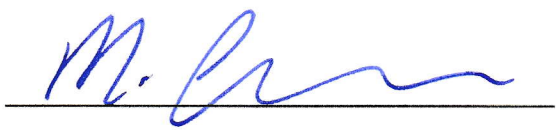
BOMBARDIER

Bombardier Aerospace Public Key Infrastructure

Certificate Policy

CIS-POL-0002

Validation and signature of the PMA CHAIR:



Author: Carillon Information Security Inc.

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Version Information

Version	Date	Author	Notes
1.0	November 21, 2014	Carillon Information Security inc.	Initial version
1.1	May 14, 2015	Carillon Information Security inc.	Modification of the TSA key life time Modification of the SCVP OID Update of the PMA chair name Adjustment to the Role Encryption Certificate SAN Misc. typographical adjustments
1.2	March 18, 2016	Carillon Information Security inc.	Clarifications in the applicant proofing process Update of the PMA chair name Misc. typographical adjustments
1.3	June 16, 2016	Carillon Information Security Inc.	Modifications to the Roles requiring separation of duties section Addition of a Document References table Correction of the name of 28 U.S.C. 1746 Removal of redundant material duplicated in another section Misc. formatting and typographical adjustments Addition of an exception under Key usage purposes
1.4	November 18, 2016	Carillon Information Security Inc.	Addition of video-based in-person identity proofing Change “Naming Policy” to “Directory Information Tree” throughout the document Correction of erroneous web link Correction of erroneous section reference Misc. formatting and typographical adjustments

			Modification to the Subject Alternative Name Value of the Server or Device Certificate
1.5	June 1st, 2017	Carillon Information Security Inc.	Section Version Information – Addition of a "date" column Section Document References – Remove table and add reference to a separate document Section 3.1.4 – Modify the short name of a reference Section 5.3.2 – Background checks frequency increased to every 3 years. Section 9.6.3 - Modify a reference. Section 10.1.6 – Addition of contentCommitment to the Key Usage and removal of the Subject Alternative Name in the TSA Certificate
1.6	February 22, 2018	Carillon Information Security Inc.	Provide more guidance regarding the use and Subject DN of LSAP Code Signing Certificates Modify and add content to sections: 1.3.6; 7.1.4. Add all requirements regarding the DAD Signature Certificates. Modify and add content to sections: 1.3.6; 1.6.2; 3.2.3.4; 4.7.2; 4.7.3; 4.9.2; 5.6; 6.1.1; 7.1.4; 10.7. Update Certificate Profiles to replace nonRepudiation by contentCommitment (all Signature Certificates) and add CRL Distribution Point (TSA Certificate) Modify and add content to sections: 10.1.1; 10.1.2; 10.1.3; 10.1.5; 10.1.6; 10.2.2; 10.2.4; 10.2.5; 10.2.7; 10.2.9; 10.2.12.
1.7	February 14, 2020	Carillon Information Security Inc.	CR-01: Change in PMA Chair Modify content in 1.5.2 Update of the general information (date, version information, etc.) and miscellaneous formatting and typographical adjustment throughout the document. CR-02: Modification to Device Signature

			Certificate Permitted EKUs Modify and add content in section 10.7 CR-03: Clarification of the ID requirements for the identification of individuals. Add content in section 3.2.3.1 CR-04: Correct terminology and requirements related to SCVP Servers. Modify content in sections: 5.6; 6.1.1; 10.1.5; 10.7
1.8	March 22, 2023	Carillon Information Security Inc.	CR-01: Document upkeep Modify content throughout the document CR-02: Modifications related to Role Signature certificates Add or modify content in sections: 1.3.3; 2.2.1; 2.2; 3.2.3.1; 3.4; 4; 5.2.1.8; 5.6; 6.1.3; 6.1.5; 6.2.4.2; 6.2.4.4; 6.2.6; 7.1.6; 10.1.3; 10.5 CR-03: Modifications related to Role Signature certificates Add or modify content in sections: 1.3.6; 1.6.2; 3.2.3.4; 4.5.2; 4.7.2; 4.7.3; 4.9.2; 5.6; 6.1.1; 6.3; 7.1.4; 7.1.6; 10.2; 10.7 CR-04: Include requirements related to encryption certificates Add or modify content in sections: 2.2.1; 2.4; 4.5.1; 4.12.1; 5.6; 6.2.3; 6.2.4; 10.7

1.9	September 03, 2024	Carillon Information Security Inc.	CR-01 – Document upkeep, misc. formatting and typographical adjustments. CR-02 – Update PKI Domain diagram. Modify content in section 1.1.4. CR-03 – Update PMA Chair physical mailing address. Modify content in section 1.5.2. CR-04 – Update Key Changeover text and table. Add or modify content in section 5.6. CR-05 – Add information in the Key Pair Generation and Installation section. Add content in section 6.1 CR-06 – Update Name Form description text for role-based Non-Aircraft Software Code Signing Certificate. Modify content in section 7.1.4. CR-07 – Update Certificate Policy publication time requirement and add URL. Add or modify content in section 9.12.2. CR-08 – Update SubCA key length. Add or modify content in section 10.1.2 CR-09 – Modify SAN in the Non-Aircraft Code Signing Certificate profile. Modify content in section 10.2.4

Document References

Document references found throughout this Certificate Policy are listed in the Bombardier PKI Referenced Documents Table.

Table of Contents

1 Introduction

This Certificate Policy defines several policies applicable to the use of digital certificates for authentication, integrity (through digital signatures) and encryption in order to provide digital Certificates to End-Entities.

The policies represent the following Assurance Levels for Public Key Certificates:

- basic-software-256,
- basic-hardware-256,
- medium-softwareCBP-256,
- medium-hardwareCBP-256,

The word “assurance” used in this CP means how well a Relying Party (RP) can be certain of the identity binding between the Public Key and the individual whose subject name is cited in the Certificate. In addition, it also reflects how well the Relying Party can be certain that the individual whose subject name is cited in the Certificate is controlling the use of the Private Key that corresponds to the Public Key in the Certificate, and how securely the system which was used to produce the Certificate and (if appropriate) deliver the Private Key to the Subscriber performs its task.

The Bombardier Aerospace PKI, hereafter referred to as the Bombardier PKI, will be required to comply with the Certification Policy of other PKI domains CAs or Bridge CAs to which it is cross-certified through the use of policy mapping or direct policy assertion.

This policy covers the Bombardier Root CA and the certified subordinated Bombardier Sub CAs. The Bombardier Principal CAs (PCAs) may cross certify with other PKI domains in order to allow interoperation with other Enterprises required for the business of Bombardier Aerospace, its Business Units, affiliated companies, and customers.

Any use of or reference to this CP outside the purview of the Bombardier PKI is completely at the using party’s risk. Only the Bombardier Root CAs and Sub CAs of those roots shall assert the OIDs listed in section 1.2 of this document in any Certificates issued by the Bombardier PKI, except in the policyMappings extension of Certificates issued by the CAs cross-certified with a Bombardier PCA for the establishment of equivalency between Bombardier and external PKI domains Assurance Levels.

This CP is consistent with the Internet Engineering Task Force (IETF) Public Key Infrastructure X.509 (IETF PKIX) RFC 3647, Internet X.509 Public Key Infrastructure Certificate Policy and Certification Practice Statement Framework.

1.1 OVERVIEW

1.1.1 Certificate Policy (CP)

Certificates issued by Bombardier contain one or more registered Certificate Policy object identifiers (OIDs) which may be used by a Relying Party to decide whether a Certificate is trusted for a particular purpose. Each OID corresponds to a specific level of assurance established by this CP. This CP shall be available to Relying Parties in accordance with the

publication rules set forth in section 2.

Cross-certificates issued by a Bombardier PCA shall, in the policyMappings extension and in whatever other fashion is determined by the Bombardier Policy Management Authority (Bombardier PMA, cf. section 1.3.1) to be necessary for interoperability, reflect what mappings exist between this CP and the cross certified PKI domains' CPs.

1.1.2 Relationship between this CP and a Bombardier PKI CPS

This CP states what assurance can be placed in a Certificate issued under this policy. The Bombardier PKI Certification Practice Statements (Bombardier PKI CPSs) state how the Bombardier CAs establish that assurance.

1.1.3 Relationship between this CP, the other PKI domains' CPs

The levels of assurance of the Certificates issued under this CP are mapped by the Bombardier Policy Management Authority (Bombardier PMA) to the levels of assurance of the Certificates issued by other PKI domains which cross certify with a Bombardier PCA. The policy mappings information is placed into the Certificates issued by a Bombardier PCA, or otherwise published or used by the Bombardier PKI Operational Authority (described in section 1.3.1.2) so as to facilitate interoperability.

1.1.4 Scope

Figure 1 illustrates the scope of this CP.

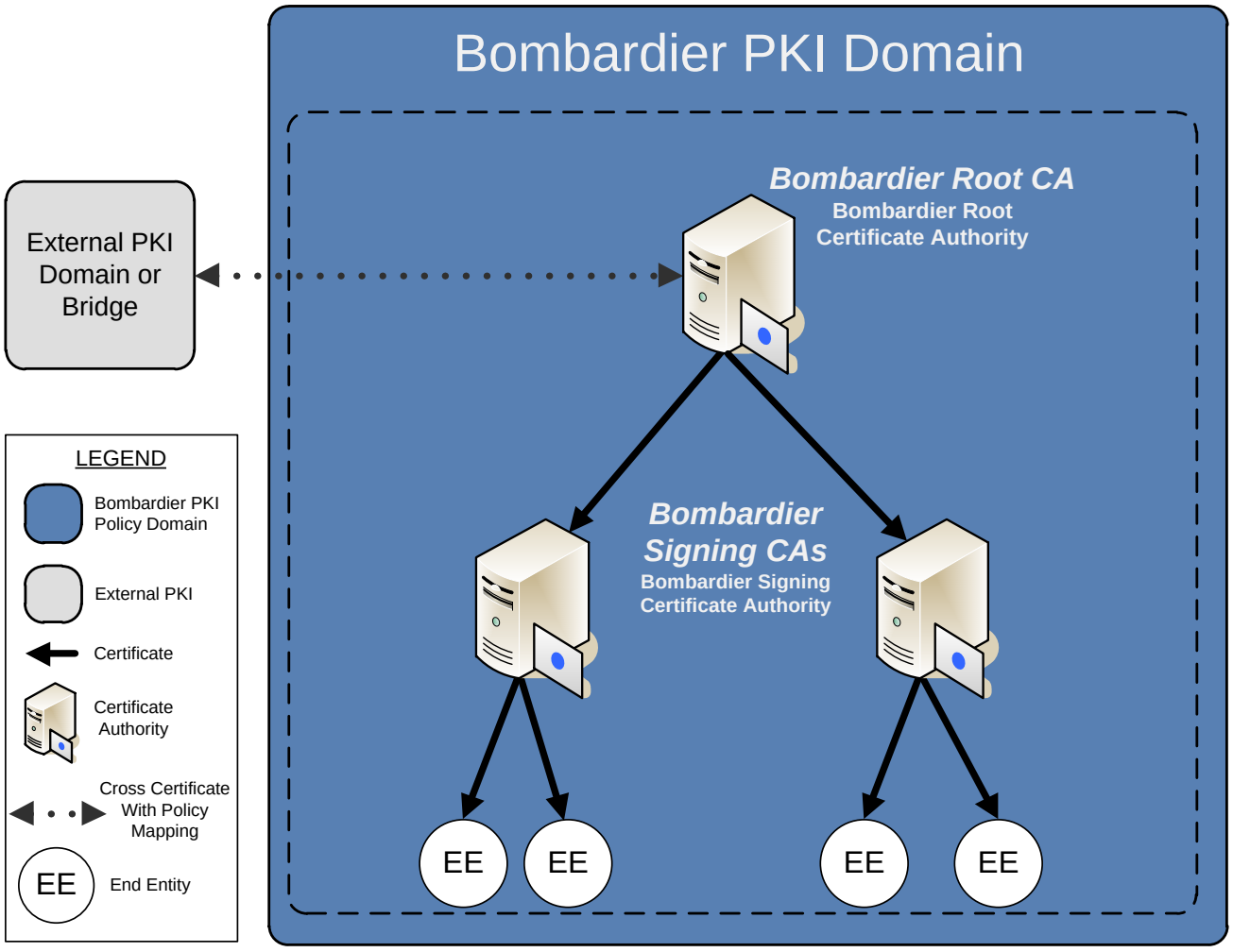

Figure 1 – Scope and Domain of Bombardier CAs

This CP imposes requirements on all the Bombardier CAs and other PKI domains involved in issuing Certificates. These include the following:

- the Bombardier Root Certification Authority (Bombardier Root CA);
- all Bombardier Certification Authorities subordinated to a Bombardier Root CA (Bombardier Sub CAs);
- other PKI domains' CAs.

The Bombardier Root CAs shall issue CA Certificates only to Bombardier Sub CAs approved by the Bombardier PMA.

The Bombardier Root CAs may also issue Certificates to individuals who operate the Bombardier Root CAs or devices necessary for the operation of the Bombardier Root CA.

The Bombardier PCA shall issue CA Certificates only to other PKI domains' CAs approved for cross certification by the Bombardier PMA.

Bombardier Sub CAs may issue Certificates to individuals, roles, devices (including ground systems, aircraft, and aircraft avionics), at any Assurance Level consistent with the Assurance Levels and type delegated to that Sub CA by its issuing CA.

The Bombardier Root CAs and Bombardier Sub CAs exist to facilitate trusted communications within the Bombardier domain and with Bombardier partners, customers, and regulatory authorities either directly or through cross-certification with other PKI domains.

