.S.* (available internally, within DND, at AEPM RDIMS #1970856)
- j. United States Code of Federal Regulations, Title 14 (14 CFR), section 91.225, *Automatic Dependent Surveillance - Broadcast (ADS-B) Out equipment*

- k. 14 CFR, section 91.227, *Automatic Dependent Surveillance-Broadcast (ADS-B) Out equipment performance requirements*
- l. FAA AC 20-165B, *Airworthiness Approval of Automatic Dependent Surveillance – Broadcast OUT Systems*, Revision B, dated 12 July 2015
- m. FAA AC 20-172B, *Airworthiness Approval for ADS-B IN Systems and Applications Document Information*
- n. FAA TSO-C166b, *Extended Squitter Automatic Dependent Surveillance - Broadcast (TIS-B) Equipment Operating on the Radio Frequency of 1090 Megahertz (MHz)*
- o. EASA Deviation Request CS-ACNS#1 for the certification of an ADS-B Out Extended Squitter & ELS installation (Major Change) and its compliance to CS-ACNS (<https://www.easa.europa.eu/system/files/dfu/CS%20ACNS%20Deviation%201.pdf>) (also available internally, within DND, at AEPM RDIMS #2006081)
- p. B-GT-D35-001/AG-000 – *Management of The Radio Frequency Spectrum (DNDP 35)*, dated 15 September 2017 (available internally, within DND, on the ADM(IM) intranet, at <http://admim-smagi.mil.ca/en/it-services/radio-spectrum-space/spectrum-management/dndp-35.page>)

3.3 **Airworthiness Requirements**

- 3.3.1 Adding a surveillance capability to a DND/CAF aircraft is a major design change that must be certified (granted Airworthiness Approval) and that requires a Technical Airworthiness Clearance (TAC) before the capability can be released for operational use.
- 3.3.2 **Technical Airworthiness Clearance.** A surveillance system design must meet the certification and TAC requirements defined in the TAM (regulatory reference 3.2.1.a) rules and standards for a new aircraft design, or an in-service design change.
- 3.3.3 **Operational Airworthiness Clearance.** The Operational Airworthiness Manual (OAM) (regulatory reference 3.2.1.d.) should be consulted to determine whether an Operational Airworthiness Clearance (OAC) is required for the proposed Surveillance System. This advisory does not include any additional guidance with respect to obtaining an OAC. Any questions or queries related to the OAC requirements and process should be directed to the Operational Airworthiness Authority (OAA).
- 3.3.4 **Airworthiness Codes, Certification Requirements and Guidance Material.** The civil and/or military airworthiness codes, and associated certification requirements, as well as standards, means and methods of compliance, associated advisory and guidance documents applicable to surveillance systems, versus intended capability, are discussed in 4.2.2.b.

NOTES

- 1. *Information on these codes, certification requirements, standards and guidance documents will be provided in the Airworthiness Design Standards Manual (ADSM), Part 3, Chapter 4, Surveillance and Avoidance Systems, soon to be promulgated. To find out more about this ADSM chapter, contact DTAES 6-4.*
- 2. *Use of later amendments to the airworthiness codes, certification requirements, standards, advisory or guidance material are acceptable.*

4 **Discussion**

4.1 **Background**

- 4.1.1 RCAF aircraft are considered as state aircraft and are not necessarily obligated to adhere to ICAO standards or recommended practices. However, the DND/CF Airworthiness Programme (regulatory reference 3.2.1.c) mandates that the DND is responsible to operate all DND-

Registered Aircraft with due regard for the safety of other air traffic. This requires DND aircraft to be equipped and certified to meet the CNS/ATM performance requirements. Therefore, surveillance standards and recommended practices mandated by the various ICAO member states are identified and discussed within this TAA advisory.

- 4.1.2 Civil Air Traffic Control (ATC) Surveillance systems are an International Civil Aviation Organization (ICAO) worldwide-mandated operational equipage requirement. Although equipage requirements may vary among ICAO member states, when worldwide fleet deployment is necessary, the most stringent requirements should generally be adopted. Annex A provides a list of surveillance equipage requirements for select ICAO member states. Even though the list does not cover all member states, meeting the U.S. and European equipage requirements is sufficient to ensure worldwide operational capability. Recent surveillance requirements implemented by various ICAO member states include, without being limited to:
- a. the U.S. mandated requirement to use equipage with ADS-B Out for operations in U.S. airspace, as of January 01, 2020;
 - b. the European Union's publication of its updated Mode S and ADS-B Out equipage requirements, effective December 07, 2020;
 - c. Australia's mandated ADS-B Out requirement since 2017.

NOTE

As worldwide requirements change over time, 1 Canadian Air Division (1 CAD) remains responsible for ensuring adequate equipage selection by reviewing ICAO member state Aeronautical Information Publications (AIPs).

- 4.1.3 From a military interoperability perspective, Identification Friend or Foe (IFF) equipage mandates now require each aircraft equipped with IFF and operating:
- a. in U.S. airspace – to have a DoD AIMS certification, or an AIMS approval based on another authority's certification (e.g., STANAG certification); and
 - b. in a NATO partner country and requiring National Security Agency (NSA) Mode 5 keys – to have an AIMS or equivalent certification (e.g., STANAG).

NOTE

The DoD AIMS certification is not considered an airworthiness approval in and of itself.

- 4.1.4 As both military and civil surveillance systems use the 1030 and 1090 MHz frequencies for transmission and interrogation, they are often integrated within the same line replaceable unit (LRU), requiring airworthiness certification to account for both.
- 4.1.5 A military implementation of an IFF where the civil capabilities are integrated into the military hardware will require airworthiness approval of the civil capabilities in accordance with this advisory.

4.2 Airworthiness Approval Process Overview

- 4.2.1 The airworthiness approval process for a new surveillance capability is no different than that set out in the TAM (regulatory reference 3.2.1.a):
- a. Part 2, Chapters 1 and 3, for the initial certification of a new to DND/CAF aircraft; or
 - b. Part 3, Chapter 2, for design change certification.

4.2.2 As shown in Figure 1, this process is based on the following steps:

- a. **Step 1: Identifying the Surveillance Operational Equipage Requirements.** A significant responsibility for the Applicant is to identify the specific civil and/or military surveillance capabilities that are required for a particular DND/CAF aircraft fleet. This is accomplished by obtaining the surveillance operational equipage requirements from Directorate Air Requirements (DAR). Additionally, a non-exhaustive list of surveillance capabilities mandated by select ICAO member States is provided in Annex A.