Within this document, the term CA, when used without qualifier, shall refer to any certification authority subject to the requirements of this Certificate Policy, including the Bombardier Root CAs and Bombardier Sub CAs.

The term Bombardier Sub CAs shall refer to any Sub CA within the Bombardier PKI.

Requirements that apply to a specific CA type will be denoted by specifying the CA type, e.g., Bombardier Root CAs, Bombardier Sub CAs, other PKI domains' CAs, etc.

The scope of this CP in terms of Subscriber (i.e., end entity) Certificate types is limited to those listed in section 10.

1.2 Document Name and Identification

This document is called the Bombardier Aerospace PKI Certificate Policy (CP).

There are several levels of assurance in this Certificate Policy, which are defined in subsequent sections.

Each Assurance Level is uniquely represented by an "object identifier" (OID), which is asserted in each Certificate issued by the Bombardier Sub CAs that complies with the policy stipulations under this CP.

The OIDs are registered under the Bombardier arc as follows:

Certificate Name	OID
id-basicSoftware-256	::= {1.3.6.1.4.1.43804.3.6.2.3}
id-basicHardware-256	::= {1.3.6.1.4.1.43804.3.6.2.4}
id-mediumSoftwareCBP-256	::= {1.3.6.1.4.1.43804.3.6.2.5}
id-mediumHardwareCBP-256	::= {1.3.6.1.4.1.43804.3.6.2.6}

The Bombardier PMA shall not request any 'pass-through' policy OIDs to be asserted in any cross-certificates issued to them by an external PKI domain.

Unless otherwise stated, a requirement stated in this CP applies to all Assurance Levels.

CAs must use SHA-256 for generation of PKI objects such as Certificates, Certificate Revocation Lists (CRLs) and Online Certificate Status Protocol (OCSP) responses.

Figure 2 illustrates the ordered hierarchy of some of these policies:

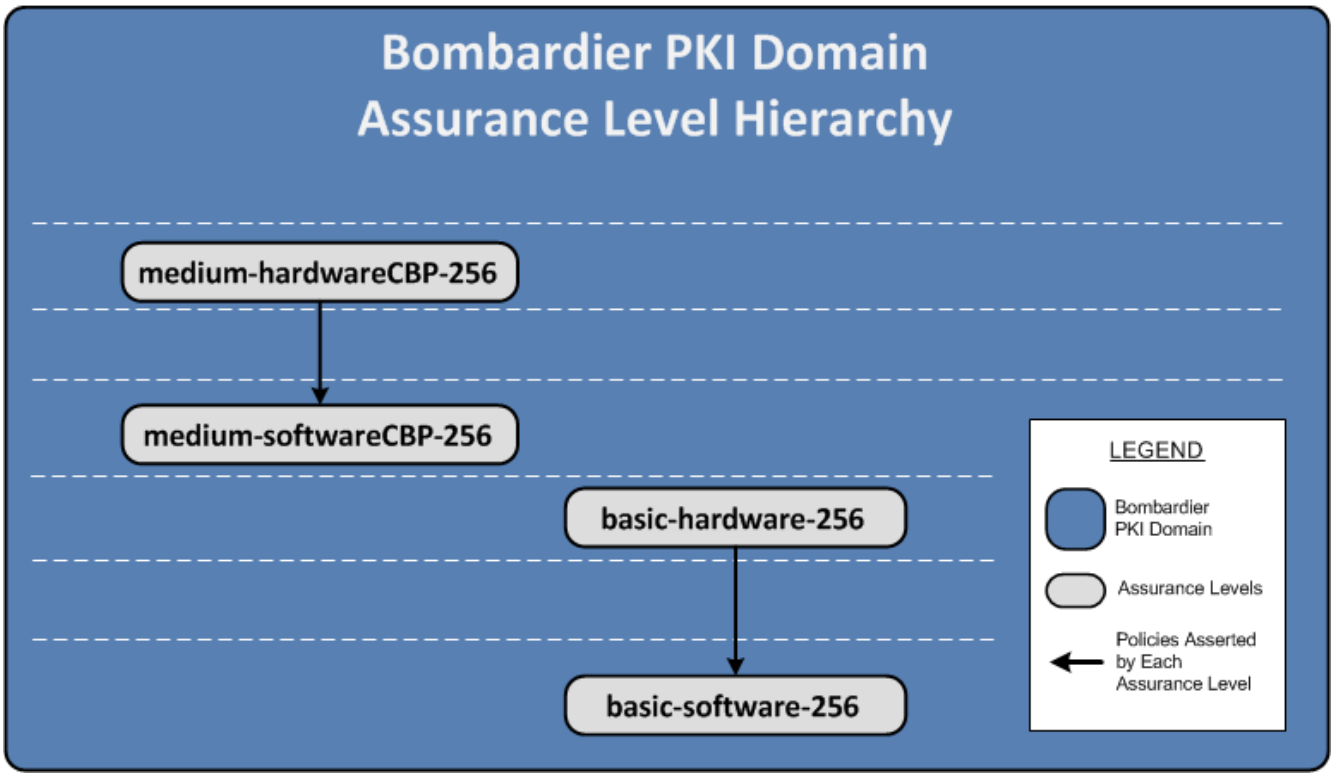

Figure 2 – Assurance Level Hierarchy and Policy Assertion Direction

1.3 PKI PARTICIPANTS

This section contains a description of the roles relevant to the administration and operation of the Bombardier CAs.

1.3.1 Bombardier PKI Authorities

1.3.1.1 Bombardier Policy Management Authority (Bombardier PMA)

The Bombardier PMA is responsible for:

- Commissioning, drafting and approving the Bombardier PKI CP (this document);
- Commissioning compliance analysis, acting on recommendations resulting from analysis, and approving the Bombardier PKI CPSs;
- Accepting and approving applications from entities desiring to cross-certify with a Bombardier PCA;
- Ensuring continued conformance of the Bombardier PKI CPSs with applicable requirements as a condition for continued securing of the Assurance Levels as stipulated in this CP;
- Managing the interoperation with other PKI domains' CAs;

- Ensuring continued conformance of the Bombardier PKI and other domains' PKI with applicable requirements as a condition for allowing continued interoperability with cross-certified CAs.

Bombardier shall enter a contractual relationship through a Memorandum Of Agreement (MOA) with the PMAs of other PKI domains setting forth the respective responsibilities and obligations of both parties, and the mappings between the Certificate levels of assurance contained in this CP and those in the respective CP of the other PKI domains' CA subject to cross-certification. The term "MOA" as used in this CP shall always refer to the Memorandum of Agreement cited in this paragraph.

A complete description of Bombardier PMA roles and responsibilities is provided in the Bombardier PKI Policy Management Authority Charter [PMA Charter and Bylaws].

1.3.1.2 Bombardier PKI Operational Authority (OA)

The Bombardier PKI Operational Authority consists of the organisations that are responsible for the operation of the Bombardier CAs, including issuing Certificates when directed by the Bombardier PMA or any authorised Bombardier Registration Authority (RA) operating under this CP, posting those Certificates and Certificate Revocation Lists (CRLs) into the repositories of the Bombardier PKI, and ensuring the continued availability of these repositories to all users in accordance with section 2 of this document.

1.3.1.3 Bombardier PKI Operational Authority Administrator

The Administrator is the individual within the Operational Authority who has principal responsibility for overseeing the proper operation of the Bombardier PKI infrastructure components, and who appoints individuals to the positions of Operational Authority Officers.

The Administrator is selected by and reports to the Bombardier PMA.

The Administrator approves the issuance of Certificates to the other trusted roles operating the Bombardier PKI CAs.

1.3.1.4 Bombardier Principal Certification Authority (PCA)

A Principal CA is a CA within a PKI that has been designated by the PMA to interoperate directly with an external domain CA (e.g., through the exchange of cross-certificates).

As operated by the Operational Authority, a Bombardier PCA is responsible for all aspects of the issuance and management of a Cross-Certificate issued to an external domain CA, as detailed in this CP, including:

- The control over the registration process,
- The identification and authentication process,
- The Cross-Certificate manufacturing process,
- The publication of Cross-Certificates,
- The revocation of Cross-Certificates,

- Ensuring that all aspects of the services, operations and infrastructure related to Cross-Certificates issued under this CP are performed in accordance with the requirements, representations, and warranties of this CP.

1.3.1.5 Bombardier Root CAs

A Bombardier Root CA is a trust anchor for Relying Parties trying to establish the validity of a Certificate issued by a Bombardier Sub CA, whose chain of trust can be traced back to that specific Root CA.

A Bombardier Root CA issues and revokes Certificates to Bombardier Sub CAs upon authorisation by the Bombardier PMA. As operated by the Operational Authority, a Bombardier Root CA is responsible for all aspects of the issuance and management of those Sub CA Certificates, as detailed in this CP, including:

- The control over the registration process,
- The identification and authentication process,
- The Certificate manufacturing process,
- The publication of Certificates,
- The revocation of Certificates, and
- Ensuring that all aspects of the services, operations and infrastructure related to Sub CA Certificates issued under this CP are performed in accordance with the requirements, representations, and warranties of this CP.

A Bombardier Root CA may function as a PCA.

1.3.1.6 Bombardier Subordinate CAs

The Bombardier Sub CAs are all of the Bombardier Signing CAs subordinate to a Bombardier Root CA as defined below.

A Signing CA is a CA whose primary function is to issue Certificates to End-Entities. A Signing CA does not issue Certificates to other CAs.

As operated by the Operational Authority, a Bombardier Signing CA is responsible for all aspects of the issuance and management of an End-Entity Certificate, as detailed in this CP, including:

- The control over the registration process,
- The identification and authentication process,
- The Certificate manufacturing process,
- The publication of Certificates,
- The revocation of Certificates,
- Ensuring that all aspects of the services, operations and infrastructure related to Certificates issued under this CP are performed in accordance with the requirements, representations, and warranties of this CP.

1.3.1.7 Certificate Status Authority (CSA)

A CSA is an authority that provides status of Certificates or certification paths. A CSA can be operated in conjunction with the CAs or independent of the CAs. Examples of a CSA are:

- Online Certificate Status Protocol (OCSP) Responders that provide revocation status of Certificates.
- Server-based Certificate Validation Protocol (SCVP) Servers that validate certifications paths and/or provide revocation status checking services.

OCSP Responders that are keyless and simply repeat responses signed by other Responders and SCVP Servers that do not provide Certificate validation services shall adhere to the same security requirements as repositories.

A Bombardier Root CA must not provide certificate status via OCSP.

1.3.1.8 Time-Stamp Authority (TSA)

A TSA is an authority that issues and validates trusted timestamps. A TSA may be operated in conjunction with a CA or independent of a CA.

1.3.2 Registration Authorities

An RA is the entity that collects and verifies each Subscriber's identity and information that are to be entered into his or her Public Key Certificate. An RA interacts with the CA to enter and approve the Subscriber Certificate request information. The Bombardier Operational Authority acts as the RA for the Bombardier Root CAs, and for Bombardier PCAs when dealing with cross certification. It performs its function in accordance with the concerned Bombardier PKI CPS approved by the Bombardier PMA.

1.3.3 Subscribers

A Subscriber is the entity whose name appears as the subject in a Certificate, who asserts that it uses its key and Certificate in accordance with the Certificate Policy asserted in the Certificate, and who does not itself issue Certificates.

Bombardier Root CA Subscribers shall include only Bombardier PKI CA Operational Authority personnel and, when determined by the Bombardier PMA, possibly certain network or hardware devices such as firewalls and routers when needed for PKI-infrastructure protection, as well as Time Stamping Authority servers.

Bombardier Sub CA Subscribers shall include Bombardier employees, subcontractor' personnel, suppliers, partners, customers, customers' customers, and hardware devices such as firewalls, routers, servers, or aircraft and/or aircraft equipment.

CAs are sometimes technically considered "Subscribers" in a PKI. However, the term "Subscriber" as used in this document refers only to those who are issued Certificates for uses other than signing and issuing Certificates or Certificate status information.

1.3.3.1 Affiliated Organisations

Subscriber certificates may be issued in conjunction with an organisation that has a relationship with the subscriber; this is termed affiliation. The organisational affiliation shall be indicated in a relative distinguished name in the subject field in the certificate, and the certificate shall be revoked in accordance with Section 4.9.1 when affiliation is terminated.

1.3.4 Relying Parties

A Relying Party is the entity that relies on the validity of the binding of the Subscriber's name to a Public Key. The Relying Party is responsible for deciding how to check the validity of the Certificate by checking the appropriate Certificate status information. The Relying Party can use the Certificate to verify the integrity of a digitally signed message, to identify the creator of a message, or to establish confidential communications with the holder of the Certificate. A Relying Party may use information in the Certificate (such as Certificate Policy identifiers) to determine the suitability of the Certificate for a particular use.

1.3.5 Other participants

1.3.5.1 Related Authorities

The Bombardier CAs operating under this CP may require the services of other security, community, and application authorities, such as compliance auditors and attribute authorities. The Bombardier PKI CPSs shall identify the parties responsible for providing such services, and the mechanisms used to support these services.

1.3.5.2 Trusted Agent

A Trusted Agent is appointed by the OA and may collect and verify a Subscriber’s identity and information on behalf of an RA. Information shall be verified in accordance with section 3.2 and communicated to the RA in a secure manner.

A Trusted Agent shall not have privileged access to the CA to enter or approve Subscriber information.

1.3.6 Applicability

The sensitivity of the information processed or protected using Certificates issued by Bombardier CAs will vary significantly. Relying Parties must evaluate the environment and the associated threats and vulnerabilities and determine the level of risk they are willing to accept based on the sensitivity or significance of the information. This evaluation is done by each Relying Party for each application and is not controlled by this CP.

To provide sufficient granularity, this CP specifies security requirements at various levels of assurance as listed in section 1.2.

The Certificate levels of assurance contained in this CP are set forth below, as well as a brief and non-binding description of the applicability for applications suited to each level.

Assurance Level	Applicability
basic-software-256	This level is relevant to environments where risks and consequences of data compromise are low. Subscriber Private Keys shall be stored in software at this Assurance Level.
basic-hardware-256	This level is relevant to environments where risks and consequences of data compromise are low. Subscriber Private Keys shall be stored in hardware at this Assurance Level.
medium-softwareCBP-256	This level is relevant to environments where risks and consequences of data compromise are moderate. This may include transactions having substantial monetary value or risk of fraud, or involving access to private information where the likelihood of malicious access is substantial. Subscriber Private Keys shall be stored in software at this Assurance Level.
medium-hardwareCBP-256	This level is relevant to environments where risks and consequences of data compromise are moderate. This may include transactions having substantial monetary value or risk of fraud, or involving access to private information where the likelihood of malicious access is substantial. Subscriber Private Keys shall be stored in hardware at this Assurance Level.

In addition to the above:

LSAP Code Signing Certificates, used for the signature of Aircraft EDS crates, are relevant to environments where software is to be loaded onto an aircraft system, the integrity of the software needs to be assured, and the source organisation of the software needs to be identified. These Certificates shall assert the medium-hardwareCBP-256 Assurance Level, and Subscriber private keys shall be stored in hardware at this assurance level. LSAP Code Signing Certificates are clearly indicated as such in the Certificate. Unless specified otherwise, the requirements applicable to Role Signature Certificates also apply to LSAP Code Signing Certificates.

Non-Aircraft Software Code Signing Certificates, used for the signature of non-aircraft software code, are relevant to environments where the integrity of the software needs to be assured, and the source organisation of the software needs to be identified. These Certificates shall assert the medium-hardwareCBP-256 Assurance Level, and Subscriber private keys shall be stored in hardware at this assurance level. Non-Aircraft Software Code Signing Certificates are clearly indicated as such in the Certificate. Unless specified otherwise, the requirements applicable to Role Signature Certificates also apply to Non-Aircraft Software Code Signing Certificates.

DAD Signature Certificates, used for the digital signature of design documents, are relevant in the context of design and engineering activities where the integrity of the document

needs to be assured, and the identity of the individual approving the document needs to be identified. These Certificates shall assert the medium-hardwareCBP-256 Assurance Level, and Subscriber private keys shall be stored in hardware at this assurance level. DAD Signature Certificates are clearly indicated as such in the Certificate. Unless specified otherwise, the requirements applicable to Role Signature Certificates also apply to DAD Signature Certificates.

1.3.6.1 Factors in Determining Usage

The Relying Party must first determine the level of assurance required for an application, and then select the Certificate appropriate for meeting the needs of that application. This will be determined by evaluating various risk factors including the value of the information, the threat environment, and the existing protection of the information environment. These determinations are made by the Relying Party and are not controlled by the Bombardier PMA or the Bombardier Operational Authority. Nonetheless, this CP contains some helpful guidance, set forth herein, which Relying Parties may consider in making their decisions.

1.3.6.2 Obtaining Certificates

Relying Parties see section 2.

All other entities see section 3.

1.4 Certificate Usage

The Bombardier CAs will issue digital Certificates to Subscribers for various uses. Examples include:

- Authentication to IT systems;
- Signing digital documents;
- Encrypting and decrypting digital documents; or
- Establishment of encrypted communication links (IPsec IP/VPN).

This list of usage for digital Certificates issued by Bombardier CAs is not complete and may be extended.

Certificates are also issued as needed to PKI infrastructure devices and/or personnel.

Certificates asserting the -256 assurance levels shall be only issued using the SHA256 hash algorithm.

1.4.1 Appropriate Certificate uses

No stipulation.

1.4.2 Prohibited Certificate uses

No stipulation.

1.5 POLICY ADMINISTRATION

1.5.1 Organisation administering the document

The Bombardier PMA is responsible for all aspects of this CP.

1.5.2 Contact person

Questions regarding this CP shall be directed to the Bombardier PMA represented by:

Mark Ferguson
Chair of the Bombardier PKI PMA
400, chemin de la Côte-Vertu Ouest,
Dorval, Québec
Canada
H4S 1Y9

1.5.3 Person determining CPS suitability for the policy

The Bombardier PMA shall commission an analysis to determine whether the Bombardier PKI CPSs conform to the Bombardier PKI CP.

When such a compliance analysis shall be performed:

- The determination of suitability shall be based on an independent compliance analyst's results and recommendations; and
- The compliance analysis shall be from a firm, which is independent from the entity being audited. The compliance analyst may not be the author of the CP or the CPS; and
- The entity PMA shall determine whether a compliance analyst meets these requirements.

When entering into a MOA:

- Each entity shall be responsible for determining whether their CPS(s) conform to their CP(s).
- Entities shall be obliged to properly adhere to the policy mapping between the Bombardier PKI CP and external PKI domain CPs.
- The entity shall be obliged to attest to such compliance periodically.

1.5.4 CPS approval procedures

The CPS shall be more detailed than the corresponding Certificate Policy described in this document. The Bombardier PKI CPSs shall specify how this CP shall be implemented to ensure compliance with the provisions of this CP. The approval procedures for the CPSs shall be outlined in the Bombardier PMA Charter and by-laws.

1.5.5 Waivers

There shall be no waivers to this CP.

1.6 DEFINITIONS AND ACRONYMS

1.6.1 Definitions

Bombardier PKI Directory - Publicly-accessible Repository.

Accreditation - Formal declaration by a Designated Approving Authority that an Information System is approved to operate in a particular security mode using a prescribed set of safeguards at an acceptable level of risk.

Activation Data - Secret data (e.g.: password, PIN code) that is used to perform cryptographic operations using a Private Key.

Assurance Level - A representation of how well a Relying Party can be certain of the identity binding between the Public Key and the individual whose subject name is cited in the Certificate. In addition, it also reflects how well the Relying Party can be certain that the End-Entity whose subject name is cited in the Certificate is controlling the use of the Private Key that corresponds to the Public Key in the Certificate, and how securely the system which was used to produce the Certificate and (if appropriate) deliver the Private Key to the End-Entity performs its task.

Authority Revocation List (ARL) - A list of revoked Certification Authority Certificates. Technically, an ARL is a CRL.

Authentication - The process whereby one party has presented an identity and claims to be that identity and the second party confirms that this assertion of identity is true.

Audit - An Independent review and examination of documentation, records and activities to access the adequacy of system controls, to ensure compliance with established policies and operational procedures, and to recommend necessary changes in controls, policies or procedures.

Certificate - A Certificate is a data structure that is digitally signed by a Certification Authority, and that contains the following pieces of information:

- The identity of the Certification Authority issuing it.
- The identity of the certified End-Entity.
- A Public Key that corresponds to a Private Key under the control of the certified End-Entity.
- The Operational Period.
- A serial number.

The Certificate format is in accordance with ITU-T Recommendation X.509 version 3.

Certification Authority (CA) - A Certification Authority is an entity that is responsible for authorising and causing the issuance or revocation of a Certificate.

By extension, the term “CA” can also be used to designate the infrastructure component that technically signs the Certificates and the revocation lists it issues.

A Certification Authority can perform the functions of a Registration Authority (RA) and can delegate or outsource this function to separate entities.

A Certification Authority performs three essential functions. First, it is responsible for identifying and authenticating the intended Authorised Subscriber to be named in a Certificate, and verifying that such Authorised Subscriber possesses the Private Key that corresponds to the Public Key that will be listed in the Certificate. Second, the Certification Authority actually creates and digitally signs the Authorised Subscriber’s Certificate. The Certificate issued by the Certification Authority then represents that CA’s statement as to the identity of the person named in the Certificate and the binding of that person to a particular public-private Key Pair. Third, the Certification Authority creates and digitally signs the Certificate Revocation Lists and/or Authority Revocation Lists.

Certificate Extension - A Certificate may include extension fields to convey additional information about the associated Public Key, the Subscriber, the Certificate Issuer, or elements of the certification process.

Certificate Manufacturing - The process of accepting a Public Key and identifying information from an authorised Subscriber; producing a digital Certificate containing that and other pertinent information; and digitally signing the Certificate.

CertiPath - CertiPath is a corporation whose purpose is to design, implement, maintain and market a secure Public Key infrastructure communications bridge, initially focused on the aerospace and defence industry.

Certificate Policy (CP) - A named set of rules that indicate the applicability of a Certificate to a particular community and/or class of applications with common security requirements.

Within this document, the term CP, when used without qualifier, refers to the Bombardier CP, as defined in section 1.

Certification Practice Statement (CPS) - A statement of practices which a CA employs for issuing and revoking Certificates and providing access to same. The CPS defines the equipment and procedures the CA uses to satisfy the requirements specified in the CP that are supported by it.

Certificate Request - A message sent from an applicant to a CA in order to apply for a digital certificate. The certificate request contains information identifying the applicant and the Public Key chosen by the applicant. The corresponding Private Key is not included in the request, but is used to digitally sign the entire request.

If the request is successful, the CA will send back a certificate that has been digitally signed with the CA’s Private Key.

Certificate Revocation List (CRL) - A list of revoked Certificates that is created, time stamped and signed by a CA. A Certificate is added to the list if revoked (e.g., because of suspected key compromise, distinguished name (DN) change) and then removed from it when it reaches the end of the Certificate’s validity period. In some cases, the CA may choose to split a CRL into a series of smaller CRLs.

When an End-Entity chooses to accept a Certificate the Relying Party Agreement requires that this Relying Party check that the Certificate is not listed on the most recently issued CRL.

Certificate Status Authority (CSA) - A CSA is an authority that provides status of Certificates or certification paths.

Cross-certificate (CC) - A Certificate used to establish a trust relationship between two Certification Authorities.

A cross-certificate is a Certificate issued by one CA to another CA which contains the subject CA Public Key associated with the private CA signature key used by the subject CA for issuing Certificates. Typically a cross-certificate is used to allow End-Entities in one CA domain to communicate securely with End-Entities in another CA domain. A cross-certificate issued by CA#1 to CA#2 allows Entity #a, who has a Certificate issued by CA#1 domain, to accept a Certificate used by Entity #b, who has a Certificate issued to Entity #b by CA#2.

Digital Signature - The result of a transformation of a message by means of a cryptographic system using keys such that a person who has received a digitally signed message can determine:

- Whether the transformation was created using the private signing key that corresponds to the signer's public verification key; or
- Whether the message has been altered since the transformation was made.

Directory - A directory system that conforms to the ITU-T X.500 series of Recommendations.

Distinguished Name - A string created during the certification process and included in the Certificate that uniquely identifies the End-Entity within the CA domain.

Encryption Key Pair - A public and private Key Pair issued for the purposes of encrypting and decrypting data.

End-Entity (EE) - A person, device or application that is issued a certificate by a CA.

Entity - Any autonomous element within the PKI, including CAs, RAs and End-Entities.

Employee - An employee is any person employed in or by Bombardier.

Federal Information Processing Standards (FIPS) - Federal standards that prescribe specific performance requirements, practices, formats, communications protocols, etc. for hardware, software, data, telecommunications operation, etc. U.S. Federal agencies are expected to apply these standards as specified unless a waiver has been granted in accordance with agency waiver procedures.

Hardware Token - A hardware device that can hold Private Keys, digital Certificates, or other electronic information that can be used for authentication or authorisation. Smartcards and USB tokens are examples of hardware tokens.

Hardware Security Module (HSM) - An HSM is a hardware device used to generate cryptographic Key Pairs, keep the Private Key secure and generate digital signatures. It is used to secure the CA keys, and in some cases the keys of some applications (End-

Entities).

Internet Engineering Task Force (IETF) - The Internet Engineering Task Force is a large open international community of network designers, operators, vendors, and researches concerned with the evolution of the Internet architecture and the smooth operation of the Internet.

Intermediate CA - A CA that is not a Root CA and whose primary function is to issue Certificates to other CAs. An Intermediate CA is a Subordinate CA.

Issuing CA - In the context of a particular Certificate, the issuing Certification Authority is the Certification Authority that signed and issued the Certificate.

Key Ceremony – A planned, exceptional event during which a Certification Authority is used to perform a non-trivial activity, such as the generation of its own Key Pair, the generation of its own Certificate Request, the issuance of a Certificate or the generation of revocation lists for offline CAs. The ceremony is usually documented in advance and in detail in a Key Ceremony Script.

Key Ceremony Script - The detailed, keystroke-level procedure to be followed during the Key Ceremony.

Key Generation - The process of creating a Private Key and Public Key pair.

Key Pair - Two mathematically related keys, having the properties that (i) one key can be used to encrypt data that can only be decrypted using the other key, and (ii) knowing one of the keys which is called the Public Key, it is computationally infeasible to discover the other key which is called the Private Key.

Local Registration Authority (LRA) - An entity that is responsible for identification and authentication of Certificate subjects, but that does not sign or issue Certificates (i.e., an LRA is delegated certain tasks on behalf of a RA or CA).

Memorandum of Agreement - As used in the context of this CP, between Bombardier or an Bombardier Business Unit and external PKI Domains legal Representation allowing interoperation between the respective Bombardier PKI CAs and an external PKI domains CA.

Bombardier consults the Bombardier PMA through the Bombardier PMA Chair on the MOA.