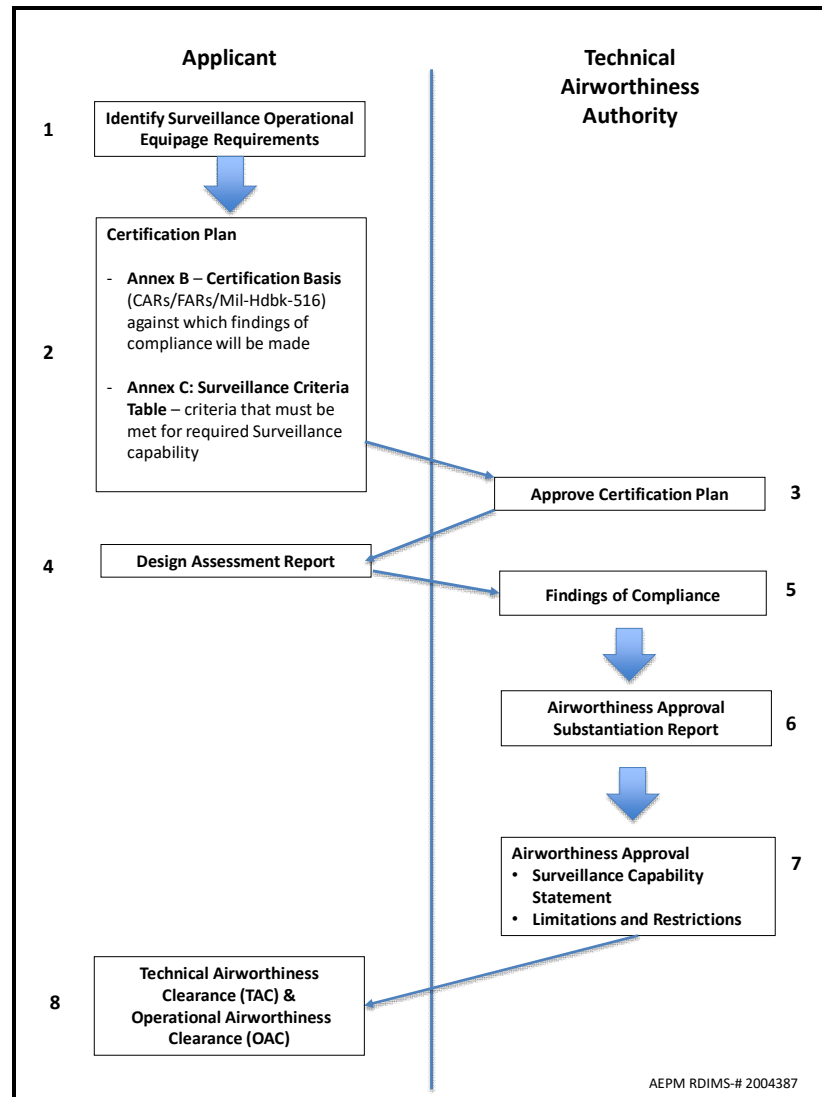


Figure1 – Surveillance System Design Certification Process

- b. **Step 2: Developing the Certification Plan, Certification Basis and Surveillance Criteria.** The Applicant is responsible for preparing the certification plan, the certification basis and selecting the appropriate surveillance criteria. Annex B provides guidance on the process of developing the certification plan, certification basis and determining the applicable surveillance criteria. This step consist of the following three sub-steps:
- (1) **Step 2a: Developing the Certification Basis.** The certification basis will be composed of certification requirements selected from one of the approved civil or military airworthiness codes identified in the ADSM, Part 1, Chapter 2, (regulatory reference 3.2.1.b). An example of a surveillance certification basis is provided in

Annex B, Table B-1. This table identifies representative civil and military certification requirements that may be applicable to a surveillance design.

- (2) **Step 2b: Drafting the Compliance Matrix.** The compliance matrix will need to address the surveillance specific standard(s), as well as associated means and method of compliance and guidance material applicable to the design change. Annex B, Table B-2 provides a list of standards, means and methods of compliance, advisory and guidance documents versus surveillance capabilities. Depending on the extent of the design change, compliance might have to be demonstrated for more than one surveillance capability (e.g., implementation of Mode S and ADS-B Out, each have their own unique criteria). An example of Compliance Matrix for ADS-B Out is provided in Table B-3 of Annex B.
- (3) **Step 2c: Selecting the Applicable Surveillance Criteria.** The Surveillance Criteria Table(s) is/are created by selecting the surveillance criteria available from the various standards, means and methods of compliance, advisory and guidance documents that correspond to the surveillance capabilities identified in Step 1. The Surveillance Criteria Table(s) will constitute the applicable set of surveillance design and certification requirements for a specific surveillance design. Advisory material for the Surveillance Criteria Table is provided in Annex C. Annex D provides additional technical criteria and considerations, beyond those provided in the selected standards that need to be considered for inclusion in the Surveillance Criteria Table.
- c. **Step 3: Obtaining TAA Approval of the Certification Plan.** If the proposed design change is considered out of scope for the Applicant, the certification plan shall be submitted to the DTAES 3 Section Head for approval. It is recommended that the compliance matrix also be submitted for approval at the same time.
- d. **Step 4: Preparing the Design Assessment Report.** Once the design has been developed and tested, it is recommended that the Applicant prepare a Design Assessment Report to provide the TAA and finding authorities with a summary of the design and compliance data being submitted, to demonstrate that the certification requirements have been satisfied. Guidance material for developing the Design Assessment Report is available in Annex E.
- e. **Step 5: Making Findings of Compliance.** The findings of compliance can be performed by DTAES staff, or by other individuals authorized by the TAA. The role of the Finding Authorities (FAs) is to review the compliance program data and to determine if the design is compliant with the certification requirements.
- f. **Step 6: Substantiation Report (optional).** A substantiation report may be required to summarize the work carried out by the TAA staff, in support of the airworthiness approval of the Surveillance capability. If required, the substantiation report will be prepared and staffed by the appropriate DTAES 3 Team Leader. Annex F provides guidance material for developing the report and determining when a report is required.
- g. **Step 7: Airworthiness Approval.** If the design change is considered out of scope for the Applicant, DTAES 3 will issue the airworthiness approval of the surveillance system design, based on the completed compliance matrix, the findings of compliance and the Substantiation Report (if required). The airworthiness approval will include the following Surveillance specific sub-steps:
- (1) **Step 7a: Flight Manual (FM)/Aircraft Operating Instructions (AOI) Updates.** The Applicant, with the support of the DTAES 6 and DTAES 7 specialists, will prepare the

required FM/AOI amendments, including identifying the TAA-approved Surveillance Capabilities. Guidance material related to the FM/AOI updates is provided in Annex G.

- (2) **Step 7b: Surveillance Capability Statement.** The TAC process for a surveillance system certification requires that a Surveillance Capability Statement be developed, approved and inserted into in the FM/AOI. Advisory material for the preparation of the capability statements is provided in Annex H.
- (3) **Step 7c: Limitations and Restrictions.** Any surveillance system associated limitations or restrictions that will be included in the FM/AOI amendments must be approved by the TAA.
- (4) **Step 7d: Instructions for Continued Airworthiness (ICAs).** Any amendments to applicable ICAs (maintenance program) that are associated with the surveillance-related design change must comply with the TAM, Part 5, Chapter 3, Annex A – Supplementary Maintenance Requirements. The Applicant will identify within the Certification Plan a proposed Finding Authority (FA) and may require the support of DTAES 4 for airworthiness approval.

h. **Step 8: TAC and OAC Approval.**

- (1) **Technical Airworthiness Clearance (TAC) Approval.** As a minimum, the final step in the surveillance system certification process is the approval of the TAC. For a new aircraft fleet, the TAC approval will be included as a component of the main TAC issued by the TAA for the new fleet. For a design change to an in-service fleet, the TAC will be issued by the WSM SDE.
- (2) **Operational Airworthiness Clearance (OAC) Approval.** The operation of certain surveillance systems may be transparent to the flight crew and/or require minimal flight crew interaction. It is, therefore, possible that an OAC may not be required for a given surveillance system. The OAM (regulatory reference 3.2.1.d.) should be consulted to determine whether an OAC is required for the proposed surveillance system. This advisory does not include any additional guidance with respect to obtaining an OAC. Any questions or queries related to the OAC requirements and process should be directed to the Operational Airworthiness Authority (OAA).