Online Certificate Status Protocol (OCSP) - Protocol useful in determining the current status of a digital Certificate without requiring CRLs.

Object Identifier (OID) - An object identifier is a specially-formatted sequence of numbers that is registered with an internationally-recognised standards organisation.

Operational Authority (OA) - An agent of the Bombardier PKI CA. The Operational Authority is responsible to the Policy Management Authority for:

- Interpreting the Certificate Policies that were selected or defined by the Policy Management Authority.
- Developing a Certification Practice Statement (CPS), in accordance with the Internet X.509 Public Key Infrastructure (PKIX) Certificate Policy and Certification Practice Framework (RFC 3647), to document the CA's compliance with the Certificate

Policies and other requirements.

- Maintaining the CPS to ensure that it is updated as required.
- Operating the Certification Authority in accordance with the CPS.

Operational Period of a Certificate - The operational period of a Certificate is the period of its validity. It would typically begin on the date the Certificate is issued (or such later date as specified in the Certificate), and end on the date and time it expires as noted in the Certificate or earlier if revoked.

Organisation - Department, agency, partnership, trust, joint venture or other association.

Person - A human being (natural person), corporation, limited liability company, or other judicial entity, or a digital device under the control of another person.

PIN - Personal Identification Number. See activation data for definition.

PKI Disclosure Statement (PDS) - Defined by IETF's RFC 3647 as "An instrument that supplements a CP or CPS by disclosing critical information about the policies and practices of a CA/PKI. A PDS is a vehicle for disclosing and emphasizing information normally covered in detail by associated CP and/or CPS documents. Consequently, a PDS is not intended to replace a CP or CPS."

PKIX - IETF Working chartered to develop technical specifications for PKI components based on X.509 Version 3 Certificates.

Policy - This Certificate Policy.

Policy Management Authority (PMA) - An agent of the Certification Authority. The Policy Management Authority is responsible for:

- Dispute resolution.
- Selecting and/or defining Certificate Policies, in accordance with the Internet X.509 Public Key Infrastructure (PKIX) Certificate Policy and Certification Practice Framework (RFC 3647), for use in the Certification Authority PKI or organisational enterprise.
- Approving of any interoperability agreements with external Certification Authorities.
- Approving practices, which the Certification Authority must follow by reviewing the Certification Practice Statement to ensure consistency with the Certificate Policies.
- Providing Policy direction to the CA and the Operational Authority.

Public Key Infrastructure (PKI) - A set of policies, processes, server platforms, software and workstations used for the purpose of administering certificates and public-private Key Pairs, including the ability to issue, maintain, and revoke Public Key certificates.

Principal CA (PCA) - CA within a PKI that has been designated to interoperate directly with another PKI (e.g., through the exchange of cross-certificates with a PCA in another PKI domain).

Private Key - The Private Key of a Key Pair used to perform Public Key cryptography. This key must be kept secret.

Public Key - The Public Key of a Key Pair used to perform Public Key cryptography. The Public Key is made freely available to anyone who requires it. The Public Key is usually provided via a Certificate issued by a Certification Authority and is often obtained by accessing a repository.

Public/Private Key Pair - See Key Pair.

Registration - The process whereby a user applies to a Certification Authority for a digital Certificate.

Registration Authority (RA) - An Entity that is responsible for the identification and authentication of Certificate Subscribers before Certificate issuance, but does not actually sign or issue the Certificates (i.e., an RA is delegated certain tasks on behalf of a CA).

Relying Party (RP) - A Relying Party is a recipient of a Certificate signed by the Bombardier PKI CA who acts in reliance on those Certificates and/or digital signatures verified using that Certificate and who has agreed to be bound by the terms of this CP and the CPS.

The term “Relying Party” designates the legal entity responsible for the recipient’s actions.

Relying Party Agreement - An agreement, entered into by a Relying Party that provides for the respective liabilities of Bombardier or its Business Units and of the Relying Party. Such agreement is a prerequisite in order to be able to rely on the Certificate.

Repository - Publication service providing all information necessary to ensure the intended operation of issued digital Certificates (e.g.: CRLs, encryption Certificates, CA Certificates).

Revocation - To prematurely end the Operational Period of a Certificate from a specified time forward.

RFC 3279 - Document published by the IETF which “[…] specifies algorithm identifiers and ASN.1 encoding formats for digital signatures and subject public keys used in the Internet X.509 PKI” (RFC 3279).

RFC 3647 - Document published by the IETF, which presents a framework to assist the writers of Certificate Policies or certification practice statements for participants within Public Key infrastructures, such as certification authorities, policy authorities, and communities of interest that wish to rely on Certificates. In particular, the framework provides a comprehensive list of topics that potentially (at the writer's discretion) need to be covered in a Certificate Policy or a certification practice statement.

RFC 4122 – Document published by the IETF which “[…] defines a Uniform Resource Name namespace for UUIDs (Universally Unique IDentifier), also known as GUIDs (Globally Unique IDentifier)”. (RFC 4122)

RFC 5280 – Document published by the IETF which “[…] profiles the X.509 v3 certificate and X.509 v2 certificate revocation list (CRL) for use in the Internet.” (RFC 5280)

Role Certificate - A Role Certificate is a Certificate which identifies a specific role on behalf of which the human Subscriber is authorized to act.

Root CA - A CA that is the trust anchor for a set of relying parties.

Server-based Certificate Validation Protocol (SCVP) - Protocol that allows a client to delegate Certificate path construction and Certificate path validation to a server.

Secure Signature-Creation Devices (SSCD) - A set of hardware and software elements designed for and allowing the creation of a digital signature in a secure manner. This is used in the context of the CEN CWA 14169 standard.

Signature Key Pair - A public and private Key Pair used for the purposes of digitally signing electronic documents and verifying digital signatures.

Signing CA - A CA whose primary function is to issue Certificates to End-Entities. A Signing CA is a Subordinate CA.

Software-based Certificate - A digital Certificate (and associated Private Keys) that are created and stored in software – either on a local workstation or on a server.

Sponsoring Organisation - An organisation with which an Authorised Subscriber is affiliated (e.g., as an employee, user of a service, business partner, customer etc.).

Subordinate CA - A CA that is not a Root CA. It is subordinate to either a Root CA or other Subordinate CA.

Subscriber - An entity that is the subject of a Certificate and which is capable of using, and is authorised to use, the Private Key, that corresponds to the Public Key in the Certificate. Responsibilities and obligations of the Subscriber shall be as required by the Certificate Policy and the Subscriber Agreement.

Subscriber Agreement - An agreement, entered into by a Subscriber that provides the responsibilities and obligations of the Subscribers when using Certificates. Such agreement is a prerequisite in order to be able to use the Private Key associated to the Certificate.

Time-Stamp Authority (TSA) - An authority that issues and validates trusted timestamps.

Token - A hardware security device containing an End-Entity's Private Key(s) and Certificate. (see "Hardware Token")

Trusted Agent - An agent who a Registration Authority relies on to verify that an applicant fulfils part of or all of the necessary prerequisites to obtain a certificate for an End-Entity.

Trustworthy System - Computer hardware, software, and/or procedures that: (a) are reasonably secure from intrusion and misuse; (b) provide a reasonable level of availability, reliability, and correct operation; (c) are reasonably suited to performing their intended functions, and (d) adhere to generally accepted security procedures.

Valid Certificate - A Certificate that (1) a Certification Authority has issued, (2) the Subscriber listed in it has accepted, (3) has not expired, and (4) has not been revoked. Thus, a Certificate is not "valid" until it is both issued by a CA and has been accepted by the Subscriber.

X.509 - An ITU-T standard for a Public Key Infrastructure.

1.6.2 Acronyms

AES	Advanced Encryption Standard

ANSI	American National Standards Institute
ASN.1	Abstract Syntax Notation One Encoder / Decoder
C	Country
CA	Certification Authority
CBP	Commercial Best Practices
CHUID	Cardholder Unique Identifier
CN	Common Name
CP	Certificate Policy
CPS	Certification Practice Statement
CRL	Certificate Revocation List
CSA	Certificate Status Authority
DAD	Design Approval Designee
DC	Domain Component
DN	Distinguished Name
DNS	Domain Name Service
ECDH	Elliptic Curve Diffie Hellman
ECDSA	Elliptic Curve Digital Signature Algorithm
EDS	Electronic Distribution of Software
EE	End-Entity
FASC-N	Federal Agency Smart Credential Number
FBCA	Federal Bridge Certification Authority
FIPS	(US) Federal Information Processing Standard
FIPS PUB	(US) Federal Information Processing Standard Publication
GUID	Globally Unique Identifier
HR	Human Resources
HTTP	Hypertext Transfer Protocol
ID	Identifier
IETF	Internet Engineering Task Force
ISO	International Organisation for Standardisation
ITU	International Telecommunication Union
KRP	Key Recovery Policy
KRPS	Key Recovery Practices Statement

LDAP	Lightweight Directory Access Protocol
LSAP	Loadable Software Airplane Parts or Loadable Software Aircraft Parts
MOA	Memorandum of Agreement
NIST	National Institute of Standards and Technology
NTP	Network Time Protocol
O	Organisation
OA	Operational Authority
OCSP	Online Certificate Status Protocol
OID	Object Identifier
OU	Organisational Unit
PCA	Principal Certification Authority
PDS	PKI Disclosure Statement
PIN	Personal Identification Number
PIPEDA	*Personal Information Protection and Electronic Documents Act*
PKCS	Public Key Certificate Standard
PKI	Public Key Infrastructure
PKIX	Public Key Infrastructure X.509
PMA	Policy Management Authority
RA	Registration Authority
RFC	Request For Comments
RSA	Rivest-Shamir-Adleman (encryption algorithm)
SCVP	Server-based Certificate Validation Protocol
SHA-1	Secure Hash Algorithm, Version 1
SSCD	Secure Signature-Creation Devices
SSL	Secure Sockets Layer
TDES	Triple Data Encryption Standard
TLS	Transport Layer Security
TSA	Time-Stamp Authority
UPN	User Principal Name
UPS	Uninterruptible Power Supply
URI	Uniform Resource Identifier
URL	Uniform Resource Locator

UUID	Universally Unique Identifier

2 Publication and Repository Responsibilities

2.1 Repositories

The Bombardier PKI operates Repositories containing all information necessary to provide lookup and validation services for issued Certificates.

The mechanisms used by the Bombardier PKI to post information to its respective Repositories, as required by this CP, shall include:

- Directory Server System that is also accessible via the Internet through the Lightweight Directory Access Protocol (LDAP) or the Hypertext Transport Protocol (HTTP); and
- Availability of the information as required by the Certificate information posting and retrieval stipulations of this CP; and
- Access control mechanisms when needed to protect repository information as described in later sections.

The PKI Repositories containing Certificates and Certificate status information shall be deployed so as to provide high levels of reliability (24 out of 24 hours, 7 out of 7 days at a rate of 99% availability or better).

2.2 Publication of certificate information

2.2.1 Publication of CA Information

The Bombardier PKI CP shall be published electronically on the Bombardier PKI web site.

Unless otherwise specified in the Certificate profile or applicable CPS, all encryption Public Key Certificates issued by the Bombardier CAs to digital Certificate users shall be published to the respective applicable Bombardier Repositories, as set forth in the applicable CPSs.

All CRLs, ARLs, CA certificates, and CA cross-certificates issued by Bombardier CAs shall be published to the Bombardier respective and applicable Repositories as set forth in the applicable CPSs. Furthermore, all of the above shall be accessible via HTTP.

The applicable Certificate Practice Statements (CPS) shall be kept confidential and shall not be published publicly with, or separate from, this CP.

All publication made by Bombardier CAs shall be performed as soon as an internal event that may require publication (revocation, issuance, or modification of a Certificate) is validated by the CA.

2.2.2 Interoperability

The Bombardier PKI shall not publish CA Certificates and CRLs in an LDAP directory.

2.2.3 Privacy of information

A Bombardier CA shall respect the privacy of Subscribers and Subscribers' employers.

2.3 Time or frequency of publication

Bombardier PKI CA public information identified in section 2.2.1 shall be published prior to the first Certificate being issued in accordance with this CP by that CA. Certificates and Certificate status information shall be published as specified in section 4 of this CP.

2.4 Access controls on Repositories

Any PKI Repository information not intended for public dissemination or modification shall be protected.

Status information for all Certificates shall be publicly available through the Internet.

Encryption Certificates for which publication is required shall be publicly available through the Internet.

This CP shall be publicly available through the Internet.

3 Identification and Authentication

3.1 Naming

3.1.1 Types of Names

The Bombardier CAs shall generate and sign Certificates containing an X.501 Distinguished Name (DN) in the Issuer and Subject fields. Such DNs shall be assigned in accordance with section 3.1.4. Subject Alternative Name may be used, if marked non-critical; section 10 lists the accepted contents (email address, UPN, FQDN, etc.) and their specific formats.

For Certificates issued to human Subscribers, the subject DN shall either contain the value “Unaffiliated” in the last organisational unit (ou) attribute or shall contain the affiliated organisation name in an appropriate relative distinguished name attribute (e.g., organisation (o), organisational unit (ou), or domain component (dc) attribute).

3.1.2 Need for names to be meaningful

The Certificates issued pursuant to this CP are meaningful only if the names that appear in the Certificates can be understood and used by Relying Parties. Names used in the Certificates shall identify the person or object to which they are assigned in a meaningful way.

DNs shall be used, wherein the Common Name represents the Subscriber in a way that is easily understandable for humans.

- For people, this will typically be:

  Given-Name[space][1]Surname, and subject to the uniqueness requirements of section 3.1.5).

- For equipment:

  This may include an IP address, a Fully-Qualified Domain Name (FQDN), a URL, or an otherwise human-understandable unique identifier.

- For Roles:

  This shall be a clear representation of the role (e.g.: Purchasing Agent, System Administrator, Final Quality Assurance Engineer, etc.);

A Bombardier Root CA shall impose restrictions on the name space authorized to that Bombardier Sub CA which are at least as restrictive as its own name constraints.

All DNs shall be unique and shall satisfy asserted namespace constraints.

Subject DNs shall accurately reflect the organisation with which the Subject is affiliated.

When UPN is used, it shall be unique and accurately reflect organisational structure.

[1] "[space]" refers to a space character and not the individual characters.

3.1.3 Anonymity or pseudonymity of Subscribers

CA certificates shall not contain anonymous or pseudonymous identities.

Certificates issued by Bombardier CAs shall not contain anonymous or pseudonymous identities, only names as defined in section 7 and as stipulated in section 3.1.2.

3.1.4 Rules for interpreting various name forms

Rules for interpreting name forms shall be contained in the [Bombardier DIT], and in the applicable Certificate profile.

The authority responsible for Bombardier PKI name space control is the Bombardier PMA.

3.1.5 Uniqueness of names

Name uniqueness across the Bombardier PKI name space domains shall be enforced. The Bombardier CAs and RAs shall enforce name uniqueness within their authorised X.500 name space.

The applicable CPSs shall describe how names shall be allocated within the Subscriber community to guarantee name uniqueness among current and past Subscribers (i.e., if “Joe Q Smith” leaves a CA’s community of Subscribers, and a new, different “Joe Q Smith” enters the community of Subscribers, how will these two people be provided unique names).

The Bombardier PMA shall be responsible for ensuring name uniqueness in Certificates issued by the Bombardier CAs.

3.1.6 Recognition, authentication, and role of trademarks

The use of trademarks will be reserved to registered trademark holders and to the CAs in strict proportion to that required for the performance of this CP.

3.1.7 Name Claim Dispute Resolution Procedure

The Bombardier PMA shall resolve or cause to be resolved any name collision brought to its attention that may affect interoperability.

3.2 Initial Identity Verification

3.2.1 Method to prove possession of Private Key

In all cases where the party named in a Certificate generates its own keys that party shall be required to prove possession of the Private Key, which corresponds to the Public Key in the Certificate request. For signature keys, this may be done by the entity using its Private Key to sign a value and providing that value to the issuing CA. The CA shall then validate the signature using the party’s Public Key. The Bombardier PMA may allow other mechanisms that are at least as secure as those cited here.

In the case of an aircraft avionics component that is not capable of generating its own keys

(e.g.: for an AMS Aircraft Entity Certificate), this may only be possible from a separate computer before the key is transferred into the aircraft avionics component. Subsequent to proof of possession, the private key shall be distributed to the aircraft avionics in a manner consistent with section 6.2.

3.2.2 Authentication of organisation identity

In all cases, the existence of an affiliated organisation shall be verified prior to issuing an end user Certificates on its behalf. Moreover, requests for end user Certificates other than unaffiliated Subscribers shall include the name of the organisation and shall be verified with the identified affiliated organisation.

The verification shall include the following:

- Full organisation name;
- Address of its head office;
- Documentation of the existence of the organisation (such as articles of incorporation or corporation number);
- Its Dun and Bradstreet (DUNS) identifier, if doing business within the United States of America or elsewhere where this identifier is commonly used. If a DUNS identifier is not able to be provided, the Entity CA shall verify with another third party (e.g. Tax authority, country, state or province corporate registry) the existence of the company, and record that identifier;
- A letter from its authorized representative officially requesting said Certificate.

The RA shall verify the information, in addition to the authenticity of the requesting representative and the representative's authorization to act in the name of the organisation.

Requests for cross certificates shall include the CA name, address, and documentation of the existence of the CA. Before issuing cross certificates, the issuing CA shall verify the information provided, in addition to the authenticity of the requesting representative and the representative’s authorization to act in the name of the CA.

3.2.3 Authentication of individual identity

The Bombardier CAs shall ensure that the applicant’s identity information is verified and checked in accordance with this CP and the applicable CPSs. The CA or an RA shall ensure that the applicant’s identity information and Public Key are properly bound. Additionally, the CA or the RA shall record the process that was followed for issuance of each Certificate. Process information shall depend upon the Certificate level of assurance and shall be addressed in the applicable CPS.

3.2.3.1 Authentication of Individuals

CAs and RAs are responsible for ensuring that they are in compliance with all applicable

laws when collecting personally identifiable information. If a jurisdiction prohibits the collection, distribution or storage of any of the information specified in this section, an alternate, equivalent proofing mechanism may be used that assures the identity of the applicant to an equivalent level, subject to approval of the Bombardier PMA. If the data is used to proof an identity for Medium Assurance Levels, this alternate procedure shall be communicated to external domain PKIs prior to implementation, or as outlined in the MOA with that external domain PKI.

The process documentation and authentication requirements shall include the following:

- The identity of the person performing the identity verification; and
- A signed declaration by that person that he or she verified the identity of the applicant as required by this CP which may be met by establishing how the applicant is known to the verifier as required by this CP, using the format set forth at 28 U.S.C. 1746 (Unsworn declarations under penalty of perjury) or comparable procedure under local law; the signature on the declaration may be either a handwritten or digital signature using a certificate that is of equal or higher level of assurance as the credential being issued;

For basic-256 Assurance Levels, the following information shall be recorded:

- the full name, including surname and given name(s) of the applicant, and maiden name, if applicable;
- the full name and legal status of the applicant's Employer;
- an email address for the applicant, if available;
- a declaration signed by the applicant indicating his acceptance of the privacy policy outlined in section 9.4;
- the date and time of the verification;

For all Assurance Levels applicable to human Subscribers other than Basic, the following information shall be recorded:

- the full name, including surname and given name(s) of the applicant, and maiden name, if applicable;
- the date and place of birth or other attribute(s) which may be used to uniquely identify the applicant;
- the full name and legal status of the Subscriber's Employer;
- a physical address or other suitable method of contact (which may be an email address);
- a declaration signed by the applicant indicating his acceptance of the privacy policy outlined in section 9.4;
- a number or code allowing unambiguous identification of the verifier;
- a unique identifying number from an ID of the applicant;
- the date and time of the verification; and

- a declaration of identity signed by the applicant using a handwritten signature or appropriate digital signature (see Practice Note). This shall be performed in the presence of the person performing the identity authentication.

PRACTICE NOTE:

In those cases in which the individual is in possession of a valid digital signature credential of equal or higher level of assurance or the signature certificate is generated immediately upon authentication of the applicant's identity, the applicant may sign the declaration of identity and certificate of acceptance using the digital credential. In the latter case, if the applicant fails to sign the declaration of identity then the certificate must be revoked.

For Certificates asserting the Medium Assurance Levels, the applicant shall:

- present one (1) valid National Government-issued photo ID or two valid non-National Government IDs, one of which shall be a recent (less than 5 years old) photo ID (e.g., Driver's License). One of the non-National Government IDs can be replaced by a valid, non-expired, Bombardier-issued photo ID.

For Basic Assurance Level Certificates, the applicant's identity can be determined based on existing corporate or commercial data.

Identity for other Assurance Levels applicable to human Subscribers shall be established by in-person proofing before the RA or Trusted Agent; information provided shall be verified to ensure legitimacy. In-person proofing may be performed remotely via a live video link. This video link must be of a quality sufficient to allow the RA or Trusted Agent to unambiguously verify the applicant's identity and ensure the legitimacy of the presented ID.

Requirements for authentication of individual identity using an in-person antecedent are listed in section 3.2.3.3.

3.2.3.2 Authentication of Component Identities

In the event a human sponsor is changed, the new sponsor shall review the status of each device under his/her sponsorship to ensure it is still authorized to receive certificates. The CPS shall describe procedures to ensure that certificate accountability is maintained.

Some computing and communications components (routers, firewalls, servers, etc.) and other non-human Subscribers (aircraft and/or aircraft equipment/components/sub-components/systems, etc.) will be named as Certificate subjects. In such cases, the component (usually referred to as a "device") shall have a human sponsor (the "Device Sponsor"). The Device Sponsor shall be responsible for providing the following registration information:

- Equipment identification (e.g. IP address, hostname, aircraft registration number, aircraft/equipment part number) or service name (e.g., DNS name) sufficient to unique identify the Subject;

- Equipment Public Keys;
- Equipment authorisations and attributes (if any are to be included in the Certificate); and
- Contact information to enable the CA or RA to communicate with the sponsor when required.

The registration information shall be verified to an Assurance Level commensurate with the Certificate Assurance Level being requested. Acceptable methods for performing this authentication and integrity checking include, but are not limited to:

- Verification of digitally signed messages sent from the Device Sponsor (using Certificates of equivalent or greater assurance than that being requested); or
- In person registration by the sponsor, with the identity of the sponsor confirmed in accordance with the requirements of section 3.2.3.1.
- In the event a human sponsor is changed, the new sponsor shall review the status of each device under his/her sponsorship to ensure it is still authorized to receive certificates. The CPS shall describe procedures to ensure that certificate accountability is maintained.

3.2.3.3 Human Subscriber Initial Identity Proofing Via Antecedent Relationship

The following requirements shall apply when human Subscriber identity is verified using antecedent relationship with the sponsoring organisation:

1. The applicant shall personally appear before a verifier (usually a Trusted Agent);
2. The applicant and the verifier shall have an established working relationship with the sponsoring organisation. The relationship shall be sufficient to enable the verifier to, with a high degree of certainty, verify that the applicant is the same person that was identity proofed. An example to meet this requirement is when the applicant and Trusted Agents are employed by the same company and the company badge forms the basis for the applicant authentication;
3. The applicant shall present a valid sponsoring organisation-issued photo ID. This photo ID shall have been issued on the basis of in-person identity proofing using one valid National Government-issued Picture ID, or two valid non-National Government IDs, one of which shall be a recent photo ID (e.g., Driver's License);
4. The verifier shall record the following:
   a. Number or code allowing unambiguous identification of the verifier;
   b. Unique identifying number from the applicant's sponsoring organisation-issued photo ID;
   c. Date and time of the identity verification; and
   d. Date and time of sponsoring organisation-issued photo ID, if applicable.
5. The verifier shall sign a declaration that he or she verified the identity of the applicant as required by the applicable certificate policy which may be met by

establishing how the applicant is known to the verifier as required by this certificate policy; and

6. The applicant shall sign a declaration of identity using a handwritten signature or appropriate digital signature. This declaration shall be signed in the presence of the verifier.

3.2.3.4 Authentication of Human Subscriber for Role Certificates

Human Subscribers may be issued Role Certificates. In addition to the stipulations below, authentication of individuals for Role Certificates shall follow the stipulations of sections 3.2.3.1 of this CP.

A Role Certificate shall identify a specific role title on behalf of which the Subscriber is authorized to act rather than the Subscriber's name. A Role Certificate can be used in situations where non-repudiation is desired. A Role Certificate shall not be a substitute for an individual Subscriber Certificate. Each role for which a Role Certificate is to exist shall have a Role Sponsor.

Multiple Subscribers can be assigned to a role at the same time, however, the signature key pair shall be unique to each Role Signature Certificate issued to each individual; the encryption key pair and Role Encryption Certificate may be shared by the individuals assigned the role.

The CA or the RA shall record the information identified in Section 3.2.3.1 for a Role Sponsor associated with the role before issuing a Role Certificate. The CA or the RA shall validate from the Role Sponsor that the individual Subscriber has been approved for the Role Certificate.

Subscribers issued Role Certificates shall protect the corresponding role credentials in the same manner as individual credentials.

The procedures for issuing Role Certificates shall comply with all other stipulations of this CP (e.g., Subscriber identity proofing, validation of organisation affiliation, key generation, private key protection, and Subscriber obligations).

For all Role Signature Certificates (including LSAP Code Signing, Non-Aircraft Software Code Signing and DAD Signature), the individual assigned the role or the Role Sponsor may act on behalf of the Certificate subject for Certificate management activities such as:

- Issuance;
- Re-key; and
- Revocation.

Issuance of Role Signature Certificates shall require the approval of the Role Sponsor. Re-key shall require the approval of the Role Sponsor if the validity period is extended beyond that already approved by the Role Sponsor.

For the Role Encryption Certificate, only the Role Sponsor may act on behalf of the Certificate subject for Certificate management activities such as:

- Issuance;

- Re-key; and
- Revocation.

3.2.4 Non-verified Subscriber information

Information that is not verified shall not be included in Certificates.

3.2.5 Validation of authority

Prior to issuing cross-certificates, the Issuing Bombardier PCA shall validate the external PKI domain CA Certificate requestor's authorisation to act in the name of the external PKI domain CA. In addition, the Bombardier PCA shall obtain Bombardier PMA approval prior to issuing CA Certificates.

Certificates that contain explicit or implicit organisational affiliation shall be issued only after ascertaining that the applicant has the authorisation to act on behalf of the organisation in the asserted capacity.

For Certificates which are to be loaded in aircraft avionics, a document proving the Applicant's employer's status as an airline or as another type of legitimate operator of the given aircraft, such as a copy of aircraft registration documents, must be provided.

For Certificates used by ground entities that communicate with aircraft avionics, a document proving the Applicant's employer's status as an airline as above, or as a supplier of datalink service to an airline, such as a signed contract to that effect, must be provided.

For all Code Signing Certificates, a document must be provided, proving the Subscriber's right to create and publish software within the community.