**ANNEX A
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Examples of surveillance equipage requirements by select ICAO member States

ICAO Member State	Surveillance Equipage Requirements (as of TAA Advisory publication date)		
	Mode A and C	Mode S	ADS-B Out
Canada	Transponder Airspace defined in CAR 601.03.	No current airspace requirement. However, aircraft required to meet TCAS requirements must be equipped with a Mode S Transponder. See Transport Canada, Civil Aviation (TCCA) AC 700-004 (advisory reference 3.2.2.e).	There is no direct requirement at this time for ADS-B in Canada. However, NAV CANADA is using ADS-B Out for flow management over the Hudson Bay area, and Northeast and Oceanic area of Canada. Air operators, including military fleets, wishing to utilize this service must meet specific aircraft ADS-B considerations as presented in TCCA AC 700-009 (advisory reference 3.2.2.h). Note: <i>The ADS-B Out means of compliance specified in TCCA AC 700-009 is not sufficient for operations in the U.S. and European airspaces.</i>
United States	FAA 14 CFR 91.215 lists the airspace in which Mode A and C transponders are required for users.	No current airspace requirement. However, aircraft required to meet TCAS requirements must be equipped with a Mode S Transponder. See also FAA 14 CFR 129.18 – <i>Collision avoidance system</i> applicable to foreign air carriers.	FAA 14 CFR 91.225 (advisory reference 3.2.2.j) defines which airspace requires ADS-B Out. FAA 14 CFR 91.227 (advisory reference 3.2.2.k) defines ADS-B Out equipment performance requirements. Military fleets operating in this airspace require ADS-B Out, unless exempted (advisory reference 3.2.2.i). Note: <i>There are two possible ADS-B implementations in the U.S.: 1090 Extended Squitter (ES) and Universal Access Transceiver (UAT). UAT is only recognized in the U.S. airspace and only for operations at, or below, 18,000 ft. Due to UATs' limited use, and since the Canadian ADS-B Out implementation will likely be space-based, installation of UATs is not recommended.</i>

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ICAO Member State	Surveillance Equipage Requirements (as of TAA Advisory publication date)		
	Mode A and C	Mode S	ADS-B Out
Countries within the European Union	The European regulation is captured in the Commission Implementing Regulation (EU) No. 1207/2011, Brussels: Official Journal of the European Union, 2011, as amended by EU 2020/587, 2020 (advisory reference 3.2.2.d).	The European regulation is captured in Commission Implementing Regulation (EU) No 1207/2011, Brussels: Official Journal of the European Union, 2011 as amended by EU 2020/587, 2020 (advisory reference 3.2.2.d). Implementation dates, affected operators, and acceptable equipment are identified in the Regulation.	The European regulation is captured in Commission Implementing Regulation (EU) No. 1207/2011, Brussels: Official Journal of the European Union, 2011 as amended by EU 2020/587, 2020 (advisory reference 3.2.2.d). Implementation dates, affected operators, and acceptable equipment are identified in the Regulation.
Other	If an ICAO member state has implemented Mode A and C transponder airspace, then meeting Canadian, U.S. or European Mode A and C requirements should suffice.	If an ICAO member state has implemented Mode S transponder airspace, then meeting the European Mode S requirements should suffice. A careful assessment of which parameters are required may be necessary.	There is limited ADS-B Out implementation or harmonization of requirements amongst ICAO member states worldwide. However, meeting the requirements applicable to U.S. and European airspace is expected to be adequate for operation in ICAO member states. It is strongly recommended that the Applicant consult the Aeronautical Information Publication (AIP) of the respective ICAO member state to confirm requirements.

Certification Plan and Certification Basis (Steps 2a and 2b)

1. General

- 1.1 This annex provides guidance on developing the surveillance system certification plan and certification basis.

2. Rationale and Guidance – Certification Plan

- 2.1. The Applicant is responsible for developing the certification plan and, if the design change is out of scope, submitting it to DTAES 3 for approval. DTAES 3 will staff the plan to DTAES 6 for the review of the surveillance system technical aspects of the plan, specifically the certification basis, means and methods of compliance, and surveillance system criteria. During the development of the plan, it is recommended that the Applicant consult DTAES 6 staff for assistance.
- 2.2 In addition to the standard certification plan requirements defined in the TAM (regulatory reference 3.2.1.a), Parts 2 and 3, the plan must include the following:
- a. the currently approved type design and any already approved surveillance system capabilities;
 - b. the new surveillance system capabilities to be certified (Step 1);
 - c. the current and proposed aircraft surveillance system equipment configuration to be approved, including any differences across the fleet;
 - d. any operating configurations and equipment restrictions that affect surveillance capabilities, including those for mission equipment and external stores. This information is used to determine the scope of compliance demonstration tests and analyses; and
 - e. the proposed certification basis (Step 2a).

3. Rationale and Guidance – Certification Basis

- 3.1 As described in paragraph 4.2.2.b.(1) of the advisory, the certification requirements that will form the certification basis must be selected from one of the approved civil or military airworthiness codes identified in the ADSM (regulatory reference 3.2.1.b).
- 3.2 Table B-1 provides a listing of the certification requirements that should be considered when defining the certification basis for a surveillance system design change.
- 3.3 The applicant must include aircraft cybersecurity requirements within the certification basis. Table B-1 is FAA-centric and, at the time this TAA advisory was published, the FAA, unlike EASA, did not have specific FAR paragraphs that dealt with Aircraft Cybersecurity. EASA has codified Aircraft Cybersecurity requirements by including paragraph 1319 into the following Certification Specification (CS) 25, 27, and 29 (Table B-1 item 23). The EASA Aircraft Cybersecurity requirements for CS 23 are addressed in EASA Guidance Material (GM) 23.2500(b). The ADSM (regulatory reference 3.2.1.b) Part 2, Chapter 6 – “Aircraft Cybersecurity” provides additional details on establishing an aircraft cybersecurity certification basis. Furthermore, DTAES 8 staff can provide assistance in establishing the aircraft cybersecurity certification basis.

**ANNEX B
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Table B-1 Example of Certification Requirements from Civil and Military Airworthiness Codes to Be Used in Developing the Certification Basis for a Surveillance System Design Change

No.	Civil Airworthiness Codes	Military Airworthiness Codes (Mil-Hdbk-516, EMACC)
1	AWM/FAR xx.581 Lightning Protection	13.2.4 Lightning Protection
2	AWM/FAR xx.899 Electrical bonding and protection	12.2 Electrical Power Distribution, Bonding and Grounding
3	AWM/FAR xx.1301 Function and Installation	11.1.1 Avionics Subsystems Architecture 11.1.1.5 Navigation subsystem
4	AWM/FAR xx.1307 Miscellaneous equipment	11.1.1 Avionics subsystems architecture
5	AWM/FAR xx.1309 Equipment, Systems and Installations	11.1 Undetected failure modes, Redundancy, Deterministic 11.2 Safety and flight critical control functions, Integrity 14.1.1 System safety, Fail-safe design 14.2. Safety Design Requirements, Single point failure 14.3 Software safety program 15. Computer Systems and Software
6	AWM/FAR xx.1310 Power Source Capacity and Distribution	12.1 Electrical Power Generation 12.2 Electrical Wiring and Power Distribution
7	AWM/FAR xx.1316 Electrical and Electronic System Lightning Protection (.1306 for AWM/FAR 23)	13.2.4 Lightning Effects
8	AWM/FAR xx.1317 High-intensity Radiated Fields (HIRF) Protection (.1308 for AWM/FAR 23)	13.1 Component/subsystem E3 qualification 13.2 System-level E3 qualification
9	AWM/FAR xx.1321 Flight Instrument - Arrangement and Visibility	9.2.1 Crew station arrangement 9.2.1.1 Controls and display readability 9.2.2 Controls and display usability
10	AWM/FAR xx.1322 Flight Crew Alerting	9.2.3 Aircrew alerting systems 11.2.1.3 Warnings, cautions, and advisories
11	AWM/FAR xx.1325 Static pressure systems	11.1.1.1 Air data system
12	AWM/FAR xx.1329 Flight Guidance Systems	6.1.13 Characteristics of secondary flight control systems 6.2 Vehicle control functions (VCF)
13	AWM/FAR xx.1331 Instruments using a power supply	12.1.5 Uninterruptible power
14	AWM/FAR xx.1333 Instrument systems	9.2.1 Crew station arrangement 9.2.1.1 Controls and display readability 9.2.2 Controls and display usability
15	AWM/FAR xx.1351 Electrical Systems and Equipment -General	12.1 Electrical Power Generation 12.1.4 Power quality
16	AWM/FAR xx.1353 Electrical equipment and installations	12.1.3 Safe operation of integrated electrical power system
17	AWM/FAR xx.1357 Circuit protective devices	12.2.3 Circuit protection
18	AWM/FAR xx.1419 Ice protection	8.2.9.1 Ice detection and protection
19	AWM/FAR xx.1431 Electronic equipment	11.1.5.3 Interface/interconnect failures 11.2.5 Electrical power quality
20	AWM/FAR xx.1529 Instructions for Continued Airworthiness	16.1 Maintenance manuals/checklists 16.2 Inspection requirements
21	AWM/FAR xx.1533(b) Additional operating limitations	11.3.2 Necessary limitations

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No.	Civil Airworthiness Codes	Military Airworthiness Codes (Mil-Hdbk-516, EMACC)
22	AWM/FAR xx.1581(a)(2) Airplane Flight Manual	11.3.2 Necessary limitations 12.1.7 Subsystem limitations 12.1.8 Procedures
23	EASA CS 25/27/29.1319 Equipment, systems and network information protection	4.1.2 Safety critical hardware and software 6.2.9.2 Security 15.2.8 Security techniques

4. Rationale and Guidance – Standards, Means and Methods of Compliance, and Guidance Documents

4.1 Table B-2 should be consulted to identify the appropriate standards, means and methods of compliance, and guidance material applicable to the required surveillance capabilities identified in Step 1. Once identified, the criteria should be collated to create the Surveillance Criteria Table, as described in Step 2c – Setting up the Surveillance Criteria Table.

NOTES

1. *For clarity, only the FAA TSOs are listed in Table B-2. However, the equivalent Canadian TSO (CAN-TSO) or EASA TSO (E-TSO) are also acceptable, unless otherwise indicated.*
2. *The FAA TSOs, CAN-TSOs and E-TSO will generally reference RTCA and EUROCAE specifications. Frequently, the TSO will add new requirements, modify or delete specific RTCA and EUROCAE requirements. Therefore, the RTCA and EUROCAE specifications associated with the TSOs identified in Table B-2 may also constitute acceptable standards, provided the TSO additions, modifications and/or deletions are addressed.*

4.2 Specialist knowledge and experience are required to interpret and select the appropriate criteria. The DTAES 6 engineering support staff can be contacted to assist in the selection of the applicable criteria and the development of the Surveillance Criteria Table. Guidance material for the development of the Surveillance Criteria Table is provided in Annex C of this advisory.

4.3 The final step in demonstrating compliance is the identification of compliance artefacts, which will be provided to support the findings of compliance and design assessment. Examples of compliance artefacts include:

- a. Design description documents;
- b. Design analysis reports;
- c. Integration lab test reports;
- d. Aircraft ground and flight test reports;
- e. Technical Standard Order (TSO) Authorization (TSOA) or Military Standard Order (MSO) approval references; and
- f. Approvals from other Airworthiness Authorities.

4.4 Table B-3 provides an ADS-B Out example surveillance system certification basis and compliance matrix.

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Table B-2 Design Standards, Means and Methods of Compliance, and Guidance Material by Type of Surveillance Capability

Capability	Design Standards	Means and Methods of Compliance or Guidance Material
Mode A/C	FAA TSO-C74 (b), (c) or (d) FAA TSO-C88 (AR)	FAA AC 23-8C – Transponder specific content FAA AC 25-7C – Transponder specific content FAA AC 27-1B – Transponder specific content FAA AC 29-2C – Transponder specific content
	EASA CS-ACNS Book 1, Issue 2	EASA CS-ACNS Issue 2, Book 2
Mode S	FAA TSO-C112 (e)	FAA AC 20-131A – Mode S specific content FAA AC 20-151C – Mode S specific content
	EASA CS-ACNS Book 1, Issue 2	EASA CS-ACNS Issue 2, Book 2
ADS-B Out	FAA TSO-C166 (b)	FAA AC 20-165B
	EASA CS-ACNS Book 1, Issue 2	EASA CS-ACNS Issue 2, Book 2
ADS-B In	FAA TSO-C195 (b)	FAA AC 20-172B
IFF Mode 1, 2, 3 and 5	Department of Defense (DoD) Air Traffic Control Radar Beacon System, Identification Friend or Foe, Mark XII/Mark XIIA, Systems (AIMS) 17-1000 <p style="text-align: center;">NOTE:</p> <p style="text-align: center;"><i>Although not explicitly considered as technical airworthiness standards, the U.S. DoD AIMS standards have been included for reference purposes.</i></p>	

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Table B-3 Example of ADS-B Out Surveillance Certification Basis and Compliance Matrix