3.2.6 Criteria for interoperation

Bombardier PCAs implementing this CP shall certify other CAs (including cross-certification) only as authorised by the Bombardier PMA. Such an external PKI domain CA shall adhere to the following requirements before being approved by the Bombardier PMA for cross-certification:

- Have a CP mapped to and determined by the Bombardier PMA to be in conformance with this CP;
- Operate a PKI that has undergone a successful compliance audit pursuant to section 8 of this CP and as set forth in the Subject CA CP;
- Issue Certificates compliant with the profiles described in this CP, and make Certificate status information available in compliance with this CP;
- Provide CA Certificate and Certificate status information to the Relying Parties in compliance with this CP.

3.3 Identification and Authentication for Re-Key Requests

3.3.1 Identification and authentication for routine re-key

External PKI domain CAs and Subscribers shall be authenticated through use of their current public key certificates or by using the initial identity-proofing process as described above in section 3.2.

Re-key of CAs other than External PKI domain CAs is not permitted.

Further identification and authentication requirements apply according to the Assurance Level, as set forth in the table below.

Assurance level	Further requirements
basic-software-256 **basic-hardware-256**	No further requirements
medium-softwareCBP-256 **medium-hardwareCBP-256**	The initial identity-proofing process must be carried out at least once every nine (9) years

For external PKI domain CAs, identity shall be re-established through the initial registration process at least once every three (3) years as required by section 3.2.2.

When a current Public Key Certificate is used for identification and authentication purposes, the expiration date of the new Certificate shall not cause the Certificate Subject to exceed the initial identity-proofing time frames specified in the table and paragraph above, and the assurance level of the new certificate shall not exceed the assurance level of the certificate being used for identification and authentication purposes.

3.3.2 Identification and authentication for re-key after revocation

After a Certificate has been revoked other than during an update action, the subject (i.e., a CA or an End-Entity) is required to go through the initial registration process described in section 3.2 to obtain a new Certificate.

3.4 Identification and Authentication for Revocation Request

Revocation requests shall always be authenticated.

Requests to revoke a Certificate may be authenticated using that Certificate's associated Public Key, regardless of whether the Private Key has been compromised.

All revocation requests shall be logged.

4 Certificate Life-cycle Operational Requirements

It is the intent of this CP to identify the minimum requirements and procedures that are necessary to support trust in the PKI, and to minimise imposition of specific implementation requirements on the OA, Subscribers, and Relying Parties.

Communication among the CA, RA, Trusted Agent, other parties confirming identities, and subscriber shall have requisite security services (i.e., source authentication, integrity, non-repudiation, or confidentiality) applied to them commensurate with the Assurance Level of the certificate being managed. When cryptography is used, the mechanism shall be at least as strong as the certificates being managed. For example, a web site secured using TLS certificate issued under medium-softwareCBP-256 policy and set up with appropriate algorithms and key sizes satisfies integrity and confidentiality requirements for medium-softwareCBP-256 certificate management.

The content of communication shall dictate if some, all, or none of the security services are required.

4.1 Certificate Application

4.1.1 Who can submit a Certificate application

4.1.1.1 Application for End-Entity Certificates by an individual

The Subscriber or RA acting on behalf of the Subscriber shall submit a Certificate application to the CA.

4.1.1.2 Application for End-Entity Certificates on behalf of a device

The Device Sponsor, who needs to be a Subscriber, or an RA acting on behalf of the Subscriber, shall submit a Certificate application to the CA.

4.1.1.3 Application for CA Certificates

For CA-Certificate applications to a Bombardier Root or PCA, an authorised representative of the Subject CA shall submit the application to the Bombardier PMA.

4.1.2 Enrolment process and responsibilities

Applicants for Public Key Certificates shall be responsible for providing accurate information in their applications for certification.

Information regarding attributes shall be verified via those offices or roles that have authority to assign the information or attribute. Relationships with these offices or roles shall be established prior to commencement of CA duties, and shall be described in the applicable CPS.

For CA certificates, the Bombardier PMA shall verify all authorisations and other attribute information received from an applicant CA.

4.1.2.1 End-Entity Certificates

The applicant and the RA must perform the following steps when an applicant applies for a Certificate:

- establish and record identity of Subscriber (per section 3.2);
- obtain a public/private Key Pair for each Certificate required; and
- establish that the Public Key forms a functioning Key Pair with the Private Key held by the Subscriber (per section 3.2.1).
- provide a point of contact for verification of any roles or authorisations requested; and
- verify the authority of the applicant.

These steps may be performed in any order that is convenient for the RA and Subscribers, and that do not defeat security; but all must be completed prior to Certificate issuance.

Any electronic transmission of shared secrets shall be protected (e.g., encrypted, or using a split secret scheme where the parts of the shared secret are sent using multiple, separate channels) using means commensurate with the requirements of the data to be protected by the Certificates being issued.

4.1.2.2 CA Certificates

The Bombardier PMA shall make the procedures and application form available to entities requesting issuance of a CA Certificate from a Bombardier Root or PCA.

A Bombardier Root CA shall certify Bombardier Sub CAs implementing this CP only as authorised by the Bombardier PMA. A CPS written to the format of the *Internet X.509 Public Key Infrastructure Certificate Policy and Certification Practices Framework*, RFC 3647, shall accompany the applications of the requesting Bombardier Sub CA.

Requests by external PKI domain CAs for CA Certificates from a Bombardier PCA shall be submitted to the Bombardier PMA using the contact provided in section 1.5.

The Bombardier PMA shall evaluate the submitted application in accordance with procedures that it shall develop and publish, and make a determination regarding whether to issue the requested Certificate(s), and what policy mapping to express in the Certificate(s), if applicable[2].

The Bombardier PMA shall commission a CPS compliance analysis prior to authorising the OA to issue and manage CA Certificates asserting this CP.

Bombardier CAs shall only issue Certificates asserting the OIDs outlined in this CP upon receipt of written authorisation from the Bombardier PMA, and then may only do so within the constraints imposed by the Bombardier PMA or its designated representatives.

[2] Note that subordinated CAs (Bombardier Sub CAs) inheriting this CP do not require policy mapping.

4.2 Certificate application processing

It is the responsibility of the RA, or, in the case of a CA Certificate, the Bombardier PMA, to verify that the information in a Certificate Application is accurate.

This may be accomplished through a system approach linking trusted databases containing personnel information, other equivalent authenticated mechanisms, or through personal contact with the Subscriber's sponsoring organisation. If databases are used to confirm Subscriber information, then these databases must be protected from unauthorized modification to a level commensurate with the level of assurance of the Certificate being sought.

Specifically, the databases shall be protected using physical security controls, personnel security controls, cryptographic security controls, computer security controls, and network security controls specified for the RA elsewhere in this CP.

The applicable CPS shall specify procedures to verify information in Certificate Applications.

4.2.1 Performing identification and authentication functions

Prior to Certificate issuance, a Subscriber shall be required to sign a Subscriber Agreement containing the requirements that the Subscriber shall protect the Private Key and use the Certificate and Private Key for authorised purposes only.

4.2.2 Approval or rejection of Certificate applications

The Bombardier CAs, respective RAs, or the Bombardier PMA may approve or reject a Certificate application.

For CAs, the Bombardier PMA may approve or reject a Certificate application.

4.2.3 Time to process Certificate applications

The certificate application processing from the time the request/application is posted on the CA or RA system to Certificate issuance shall take no more than 30 days.

4.3 Certificate Issuance

Upon receiving a request to issue a Certificate, the CA shall ensure that there is no deviation in the requested attributes from the information validated as per section 4.2.

The Certificate request may contain an already built ("to-be-signed") Certificate. This Certificate must not be signed until the process set forth in this CP and the respective CPS has been met.

While the Subscriber may do most of the data entry, it is still the responsibility of the CA and the RA to verify that the information is correct and accurate. This may be accomplished through a system approach linking trusted databases containing personnel information, through other equivalent authenticated mechanisms, or through personal contact with the Subscriber's sponsoring organisation. If databases are used to confirm Subscriber information, then these databases must be protected from unauthorized modification to a level commensurate with the level of assurance of the Certificate being sought.

Specifically, the databases shall be protected using appropriate physical security controls, personnel security controls, cryptographic security controls, computer security controls, and/or network security controls specified for the RA elsewhere in this CP to a level commensurate with the level of assurance of the Certificate being sought.

4.3.1 CA actions during Certificate issuance

The CA verifies the source of a Certificate Request before issuance. Certificates shall be checked to ensure that all fields and extensions are properly populated.

The CA shall authenticate a Certificate Request, ensure that the Public Key is bound to the correct Subscriber, obtain a proof of possession of the Private Key, then generate a Certificate, and provide the Certificate to the Subscriber. The CA shall publish the Certificate to a repository in accordance with this CP and the applicable CPS. This shall be done in a timely manner, as described in section 4.9.5.

4.3.2 Notification to Subscriber by the CA of issuance of Certificate

The CA shall notify Subscribers of successful Certificate issuance in accordance with procedures set forth in the applicable CPS.

The Bombardier OA shall inform the Bombardier PMA of any Certificate issuance to a CA by a Bombardier Root or PCA. The Bombardier PMA shall inform the authorised instance of such applicant CA of the successful Certificate issuance.

Notification of Certificate issuance shall be provided to the Bombardier CAs and to cross-certified PKI domains' PMAs according to the contractual obligations established through the respective MOA by the Bombardier PMA.

4.4 Certificate Acceptance

Bombardier shall enter into a Memorandum of Agreement (MOA) with external PKI domains' legal representatives setting forth the respective responsibilities and obligations of both parties. The acceptance procedure for the respective CA Certificates shall be defined in the MOA.

4.4.1 Conduct constituting Certificate acceptance

As part of the Certificate issuance process, a Subscriber shall explicitly indicate acceptance or rejection of the Certificates to the CA as set forth in the respective CPS.

For the issuance of CA Certificates to Bombardier Sub CAs, the Bombardier PMA shall set up an acceptance procedure indicating and documenting the acceptance of the issued CA Certificate.

4.4.2 Publication of the Certificate by the CA

Certificates shall be published according to section 2 as soon as they are issued.

4.4.3 Notification of Certificate issuance by the CA to other entities

The Bombardier OA shall inform the Bombardier PMA of any cross Certificate issuance to an external PKI domain CA by a Bombardier PCA.

The Bombardier PMA shall inform the authorised representative of such applicant external PKI domain CA of the successful cross Certificate issuance.

Notification of such cross Certificate issuance shall be provided to the Bombardier CAs and to cross-certified PKI domains' PMAs according to the contractual obligations established through the respective MOA by the Bombardier PMA.

4.5 Key pair and Certificate usage

4.5.1 Subscriber Private Key and Certificate usage

Subscribers and CAs shall protect their Private Keys from access by any other party, as specified in section 6.2. Use of the Private Key corresponding to the Public Key in the Certificate, aside from initial proof-of-possession transaction with the CA, shall only be permitted once the Subscriber has agreed to the Subscriber Agreement and accepted the Certificate.

Subscribers and CAs shall use their Private Keys for the purposes as constrained by the extensions (such as key usage, extended key usage, Certificate Policies, etc.) in the Certificates issued to them. For example, the OCSP Responder Private Key shall be used only for signing OCSP responses.

Subscribers and CAs shall discontinue use of the Private Key upon expiration or revocation of the Certificate, except for decryption purposes.

4.5.2 Relying Party Public Key and Certificate usage

Reliance on a Certificate must be reasonable under the circumstances. If the circumstances indicate a need for additional assurances, the Relying Party must obtain such assurances for such reliance to be deemed reasonable.

Before any act of reliance, Relying Parties shall independently assess the following:

- the appropriateness of the use of a Certificate for any given purpose and determine that the Certificate will, in fact, be used for an appropriate purpose that is not prohibited or otherwise restricted by section 1.4.1 or 1.4.2. CAs and RAs are not responsible for assessing the appropriateness of the use of a Certificate;
- that the Certificate is being used in accordance with the keyUsage, extendedKeyUsage, and certificatePolicies field extensions included in the Certificate; and
- the status of the Certificate and all Certificates in the chain of trust, including revocation status according to section 4.9.6.

Assuming that the use of the Certificate is appropriate, Relying Parties shall utilise appropriate software and/or hardware to perform digital signature verification or other

cryptographic operations they wish to perform, as a condition of relying on Certificates in connection with each such operation. Such operations include identifying a Certificate chain and verifying the digital signatures on all Certificates in the Certificate chain.

In circumstances where a Time Stamping service is used, applications verifying software packages signed with a Medium Assurance LSAP Code Signing Certificate used for signature of Aircraft EDS crates, shall check the timestamp, and shall reject any software package which either does not have a timestamp issued by a recognized Time Stamp Authority, or whose timestamp shows a time later than the time of the check, or whose timestamp shows a time before the 'Valid before' date of the Certificate signing the software package.

4.6 Certificate Renewal

Renewing a Certificate means creating a new Certificate with the same name, key, and other information as the old one, with a new extended validity period and a new serial number. Certificates may be renewed in order to reduce the size of CRLs. A certificate may be renewed if the public key has not reached the end of its validity period, the associated private key has not been compromised, and the Subscriber name and attributes are unchanged. After certificate renewal, the old certificate may or may not be revoked, but must not be further re-keyed, renewed, or modified.

Certificate Renewal shall only be supported for OCSP Certificates, CA Cross-Certificates, or Certificates where the Certificate Lifetime is shorter than the Private Key lifetime.

4.6.1 Circumstance for Certificate renewal

A Certificate may be renewed if the Public Key has not reached the end of its validity period, the associated Private Key has not been revoked or compromised, and the Subscriber name and attributes are unchanged. In addition, the validity period of the Certificate must not exceed the remaining lifetime of the Private Key, as specified in Section 5.6. The identity proofing requirement listed in Section 3.3.1 shall also be met.

4.6.2 Who may request renewal

An external PKI domain's PMA may request renewal of its cross Certificate.

A Device Sponsor may request renewal of an OCSP Certificate.

The PMA may request renewal of a PCA's Cross-Certificates.

4.6.3 Processing Certificate renewal requests

A Certificate renewal shall be achieved using one of the following processes:

- Initial registration process as described in Section 3.2; or
- Identification & Authentication for Re-key as described in Section 3.3, except the old key can also be used as the new key.

For Cross-Certificates issued by a Bombardier PCA, Certificate renewal also requires that a valid MOA exists between the Bombardier PMA and the Subject CA, and the term of the MOA is beyond the expiry period for the new Certificate.

4.6.4 Notification of new Certificate issuance to Subscriber

See Section 4.3.2.

4.6.5 Conduct constituting acceptance of a renewal Certificate

See Section 4.4.1.

4.6.6 Publication of the renewal Certificate by the CA

See Section 4.4.2.

4.6.7 Notification of Certificate issuance by the CA to other entities

See Section 4.4.3.

4.7 Certificate Re-Key

The longer and more often a key is used, the more susceptible it is to loss or discovery. Therefore, it is important that a Subscriber periodically obtains new keys and re-establishes its identity. Re-keying a Certificate means that a new Certificate is created that has the characteristics and assurance level as the old one, except that the new Certificate has a new, different Public Key (corresponding to a new, different Private Key) and a different serial number, and it may be assigned a different validity period.

After a re-key, the old Certificate shall not be further re-keyed, renewed, or modified. Additionally, the old Certificate shall be revoked, preferably with reason “superseded”, if it is not expired.

4.7.1 Circumstance for Certificate re-key

A CA may issue a new Certificate to the Subject when the Subject has generated a new Key Pair and is entitled to a Certificate.

4.7.2 Who may request certification of a new Public Key

A Subject may request the re-key of its Certificate.

A Role Sponsor may request re-key of Role Signature (including LSAP Code Signing, Non-Aircraft Software Code Signing and DAD Signature) and Role Encryption Certificates for which he/she is the sponsor.

The individual identified in a Role Signature Certificate (including LSAP Code Signing, Non-Aircraft Software Code Signing and DAD Signature) may request re-key of his/her Role Signature Certificate.

A Device Sponsor may request re-key of a component Certificate they have sponsored.

An external PKI domain’s PMA may request re-key of its cross Certificate.

4.7.3 Processing Certificate re-keying requests

A Certificate re-key shall be achieved using one of the following processes:

- Initial registration process as described in section 3.2; or
- Identification & Authentication for Re-key as described in section 3.3.

For CA Certificates issued to other PKI domains' CAs, Certificate re-keying also requires that a valid MOA exists between Bombardier and the PMA of the respective other PKI domain CA, and the term of the MOA is beyond the expiry period for the new Certificate.

For Role Signature (including LSAP Code Signing, Non-Aircraft Software Code Signing and DAD Signature) and Role Encryption Certificates, re-key shall require the approval of the Role Sponsor if the validity period is extended beyond that already approved by the Role Sponsor.

4.7.4 Notification of new Certificate issuance to Subscriber

See section 4.3.2.

4.7.5 Conduct constituting acceptance of a re-keyed Certificate

See section 4.4.1 .

4.7.6 Publication of the re-keyed Certificate by the CA

See section 4.4.2 .

4.7.7 Notification of Certificate issuance by the CA to other entities

See section 4.4.3 .

4.8 Certificate Modification

Updating a Certificate means creating a new Certificate that has the same or a different key and a different serial number, and that it differs in one or more other fields, from the old Certificate. For example, a Bombardier Sub CA may choose to update a Certificate of a Subscriber whose characteristics have changed (e.g., has been assigned a new email address). The old Certificate may or may not be revoked, but must not be further re-keyed, renewed, or updated.

Further, if an individual's name changes (e.g., due to marriage), then proof of the name change must be provided to the RA or the Trusted Agent in order for an updated Certificate having the new name to be issued, such as by the method described in section 3.2 of this CP.

This CP supports Certificate modification only for CA Certificates.

4.8.1 Circumstance for Certificate modification

A CA may issue a new Certificate to the Subject when some of the Subject information has

changed, e.g., name change due to change in marital status, change in subject attributes, etc., and the Subject continues to be entitled to a Certificate.

4.8.2 Who may request Certificate modification

The PMA may request modification of a Bombardier CA Certificate.

An external PKI domain's PMA may request modification of its cross Certificate.

4.8.3 Processing Certificate modification requests

A Certificate modification shall be achieved using one of the following processes:

- Initial registration process as described in Section 3.2; or
- Identification & Authentication for Re-key as described in Section 3.3. In addition, the validation of the changed subject information shall be in accordance with the initial identity-proofing process as described in Section 3.2.

For Cross-Certificates issued by a Bombardier CA, Certificate modification also requires that a valid MOA exists between the PMA and the Subject CA, and the term of the MOA is beyond the expiry period for the new Certificate.

4.8.4 Notification of new Certificate issuance to Subscriber

See Section 4.3.2

4.8.5 Conduct constituting acceptance of modified Certificate

See Section 4.4.1

4.8.6 Publication of the modified Certificate by the CA

See Section 4.4.2

4.8.7 Notification of Certificate issuance by the CA to other entities

See Section 4.4.3

4.9 Certificate Revocation and Suspension

4.9.1 Circumstances for revocation

A Certificate shall be revoked when the binding between the subject and the subject's Public Key defined within a Certificate is no longer considered valid. Examples of circumstances that invalidate the binding are:

- Identifying information or affiliation components of any names in the Certificate become invalid;
- An organisation terminates its relationship with the CA such that it no longer provides affiliation information;

- Privilege attributes asserted in the Subject's Certificate are reduced;
- The Subject can be shown to have violated the stipulations of its agreement;
- The Private Key, or the media holding the Private Key, is suspected of compromise; or
- The Subject or other authorised party (as defined in this CP or the respective CPS) asks for his/her Certificate to be revoked.

Whenever any of the above circumstances occur, the associated Certificate shall be revoked and placed on the CRL. Revoked Certificates shall be included on all new publications of the Certificate status information until the Certificates expire.

In addition, if it is determined subsequent to issuance of new Certificates that a private key used to sign requests for one or more additional Certificates may have been compromised at the time the requests for additional Certificates were made, all Certificates authorized by directly or indirectly chaining back to that compromised key shall be revoked.

Bombardier PKI shall request that cross-certified PKI domains' PMAs revoke its cross Certificate if it does not meet the stipulations of the Certificate policies listed in the cross Certificate, including the cross-certified PKI domains' policy OIDs and "pass-through" policy OIDs.

4.9.2 Who can request revocation

A Certificate subject, human supervisor of a human subject, Human Resources (HR) person for the human subject, Device Sponsor for a component they have sponsored, issuing CA, or RA may request revocation of a Certificate.

For Role Signature Certificates (including LSAP Code Signing, Non-Aircraft Software Code Signing and DAD Signature), revocation may be requested by the individual identified in the Certificate or by the Role Sponsor.

Role Encryption Certificate revocation may only be requested by the Role Sponsor.

In the case of CA Certificates issued to another PKI domain by a Bombardier PCA, the external PKI domain PMA or the Bombardier PMA may request revocation of a Certificate.

For CA Certificates, authorised individuals representing the CA Operational Authority may request revocation of Certificates.

Notwithstanding the above, a Bombardier CA may, at its sole discretion, revoke any Subscriber or Device Certificate it has issued for reasons outlined in section 4.9.1.

4.9.3 Procedure for revocation request

A request to revoke a Certificate shall identify the Certificate to be revoked, explain the reason for revocation, and allow the request to be authenticated (e.g., digitally or manually signed).

Any CA may unilaterally revoke a CA Certificate it has issued. However, the Operational Authority for Bombardier CAs shall revoke a Subject CA Certificate only in the case of an emergency. Generally, the Certificate will be revoked based on the subject request,

authorised representative of subject request, or PMA request.

Upon receipt of a revocation request, a CA shall authenticate the request and then revoke the Certificate. In the case of a CA Certificate issued by a Bombardier Root or PCAs, the Operational Authority shall seek guidance from the Bombardier PMA before revocation of the Certificate except when the Bombardier PMA is not available and there is an emergency situation such as:

- Request from the Subject CA for reason of key compromise;
- Determination by the Operational Authority that a Subject CA key is compromised; or
- Determination by the Operational Authority that a Subject CA is in violation of this CP, an applicable CPS, or a contractual obligation to a degree that threatens the integrity of the Bombardier PKI.

For Certificates issued by a Bombardier Sub CA whose operation involves the use of a cryptographic hardware token, a Subscriber ceasing its relationship with the organisation that sponsored the Certificate shall, prior to departure, surrender to the organisation (through any accountable mechanism) all cryptographic hardware tokens that were issued by or on behalf of the sponsoring organisation. The token shall be returned to Bombardier and disposed of in accordance with section 6.2.10 promptly upon surrender and shall be protected from malicious use between surrender and such disposition.

If a Subscriber leaves an organisation and the hardware tokens cannot be obtained from the Subscriber, then all Subscriber Certificates associated with the un-retrieved tokens shall be immediately revoked for the reason of key compromise.

4.9.4 Revocation request grace period

There is no revocation grace period. The parties identified in section 4.9.2 must request revocation as soon as they identify the need for revocation.

4.9.5 Time within which CA must process the revocation request

Bombardier Root and PCAs shall process all revocation requests for CA Certificates within six (6) hours of receipt of request.

For Bombardier Sub CAs, processing time for Subscriber Certificate revocation requests shall be as specified below:

Assurance Level	Processing Time for Revocation Requests
basic-software-256 basic-hardware-256	Within thirty-six (36) hours of receipt of request
medium-softwareCBP-256 medium-hardwareCBP-256	Before next CRL is generated unless request is received within 2 hours of CRL generation

4.9.6 Revocation checking requirement for Relying Parties

Use of revoked Certificates could have damaging or catastrophic consequences in certain applications. The matter of how often new revocation data should be obtained is a determination to be made by the Relying Party and the system accreditor. If it is temporarily infeasible to obtain revocation information, then the Relying Party must either reject use of the Certificate, or make an informed decision to accept the risk, responsibility, and consequences for using a Certificate whose authenticity cannot be guaranteed to the standards of this policy. Such use may occasionally be necessary to meet urgent operational requirements.

4.9.7 CRL issuance frequency

CRLs shall be issued periodically, even if there are no changes to be made, to ensure timeliness of information. Certificate status information may be issued more frequently than the issuance frequency described below.

A CA shall ensure that superseded Certificate status information is removed from the PKI Repository upon posting of the latest Certificate status information.

Certificate status information shall be published not later than the next scheduled update. This will facilitate the local caching of Certificate status information for offline or remote (laptop) operation. PKI participants shall coordinate with the PKI Repositories to which they post Certificate status information to reduce latency between creation and availability.

The following table provides CRL issuance frequency requirements.

Reason	CRL Issuance Frequency
Routine	CAs that are offline and do not issue End-Entity Certificates except for internal operations must issue CRLs at least once every 30 days. At least once every twenty-four (24) hours for all others.
Loss or Compromise of Private Key	Within eighteen (18) hours of request for revocation.
CA Compromise	Immediately, but no later than eighteen (18) hours after notification of such compromise.

CAs that issue routine CRLs less frequently than the requirement for Emergency CRL issuance (i.e., CRL issuance for loss or compromise of key or for compromise of CA) shall meet the requirements specified above for issuing Emergency CRLs.

Such CAs shall also be required to notify the other cross-certified PKI domains' Operational Authorities upon Emergency CRL issuance. This requirement shall be included in the respective MOA between Bombardier and other respective PKI domains' responsible organisations.

For offline Root CAs, the *nextUpdate* shall be less than or equal to *thisUpdate* plus 45 days.

For all other CAs, the *nextUpdate* shall be less than or equal to *thisUpdate* plus 48 hours.

4.9.8 Maximum latency for CRLs

The maximum delay between the time a Subscriber Certificate revocation request is received by a CA and the time that this revocation information is available to Relying Parties shall be no greater than twenty-four (24) hours.

The CRL shall be subject to the Repository availability requirements in section 2.1. Care shall be taken by the CA to ensure that the public copy is replaced atomically when it is being updated.

4.9.9 On-line revocation/status checking availability

In addition to CRLs, CAs and Relying Party client software may optionally support on-line status checking. Client software using on-line status checking need not obtain or process CRLs.

If a CA supports on-line revocation/status checking, the latency of Certificate status information distributed on-line by the CA or its delegated status responders shall meet or exceed the requirements for CRL issuance stated in 4.9.7.

The OCSP availability requirements shall be specified in the relevant Relying Party Agreement.

4.9.10 On-line revocation checking requirements

The Bombardier CAs are not required to operate an OCSP Responder covering the Certificates they issue.

If OCSP is implemented, the Bombardier PKI Repository shall contain and publish a list of all OCSP Responders operated by the Bombardier CAs. In addition, the OCSP service shall comply with the Internet Engineering Task Force (IETF) RFC 6960 to meet security and interoperability requirements.

4.9.11 Other forms of revocation advertisements available

Any alternate forms used to disseminate revocation information shall be implemented in a manner consistent with the security and latency requirements for the implementation of CRLs and on-line revocation and status checking.