Certification Requirement and Title	Certification Basis		Means of Compliance	Compliance Artefacts	Finding Authority
	Certification Requirement Text <i>[Caution: Exact requirement will depend on specific FAR Part and amendment level]</i>	Notes			
FAR xx.1301 Function and Installation	Each item of installed equipment must— (a) Be of a kind and design appropriate to its intended function; (b) Be labeled as to its identification, function, or operating limitations, or any combination of these factors; (c) Be installed according to limitations specified for that equipment; and (d) Function properly when installed.		Applicable portions of: AC 23-8C, 25-7D, 27-1B, 29-2C, and 20-165B, as defined in the Criteria Table	<ul style="list-style-type: none"> Design Data, Analysis and Test Reports Design Assessment Report 	FA Avionics and Software
FAR xx.1309 Equipment, Systems and Installations	The equipment, systems, and installations whose functioning is required by this subchapter, must be designed to ensure that they perform their intended functions under any foreseeable operating condition.		AC 23/25.1309, and applicable portions of AC 27-1B, 29-2C, AC 20-165B, as defined in the Criteria Table	<ul style="list-style-type: none"> Design Data, Analysis and Test Reports Design Assessment Report 	FA Avionics and Software
FAR xx.1309 Equipment, Systems and Installations	The airplane systems and associated components, considered separately and in relation to other systems, must be designed so that (1) The occurrence of any failure condition which would prevent the continued safe flight and landing of the airplane is extremely improbable, and (2) The occurrence of any other failure conditions which would reduce the capability of the airplane or the ability of the crew to cope with adverse operating conditions is improbable.		AC 23/25.1309, and applicable portions of AC 27-1B, 29-2C, AC 20-165B, as defined in the Criteria Table	<ul style="list-style-type: none"> Design Data, Analysis and Test Reports Design Assessment Report 	FA Avionics/ Software and System Safety
FAR 25.1310 Power Source and Distribution	Each installation whose functioning is required for type certification or under operating rules and that requires a power supply is an “essential load” on the power supply. The power sources and the system must be able to supply the following power loads in probable operating combinations and for probable durations		Applicable portions of AC 25-7D and AC 20-165B, as defined in the Criteria Table	<ul style="list-style-type: none"> Design Data, Analysis and Test Reports Design Assessment Report 	FA Electrical
Mil Hdbk 516 section 13.2.4 Lightning Effects	516-Criterion: Verify that the air system has met all requirements for lightning, either direct (physical) or indirect (electromagnetic) effects and that any potential for ignition of fuel vapors is eliminated.	Or FAR 23.1306 or FAR 25/27/29.1316 Lightning Protection	Mil Std 464 or AC 20-136B, and applicable portions of AC 27-1B, 29-2C, and AC 20-165B, as defined in the Criteria Table	<ul style="list-style-type: none"> Design Data and Test Reports Design Assessment Report 	FA E3
FAR 23.1308, 25/27/29.1317 High-intensity Radiated Fields (HIRF) Protection.	Each electrical and electronic system that performs a function whose failure would prevent the continued safe flight and landing of the airplane must be designed and installed so that— (1) The function is not adversely affected during and after the time the airplane is exposed to HIRF environment I, as described in appendix L to this part:[...]		FAA AC 20-158A, and applicable portions of AC 27-1B, 29-2C and AC 20-165B, as defined in the Criteria Table	<ul style="list-style-type: none"> Design Data, Analysis and Test Reports Design Assessment Report 	FA E3

Surveillance Criteria Table (Step 2c)

1. General

1.1 This annex provides guidance on developing the surveillance system Criteria Table(s).

2. Rationale and Guidance

2.1 As described in paragraph 4.2.2.b.(3) of the advisory, Step 2c, the surveillance system Criteria Table(s) identifies(y) the applicable criteria and means of compliance that will be used to certify the surveillance design. For example, a design change which only implements ATCRBS Mode S may only require one Surveillance Criteria Table. However, a design change which implements ATCRBS Mode S, as well as ADS-B Out, may require two tables (i.e., an ATCRBS Mode S Surveillance Criteria Table and an ADS-B Out Surveillance Criteria Table).

2.2 For out-of-scope projects, the Surveillance Criteria Table(s) will be submitted to the TAA for approval. It is recommended that the table(s) be submitted with the certification plan. However, if necessary, the table(s) may be submitted at a later date.

2.3 Annex D identifies additional technical criteria that the TAA has provided to supplement the criteria associated with various surveillance system designs. The additional criteria should be included in the Surveillance Criteria Table(s), as appropriate.

2.4 The criteria in the table will be used to evaluate the surveillance system design, by using the appropriate means of compliance identified in the compliance matrix.

2.5 It is recommended that assistance with developing the Criteria Table(s) be requested from DTAES 6 engineering support staff.

2.6 The following should be considered in developing, and obtaining approval of, the Surveillance Criteria Table:

- a. Detailed table(s) is/are key to the successful certification of surveillance capability. They should be structured around the following information:
 - (1) the aircraft avionics components to which the approval will apply; and
 - (2) the operating modes of the surveillance system.
- b. The Surveillance Criteria Table should identify the certification criteria.
- c. Where any criteria have been satisfied by prior certification, and continue to be met by the design change, this may be indicated in the comments section of the Criteria Table, and a reference provided in the compliance matrix.
- d. The table should include the reasons for excluding any portions of the criteria that would otherwise be expected to apply.
- e. Generally, FAA advisory circulars use mandatory terms, such as “must”, that are only applicable when the means of compliance that the Applicant chose to follow are recommended in the AC. The AC also uses ‘non-mandatory’ terms, such as “should” or “recommended”, to identify other acceptable means of compliance that Applicants are encouraged to use, but are not mandated. The term “may” is used for optional methods.
- f. The TAA recommends that the ‘non-mandatory’ criteria be considered for inclusion in the Surveillance Criteria Table. The FAA’s reason for including non-mandatory criteria in the ACs is to provide an increased design level of safety. When a non-mandatory criterion is applied, it should be identified in the Criteria Table as ‘not mandatory.’

2.7 **Example of a Surveillance Criteria Table.** Table C-1 is an example of a partial ADS-B Criteria Table.

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Table C-1 – Example of a Partial ADS-B Out Criteria Table

Criterion # (AC 20-165B)	Criterion Text	Compliance Technique	Compliance Notes	Results (Met / Not Met)	Comments
3.1	General Installation Guidance		N/A, title only		
3.1.1	Environmental Qualification Ensure the environmental qualification of the installed equipment is appropriate for the aircraft, in accordance with AC 21-16G, <i>RTCA Document DO-160 versions D, E, F, and G, "Environmental Conditions and Test Procedures for Airborne Equipment"</i> .	Description	Engineering Inspection		
3.1.2	The ADS-B System Design Assurance (SDA) parameter indicates the probability of an ADS-B system malfunction causing false or misleading position information or position quality metrics to be transmitted. SDA may be preset at installation for systems that do not use multiple position sources with different design assurance levels; otherwise the system must be capable of adjusting the SDA broadcast parameter to match the position source being employed at the time of transmission.	Description, Analysis	Engineering Inspection		
3.1.2.1	Compliant Architecture	NA	N/A, title only		
3.1.2.1.1	ADS-B equipment that meets the minimum performance requirements of TSO-C166b or TSO-C154c, and is directly connected to a position source meeting the minimum performance requirements of any revision of the following TSOs may set the SDA = 2 without further analysis: • TSO-C129, Airborne Supplemental Navigation Equipment Using the Global Positioning System (GPS); [...] .	Description	Engineering Inspection and Evidence of TSO Approval		
3.1.2.1.2	For installations in aircraft with more complex system architectures, a system safety assessment, as described below, is required to set the SDA. [...] .	Analysis			
3.1.2.2	Conducting the System Safety Assessment	NA	N/A, title only		
Annex D of this advisory (TAA Advisory 2021-01) – Additional Technical Considerations and Interpretations, Section 2.1	<u>ADS-B Out – Continuity</u> In the past, there have been discussions with respect to whether the EASA system continuity (loss of function) requirement for an ADS-B Out system should be 2×10^{-4} or 1×10^{-5} /flight hour. EASA's position on this matter is that, where suitably justified by an Applicant, a deviation (advisory reference 3.2.2.o) to the 1×10^{-5} /flight hour requirement in CS-ACNS issue 2 (advisory reference 3.2.2.g) is acceptable. The FAA requirement for continuity considers the loss of function of an ADS-B Out system to be a Minor failure condition, which equates to a continuity of 10^{-3} /flight hour (advisory reference 3.2.2.n, Para 3.b.). Therefore, the TAA's recommended continuity requirement is dependent on whether operations will be conducted within the USA or Europe. For aircraft where the Statement of Operating Intent (SOI) clearly indicates that operations will only ever occur within the USA a continuity requirement of 10^{-3} /flight hour is applicable. For aircraft where the SOI indicates operations will also occur in Europe a continuity requirement of 2×10^{-4} /flight hour is applicable. Either requirement can normally be achieved by a single ADS-B out system.	Description	Engineering Inspection		

Additional Technical Considerations and Interpretations

1. General

- 1.1 This annex identifies additional technical considerations and criteria provided by the TAA to supplement those found in the various FAA and EASA advisory materials. Not all of these considerations may be applicable to a specific design approval.

2. Rationale and Guidance

2.1 ADS-B Out

2.1.1 Continuity

- 2.1.1.1 In the past, there have been discussions with respect to whether the EASA system continuity (loss of function) requirement for an ADS-B Out system should be 2×10^{-4} or 1×10^{-5} /flight hour. EASA's position on this matter is that, where suitably justified by an Applicant, a deviation (advisory reference 3.2.2.o) to the 1×10^{-5} /flight hour requirement in CS-ACNS issue 2 (advisory reference 3.2.2.g) is acceptable.

- 2.1.1.2 The FAA requirement for continuity considers the loss of function of an ADS-B Out system to be a Minor failure condition, which equates to a continuity of 10^{-3} /flight hour (advisory reference 3.2.2.n, Para 3.b.).

- 2.1.1.3 Therefore, the TAA's recommended continuity requirement is dependent on whether operations will be conducted within the USA or Europe. For aircraft where the Statement of Operating Intent (SOI) clearly indicates that operations will only ever occur within the USA a continuity requirement of 10^{-3} /flight hour is applicable. For aircraft where the SOI indicates operations will also occur in Europe a continuity requirement of 2×10^{-4} / flight hour is applicable. Either requirement can normally be achieved by a single ADS-B Out system.

NOTE

Although technical airworthiness criteria for continuity could be met with a single ADS-B Out system, the operational community will have to consider whether a single system is sufficient to support their dispatch reliability requirements.

2.1.2 Antenna Diversity

- 2.1.2.1 FAA AC 20-165B (advisory reference 3.2.2.l) allows a single bottom-mounted antenna, under certain conditions, for ADS-B Out. The EU CS-ACNS (advisory reference 3.2.2.g) specifies which aircraft must implement antenna diversity for ADS-B Out or Mode S. TCCA and NAV CANADA have not officially identified which ADS-B Out infrastructure will be implemented. Nonetheless, there has been substantial discussion that the projected Canadian ADS-B Out system will likely be a space-based system (e.g., Aireon).

- 2.1.2.2 Having antenna diversity on an aircraft improves the ability of the ground-based system to continue tracking the aircraft, especially during aircraft maneuvers. Antenna diversity becomes a necessity for operations in airspace monitored by a space-based ADS-B Out system. Therefore, it is recommended that Applicants implement an ADS-B Out design that includes antenna diversity.

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2.1.3 Position Source

2.1.3.1 The civil regulations for ADS-B Out require that the position source meet strict performance requirements. FAA AC 20-165B (advisory reference 3.2.2.1), para 3.3 recommends a method by which this can be accomplished.

2.1.4 Flight Test

2.1.4.1 FAA AC 20-165B provides guidance for the installation and airworthiness approval of ADS-B Out systems in aircraft, including the flight test requirements. The flight test is expected to generate a Performance Report. The Public ADS-B Performance Report User's Guide can be found at <https://adsbperformance.faa.gov/PAPRUsersGuide.pdf>. The User's Guide describes the parameters collected and reported in the Public ADS-B Performance Report, which is generated by the FAA upon request. The Applicant may suggest to the TAA an alternate method by which the flight test objectives would be met. The proposed alternate method must ensure that the Performance Report parameters are properly verified.

NOTE

NAV CANADA is not yet set up to provide the same information as that contained in the FAA Performance Report.

2.1.4.2 CS-ACNS Book 2 (advisory reference 3.2.2.g) does not mandate a flight test for the European airspace.

2.1.5 Position Source and Transponder Previously Approved Pairing

2.1.5.1 Pairing of position source and transponder from an FAA previously approved implementation can be found at: <https://www.faa.gov/nextgen/equipadsb/installation/equipment/>.

2.1.5.2 Using previously approved pairing data can make compliance substantiation simpler. Should there be any deviations from the previously approved pairing the Applicant must analyze and account for those deviations.

2.1.6 Latency

2.1.6.1 There is a time requirement between the actual position reading and the publishing of the position. This is called latency. If the installation has already been approved under 2.1.5.1 and the installation is the same, the latency requirement is considered satisfied. If a latency calculation must be performed, the calculation shall be as described in Appendix C of FAA AC 20-165B.

2.1.7 Master Minimum Equipment List (MMEL)

2.1.7.1 If an aircraft has a MEL or a MMEL, the installation of the surveillance system may impact it. The MEL or MMEL must be reviewed during the design change process and any required amendments must be submitted to TAA and OAA for approval.

2.2 ADS-B In

2.2.1 There is currently no airspace where ADS-B In equipage is mandated. Its purpose is to provide more situational awareness to the operators. If integrated with existing ACAS/TCAS or Traffic Avoidance System (TAS) displays, the Applicant will need to show that the

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ACAS/TCAS/TAS installation has not been compromised through an appropriate system safety assessment.

2.2.2 FAA AC 20-172B (advisory reference 3.2.2.m) provides guidance for the initial installation and airworthiness approval of ADS-B In equipment in aircraft for each of the applications chosen.

2.3 Military IFF Mode 5

2.3.1 Mode 1, 2 and 3 are implicitly included in Mode 5 Level 1 or Level 2 systems and, therefore, included in the discussion herein. Mode 4 was decommissioned in June 2020.

2.3.2 The IFF Mode 5 functionality is considered by the TAA as miscellaneous non-required equipment (see advisory reference 3.2.2.f). However, IFF Mode 5 capable Line Replaceable Units (LRUs) often contain Mode A/C, Mode S and ADS-B Out capabilities. Therefore:

- a. the civil functionalities integrated within the IFF must be approved in accordance with the civil criteria contained in this TAA advisory; and
- b. IFF equipment and installations which meet the requirements of AIMS 03-1000B Amdt 1 (advisory reference 3.2.2.b) or STANAG 4193 Edition 3 (advisory reference 3.2.2.c) include non-interference testing against civil functionalities. Those test results can be used to substantiate the non-interference requirements defined in TAA Advisory 2006-04 (advisory reference 3.2.2.f).

NOTE

AIMS 03-1000B Amdt 1 applies to IFF Mode 5 and the civil surveillance requirements. It includes the requirements from STANAG 4193. Since it is expected that Canadian military fleets will be operating in U.S. airspace and using U.S. crypto keys, it is recommended that AIMS 03-1000B Amdt 1 be used.

2.3.3 In order to use National Security Agency (NSA) cryptography (crypto) keys and operate IFF equipment in U.S. airspace, a "Letter of Certification" from the DoD AIMS is required (DSCA Policy 11-40). The DoD AIMS certification is comprised of the transponder certification and the platform certification. It includes qualification of the military and civil surveillance functionalities. The system must meet AIMS 03-1000A Amdt 1 or STANAG 4193 Edition 3. DoD AIMS will provide the Applicant with a Letter of Certification stating the exact configuration that the certification was performed against. The Letter of Certification is not an airworthiness certification, but rather a "Fit for Use" confirmation that the transponder and the platform provides the intended military functionality.

NOTE

DoD AIMS certification requirements are not a replacement certification standard for Mode A, C, S and ADS-B requirements. However, the Applicant is encouraged to leverage required AIMS testing artifacts (ground test report, flight test report, etc.) to demonstrate compliance with the aircraft certification basis when possible and arranged with the Finding Authority. Mode S and ADS-B are covered in the AIMS Certification and Operational Requirements AIMS 03-1000B Amdt 1 or STANAG 4193 Edition 3, only to the extent that military requirements may differ from the requirements of non-government documents. Furthermore, the DoD AIMS Letter of Certification does not cover certification items such as System Safety, Structural, Load Analysis, Human factors, etc.

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- 2.3.4 The military IFF capability includes classified requirements. These classified requirements do not impact the technical airworthiness certification of military or civil surveillance systems, but will require qualification by DoD AIMS.

NOTE

If the Applicant intends to have one civil surveillance system and one military IFF system, not integrated within one LRU, it is recommended that they discuss it with DTAES 6 before committing to the design.

- 2.3.5 Position Source

- 2.3.5.1 Military IFF Mode 5 Level 2 requires a GPS source with P(Y) or M code capability.

3. Other Considerations

3.1 Aircraft Level System Safety Considerations

- 3.1.1 The contents of this TAA advisory are primarily directed at the installation and certification aspects of surveillance systems. These systems might be installed as a stand-alone item, or installed as part of a more substantial avionics upgrade program. The avionics upgrade will likely also include changes to civil communication and/or navigation capabilities. Prior avionics upgrade program experience has identified the lack of clear guidance surrounding required probability failure levels. This has resulted in numerous discussions with respect to the required probability failure levels that would be appropriate to Communication, Navigation and Surveillance Systems (CNS), that are intended to be used to fulfill civil Air Traffic Management (ATM) functions.

- 3.1.2 Canadian Forces Technical Order A-GA-005-000/AG-001 – *The Department of National Defence/Canadian Forces Airworthiness Programme, 2020* (regulatory reference 3.2.1.c), Part 2 – Airworthiness Requirements, Section 1, identifies the following Airworthiness Safety Criteria applicable to the DND/CAF:

- a. the DND responsibility to operate all DND-Registered Aircraft with due regard for the safety of other air traffic. This requires DND aircraft to be equipped and certified to meet the CNS/ATM performance requirements; and
- b. the Baseline Safety Criteria applicable to various classes of DND aircraft which allows for relaxation of the required quantitative probability of failure criteria for certain classes of aircraft.

- 3.1.3 For CNS/ATM capabilities, the TAA expects that Civil standards will be utilized. Therefore, the relaxation of the quantitative failure criteria for Military Aircraft General (Fixed-Wing Transport Aircraft & Helicopters) and Military Fighter & Trainer Aircraft (Ejection Seat Equipped) identified in Figure 2-1-1 (regulatory reference 3.2.1.c) is not considered appropriate for equipment and installations providing civil CNS/ATM capabilities.

3.2 ICAO 24-Bit Aircraft Address Codes

- 3.2.1 If ICAO 24-bit aircraft address codes have not already been assigned to a RCAF fleet, the WSM or PMO can contact DAR 3 as the DND OPI for such codes.

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3.3 Radio Licensing & Interrogator Use Agreements

3.3.1 Any RCAF radio equipment, such as IFF transponders and interrogators, must be licensed by Assistant Deputy Minister (ADM) Information Management (IM) / Director General Information Management Operations (DGIMO) / DND Frequency Spectrum Management (DFSM) as complying with the Canadian Radio Communications Act.

3.3.2 The Applicant should direct frequency spectrum management enquires to ADM(IM) DFSM. DFSM policy, direction and contact information can be found at the following intranet website:

<http://admim-smagi.mil.ca/en/it-services/radio-spectrum-space/spectrum.page>

3.3.3 ADM(IM) / DFSM publishes policy, standards for spectrum management and instructions for obtaining spectrum supportability, licencing and frequency assignments for DND/CAF radio-frequency emitters in CFTO B-GT-D35-001/AG-000 (advisory reference 3.2.2.p). This publication is also referred to as DNDP35, and is available at the following website:

<http://admim-smagi.mil.ca/en/it-services/radio-spectrum-space/spectrum-management/dndp-35.page>

3.4 IFF Mode 5 National Origin Code and Platform Identification Number

3.4.1 IFF Mode 5 requires a National Origin (NO) code and a Platform Identification Number (PIN). DAR 3 is the OPI for the NO codes and PINs.

3.4.2 The NATO National Origin codes effective 2019 are listed in advisory reference 3.2.2.a.

3.4.3 Since the allocated NO codes and PINs can change over time, it is, recommended that the WSM/PMO contact DAR 3 to obtain the current NO codes and PINs.

Design Assessment Report (Step 4)

1. General

- 1.1 This annex provides guidance on the development of the Design Assessment Report that is identified in the main body of this advisory under Step 4 (paragraph 4.2.2.d of the advisory) of the Surveillance Design Certification Process.

NOTE

Although the Applicant is responsible for providing the TAA with the Design Assessment Report, it is recommended that the Applicant seek the assistance of the DTAES 6 engineering support staff for the report development.

2. Rationale and Guidance

- 2.1 The primary purpose of the Design Assessment Report is to summarize the results from the compliance program, and provide the TAA and Finding Authorities (FAs) with references to the design description documents and compliance artefacts. The assessment report will be used as a roadmap to assist the FAs during their evaluation of the compliance data. The report should be written and structured to provide the TAA and FAs with the information they require in making their findings.
- 2.2 The Design Assessment Report should include the following information:
- a. the Surveillance capabilities that are proposed for approval;
 - b. the aircraft avionics systems configuration;
 - c. the means of compliance used, including the use of existing approvals and data for similar products;
 - d. any recommended restrictions and limitations on the capability;
 - e. where existing equipment approvals have been applied;
 - f. the extent to which an existing design was modified to meet the equipment and installation criteria for the surveillance system;
 - g. any interpretation of the surveillance criteria used during the assessment (agreed interpretations are generally established through approval of the Surveillance Criteria Table(s));
 - h. any aspects of the design that do not meet, or only partially meet, the mandatory and non-mandatory criteria;
 - i. any areas where an 'Equivalent Level of Safety' finding has been used, or when an alternate means of compliance has been used to show that a criterion has been met;
 - j. any areas where an 'Acceptable Level of Safety' (ALOS) assessment has been used to recommend approval, in lieu of showing that a criterion has been met; and
 - k. any possible or recommended mitigating actions that will be required as a result of the use of an ALOS argument, or airworthiness limitations/restriction, to approve the design.
- 2.3 Prior to providing the report to the FAs, it should be reviewed by DTAES 6-4 to obtain an endorsement of the report conclusions and recommendations.

Substantiation Report (Step 6)

1. General

- 1.1 This annex provides guidance on the development of a substantiation report identified in this advisory under Step 6 (paragraph 4.2.2.f of the advisory) of the Surveillance System Design Certification Process.

2. Rationale and Guidance

- 2.1 The role of the substantiation report is to document any compliance issues, validate any claims of Equivalent Level of Safety (ELOS)/Acceptable Level of Safety (ALOS) and explain to the TAA and OAA the rationale behind any restrictions and/or limitations that the TAA staff are proposing.
- 2.2 Examples of compliance issues may include:
- a. Failure to meet some of the surveillance criteria, either in whole or part;
 - b. Findings of ELOS;
 - c. Use of an ALOS argument to support the airworthiness approval; and
 - d. Request for an exemption to a certification requirement.
- 2.3 DTAES 3 is responsible for determining whether or not a substantiation report is required, and will coordinate the report with DTAES 6.
- 2.4 A substantiation report may not be required if the airworthiness approval can be granted based only on the completed compliance matrix, and if the Finding Authorities (FAs) are able to successfully complete all of their findings. This assumes that there are no certification issues to be resolved, nor any requirement to base the approval on an ALOS assessment.
- 2.5 Compliance issues typically arise during the following stages of the Surveillance System Design Certification Process, and may need to be addressed in the substantiation report:
- a. **Design Assessment** (Step 4). Examples of issues that may be identified during the design assessment phase and need to be documented in the substantiation report include:
 - (1) lack of adequate compliance artefacts to make a conclusive assessment that the surveillance criteria have been met;
 - (2) missing or inappropriate surveillance criteria selection;
 - (3) claims that the design meets the ELOS or ALOS criteria;
 - (4) lack of information to support an ELOS claim;
 - (5) lack of information to support an ALOS claim;
 - (6) proposals to use limitations, restrictions or 'operational/aircrew' procedures to compensate for design deficiencies, or to compensate for areas of non-compliance; and
 - (7) requests for exemptions or deviations to the certification requirements.
 - b. **Findings of Compliance** (Step 5). Issues that may be raised by the FAs and require resolution in the substantiation report include:

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- (1) lack of adequate proof of compliance data to make a finding of compliance to the requirement specified in the certification basis;
- (2) FAs' comments and/or recommendations to address any issues or design deficiencies identified in the Design Assessment Report;
- (3) restrictions and/or limitations recommended by the FAs; and
- (4) FAs' assessment of any ELOS or ALOS arguments that are used in the recommendation for approval of a design.

Updates to Flight Publications Flight Manual (FM)/Aircraft Operating Instructions (AOI) (Step 7a)

1. General

- 1.1 This annex provides additional considerations for the development of updates to the FM and/or AOI, as required in Step 7(a) of the Surveillance Design Certification Process (paragraph 4.2.2.g.(1) of the advisory).

2. Rationale and Guidance

- 2.1 The development of FM/AOI updates will be based on the following considerations:
- a. The Applicant, in concert with the applicable DTAES 3 Team Leader and the DTAES 6-4 and DTAES 7-6 specialists, will prepare and recommend the approval of the required FM/AOI updates.
 - b. **Surveillance Capability Statement.** As described in Step 7b of the Surveillance System Design Certification Process (paragraph 4.2.2.g.(2) of the advisory), the approved capability statement is part of the FM/AOI update.
 - c. **Limitations and Restrictions.** As described in Step 7c of the Surveillance System Design Certification Process (paragraph 4.2.2.g.(3) of the advisory), and in accordance with the Operating Limitations section of the TAM (regulatory reference 3.2.1.a), Part 2, Chapter 7, Flight Publications, any additional limitations and/or restrictions associated with the Surveillance System design approval must be approved by the TAA and inserted into the FM/AOI.
 - d. **Operating Procedures.** Describe the normal, abnormal, emergency and maintenance test flight operating procedures for the system. The Surveillance System-related operating procedures that are included with the FM/AOI are approved by the TAA during the Airworthiness Clearance process.
 - e. **Surveillance System Functional Description.** Describe the surveillance system and the interface with other systems on the aircraft.

Surveillance Capability Statements (Step 7b)

1. General

- 1.1 This annex provides guidance on the development of the Surveillance Capability Statements to be inserted into the FM and/or AOI, as required in Step 7(b) of the Surveillance System Design Certification Process (paragraph 4.2.2.g.(2) of the advisory).

2. Airworthiness Requirements

- 2.1 The following documents, among others, have a requirement for a capability statement:
- a. FAA AC 20-165B (advisory reference 3.2.2.1) – Paragraph 2.2 Aircraft Flight Manual:
“Include ADS-B OUT operating limitations, normal operating procedures, and a system description in the Airplane Flight Manual (AFM), Rotorcraft Flight Manual (RFM), AFM Supplement (AFMS), or RFM Supplement (RFMS). The flight manual must also state that the installation meets the requirements of § 91.227. This can be accomplished by adding the following statement to the General or Normal Procedures section of the flight manual:

The installed ADS-B OUT system has been shown to meet the equipment requirements of 14 CFR 91.227”.
 - b. CS-ACNS Issue 2, Book 2 (advisory reference 3.2.2.g), Subpart D Appendix G – Example of Flight Manual Supplement for ADS-B Out
“The installed ADS-B out system is fully compliant with the requirements of CS ACNS.D.ADSB (1090 MHz Extended Squitter ADS-B Out).”
- 2.2 As described in Step 7b of the Surveillance System Design Certification Process, the TAA requires that Surveillance Capability Statements be developed, approved and inserted into in the FM/AOI. The capability statements provide the aircrew with a concise summary of the aircraft’s approved surveillance system capabilities and limitations, and are meant to be used by them in the preparation of flight plans and ATC clearance requests. The surveillance system capability statements may refer to the system description and operating procedures contained in the FM/AOI.
- 2.3 Once the design assessment (Step 4) has been completed, the Surveillance Capability Statements should be drafted and made available to the Finding Authorities (FAs), to provide them with a summary of the proposed capabilities and limitations arising from the assessment. In their Technical Notes, the FAs will be required to make a recommendation to the TAA regarding the approval of the wording in the capability statements.
- 2.4 The Surveillance Capability Statements will be approved as part of the TAC approval process. Once the capability statement has been approved by the TAA, the Weapon System Management organization is responsible for inserting the statements into the FM/AOI.
- 2.5 The format of the capability statements should be consistent with the format and structure of the existing FM/AOI. Subsequent changes to the statements are subject to the Technical Airworthiness Data (TAWD) change approval process described in the TAM (regulatory reference 3.2.1.a).

**ANNEX H
TO TAA ADVISORY 2021-01
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3. Surveillance Capability Statement Example

- 3.1 Figure H-1 provides an example of a surveillance capability statement to illustrate the type of information that needs to be included in the FM/AOI, following the approval of a design change supporting ADS-B Out Capabilities.
- 3.2 The capability statement should identify the criteria against which the system was evaluated and clearly indicate that the system is compliant with the chosen criteria.
- 3.3 The capability statement should also identify the ICAO Block 10 flight plan code (Surveillance Equipment Section) in either a tabular format, or included with the capability statement (as shown in Figure H-1). For example, “A certified ADS-B with dedicated 1090 MHz ADS-B Out capability can select B1 in the Surveillance Equipment section of Block 10 on the ICAO Flight Plan form.

NOTE

For information on possible ICAO Block 10 capability codes, refer to ICAO Doc 4444, Procedures for Air Navigation Services, Air Traffic Management, Appendix 2.

Figure H-1 Example of a Surveillance Capability Statement

Approved Technical Airworthiness Data
Surveillance Capability Statement
Approved Capability: ADS-B Out
The ADS-B OUT system has been installed and certified in accordance with FAA AC 20-165B and fully meets the equipment requirements of 14 CFR 91.227.
Accordingly “B1 – ADS-B with dedicated 1090 MHz ADS-B out capability” can be selected in the ICAO flight plan form Box 10 Surveillance Equipment section.
-----and/ or -----
The installed ADS-B out system is fully compliant with the requirements of EASA CS ACNS.D.ADSB (1090 MHz Extended Squitter ADS-B Out).
Accordingly “B1 – ADS-B with dedicated 1090 MHz ADS-B out capability” can be selected in the ICAO flight plan form Block 10 Surveillance Equipment section.