Any alternative method must meet the following requirements:

- the alternative method must be described in the applicable approved CPS; and
- the alternative method must provide authentication and integrity services commensurate with the Assurance Level of the Certificate being verified.

4.9.12 Special requirements related to key compromise

None beyond those stipulated in section 4.9.7.

4.9.13 Circumstances for suspension

Certificate suspension is not supported by this CP.

4.9.14 Who can request suspension

Not supported.

4.9.15 Procedure for suspension request

Not supported.

4.9.16 Limits on suspension period

Not supported.

4.10 Certificate status services

The Bombardier PKI is not required to support Server-based Certificate Validation Protocol (SCVP).

4.10.1 Operational characteristics

No stipulation.

4.10.2 Service availability

Relying Parties are bound to their obligations and the stipulations of this CP irrespective of the availability of the Certificate status service.

4.10.3 Optional features

No stipulation.

4.11 End of subscription

Certificates that have expired prior to or upon end of subscription are not required to be revoked.

Unexpired CA Certificates shall always be revoked at the end of subscription.

4.12 Key escrow and recovery

4.12.1 Key escrow and recovery policy and practices

Under no circumstances shall a CA or End-Entity signature key be escrowed by a third-party.

For Bombardier CAs that escrow the private keys of encryption certificates, a Key Recovery Policy and a Key Recovery Practise Statement (KRPS) shall be developed. The Bombardier PMA shall ensure that the PKI operates in compliance with the KRPS.

4.12.2 Session key encapsulation and recovery policy and practices

This CP does not support the recovery of session keys.

5 Facility, Management, and Operational Controls

5.1 Physical Controls

5.1.1 Site Location and Construction

The location and construction of the facility housing CA and CSA equipment shall be consistent with facilities used to house high value, sensitive information. The site location and construction, when combined with other physical security protection mechanisms such as guards and intrusion sensors, shall provide robust protection against unauthorised access to the CA equipment and records.

5.1.2 Physical Access

5.1.2.1 CA Physical Access

CA and CSA equipment shall always be protected from unauthorised access. The physical security requirements pertaining to CA and CSA equipment are:

1. Ensure no unauthorised access to the hardware is permitted
2. Ensure all removable media and paper containing sensitive plain-text information is stored in secure containers
3. Ensure manual or electronic monitoring for unauthorised intrusion at all times
4. Ensure an access log is maintained and inspected periodically
5. Provide at least three (3) layers of increasing security such as perimeter, building, and CA room
6. For CAs asserting:
    a. Only Basic Assurance Levels and/or lower: Require controls to physical access and cryptographic modules consistent with those used for commercially sensitive systems
    b. All other Assurance Levels: Require two (2) person physical access control to both the cryptographic module and computer system
7. If a CA shares physical location with a CA of a higher Assurance Level, the CA's physical controls must be as if it were operating at that higher Assurance Level.

Removable cryptographic modules shall be deactivated prior to storage. When not in use, removable cryptographic modules, activation information used to access or enable cryptographic modules shall be placed in secure containers. Activation data shall either be memorised or recorded and stored in a manner commensurate with the security afforded the cryptographic module, and shall not be stored with the cryptographic module.

A security check of the facility housing the CA or CSA equipment shall occur if the facility is to be left unattended. At a minimum, the check shall verify the following:

- The equipment is in a state appropriate to the current mode of operation (e.g., that

cryptographic modules are in place when “open”, and secured when “closed”);

- For offline CAs and CSA, all equipment other than the PKI Repository is shut down;
- Any security containers are properly secured;
- Physical security systems (e.g., door locks, vent covers) are functioning properly; and
- The area is secured against unauthorised access.

A person or group of persons shall be made explicitly responsible for making such checks. When a group of persons is responsible, a log identifying the person performing a check at each instance shall be maintained. If the facility is not continuously attended, the last person to depart shall initial a sign-out sheet that indicates the date and time and asserts that all necessary physical protection mechanisms are in place and activated.

5.1.2.2 RA Equipment Physical Access

RA equipment shall be protected from unauthorised access while the RA cryptographic module is installed and activated. The RA shall implement physical access controls to reduce the risk of equipment tampering even when the cryptographic module is not installed and activated. These security mechanisms shall be commensurate with the level of threat in the RA equipment environment.

5.1.3 Power and air conditioning

CAs shall have backup power sufficient to automatically lockout input, finish any pending actions, and record the state of the equipment before lack of power or air conditioning causes a shutdown. PKI Repositories shall be provided with Uninterruptible Power sufficient for a minimum of six (6) hours operation in the absence of commercial power, to support continuity of operations.

5.1.4 Water exposures

Protection against water exposures shall be in conformance with Bombardier standard data centre procedures. CA equipment shall be installed such that it is not in danger of exposure to water (e.g., on tables or elevated floors). Water exposure from fire prevention and protection measures (e.g. sprinkler systems) are excluded from this requirement.

5.1.5 Fire prevention and protection

Fire prevention and protection means shall be in conformance with Bombardier standard data centre procedures.

5.1.6 Media storage

CA media shall be stored so as to protect it from accidental damage (water, fire, electromagnetic), theft and unauthorized access. Media that contains audit, archive, or backup information shall be duplicated and stored in a location separate from the CA

location.

5.1.7 Waste disposal

Sensitive waste material shall be disposed of in a secure fashion.

5.1.8 Off-site backup

Full system backups of the CAs, sufficient to recover from system failure, shall be made on a periodic schedule, described in the respective CPS. Backups shall be performed and stored offsite not less than once every seven (7) days, unless the CA is offline, in which case, it shall be backed up whenever it is activated or every 7 days, whichever is later. At least one (1) full backup copy shall be stored at an offsite location (at a location separate from the CA equipment). Only the latest full backup need be retained. The backup data shall be protected with physical and procedural controls commensurate to that of the operational CA. Regular testing of backup data shall be performed to ensure that the data can be restored.

5.2 Procedural Controls

5.2.1 Trusted roles

A trusted role is one whose incumbent performs functions that can introduce security problems if not carried out properly, whether accidentally or maliciously. The people selected to fill these roles must be extraordinarily responsible or the integrity of the CA is weakened. The functions performed in these roles form the basis of trust for all uses of the CA. Two approaches are taken to increase the likelihood that these roles can be successfully carried out. The first ensures that the person filling the role is trustworthy and properly trained. The second distributes the functions among more than one person, so that any malicious activity would require collusion.

The requirements of this policy are drawn in terms of four roles:

- CA System Administrator – authorised to install, configure, and maintain the CA; establish and maintain user accounts; configure profiles and audit parameters; and generate component keys.
- Registration Authority – authorised to request or to approve Certificates or Certificate revocations.
- Audit Administrator – authorised to view and maintain audit logs.
- Operator – authorised to perform system backup and recovery.

The following sections define these and other trusted roles.

5.2.1.1 CA System Administrator

The CA System Administrator shall be responsible for:

- Installation, configuration, and maintenance of the CA;

- Establishing and maintaining CA system accounts;
- Configuring Certificate profiles or templates and audit parameters; and
- Generating and backing up CA keys.

CA System Administrators shall not issue Certificates to Subscribers.

5.2.1.2 Registration Authority

Personnel designated as Registration Authorities shall be responsible for issuing Certificates; that is:

- Registering new applicants and requesting the issuance of Certificates;
- Verifying the identity of applicants and accuracy of information included in Certificates;
- Entering Subscriber Information, and verifying correctness;
- Approving and executing the issuance of Certificates;
- Requesting, approving and executing the revocation of Certificates;
- Securely communicating requests to, and responses from, the CA; and
- Receiving and distributing Subscriber Certificates.

The RA Role is highly dependent on the Public Key Infrastructure implementations and local requirements. The responsibilities and controls for RAs shall be explicitly described in the applicable CPS.

A Trusted Agent must not act as a Registration Authority.

5.2.1.3 Audit Administrator

The Audit Administrator shall be responsible for:

- Reviewing, maintaining, and archiving audit logs; and
- Performing or overseeing internal compliance audits to ensure that the CA is operating in accordance with the applicable CPSs.

5.2.1.4 Operator

The operator shall be responsible for the routine operation of the CA equipment and operations such as system backups and recovery or changing recording media.

5.2.1.5 CSA Roles

A CSA shall have at least the following roles.

The CSA administrator shall be responsible for:

- Installation, configuration, and maintenance of the CSA;
- Establishing and maintaining CSA system accounts;
- Configuring CSA application and audit parameters, and;

- Generating and backing up CSA keys.

The CSA Audit Administrator shall be responsible for:

- Reviewing, maintaining, and archiving audit logs; and
- Performing or overseeing internal compliance audits to ensure that the CSA is operating in accordance with its CPS.

The CSA Operator shall be responsible for the routine operation of the CSA equipment and operations such as system backups and recovery or changing recording media.

5.2.1.6 Device Sponsor

A Device Sponsor fills the role of a Subscriber for non-human system components that are named as Public Key Certificate subjects. The Device Sponsor works with the RAs to register components (routers, firewalls, etc.) in accordance with section 3.2.3.2 and is responsible for meeting the obligations of Subscribers as defined throughout this document.

A Device Sponsor need not be a trusted role but should have been issued a credential that is equal to or higher Assurance Level than the credential that they are sponsoring.

5.2.1.7 Trusted Agent

A Trusted Agent is responsible for:

- Verifying identity, pursuant to section 3.2; and
- Securely communicating Subscriber information to the RA.

A Trusted Agent is NOT a trusted role.

5.2.1.8 Role Sponsor

A Role Sponsor is a Subscriber responsible for the management activities pertaining to the Roles Certificates for which he/she is the sponsor. The Role Sponsor shall hold an individual Certificate in his/her own name issued by the same CA (or by another PKI approved by the Bombardier PKI PMA) at the same or higher assurance level as the Role Certificate being requested for Subscribers. The Role Sponsor need not hold a Role Certificate.

In addition, the Role Sponsor shall be responsible for:

- Authorizing individuals for a Role Certificate;
- Recovery of private decryption keys associated with Role Encryption Certificates;
- Revocation of individual Role Certificates;
- Always maintaining a current up-to-date list of individuals who have been issued Role Certificates; and
- Always maintaining a current up-to-date list of individuals who have been provided decryption private keys associated with Role Encryption Certificates.

A Role Sponsor is NOT a trusted role.

5.2.2 Number of persons required per task

Two (2) or more persons shall be required to perform the following tasks:

- CA and CSA Signing key generation;
- CA and CSA Signing key activation; and
- CA and CSA Signing Private Key backup.

Where multiparty control is required, at least one of the participants shall be an Administrator. All participants shall serve in a trusted role as defined in section 5.2.1.

Multiparty control shall not be achieved using personnel that serve in the Audit Administrator Role.

It is recommended that multiple persons be assigned to all roles in order to support continuity of operations.

5.2.3 Identification and authentication for each role

An individual in a Trusted Role shall identify and authenticate him/herself before being permitted to perform any actions set forth above for that role.

An individual in a Trusted Role shall authenticate to remote components of the PKI using a method commensurate with the strength of the PKI.

5.2.4 Roles requiring separation of duties

Role separation, when required as set forth below, may be enforced either by the CA equipment, or procedurally, or by both means.

Individual CA and CSA personnel shall be specifically designated to the four roles defined in section 5.2.1 above, as applicable. Individuals may assume more than one role, except:

- Individuals who assume a Registration Authority role may not assume an Administrator role;
- Individuals who assume an Audit Administrator role shall not assume any other role; and
- An individual fulfilling the role of Trusted Agent shall not hold any other role within the same CA, except the role of Registration Authority, and shall not perform its own compliance auditor function.
- Under no circumstances shall any of the four roles perform their own compliance auditor function.

No individual fulfilling any of the roles outlined in section 5.2.1 shall be assigned more than one identity.

5.3 Personnel Controls

5.3.1 Qualifications, experience, and clearance requirements

All of the individuals responsible and accountable for the operation of each CA and CSA shall be identified. The trusted roles of these individuals per section 5.2.1 shall be identified.

All persons filling trusted roles shall be selected on the basis of loyalty, trustworthiness, and integrity, and shall be subject to background investigation to the extent allowed by law. Personnel appointed to CA trusted roles, CSA trusted roles, and RA role shall:

- Have successfully completed an appropriate training program;
- Have demonstrated the ability to perform their duties;
- Be trustworthy;
- Have no other duties that would interfere or conflict with their duties for the trusted role;
- Have not been previously relieved of duties for reasons of negligence or non-performance of duties;
- Have not been denied a security clearance, or had a security clearance revoked for cause;
- Have not been convicted of a serious crime or other offence which affects his/her suitability for the position; and
- Be appointed in writing by an approving authority

For CAs issuing Certificates at Medium (or higher) Assurance Levels (excluding CAs operating only at the CBP Assurance Levels), each person filling a trusted role shall satisfy the following two requirements:

- One of:
  - The person shall be a citizen of the country where the CA is located; or
  - For CAs located within the European Union, the person shall be a citizen of one of the member states of the European Union; and
- For jurisdictions where obtaining a suitable criminality check or financial verification is not possible, CA/CSA System Administrators, Audit Administrators, CA/CSA Operators, and RA Trusted Roles shall have a security clearance equivalent to U.S. Secret or higher issued by a NATO member nation or major non-NATO ally as defined by the International Traffic in Arms Regulation (ITAR) - 22 CFR 120.32.

For RAs, Trusted Agents, and personnel appointed to the trusted roles for the CSAs, in addition to the above, the person may be a citizen of the country where the function is located.

If a given CA shall only be operating at a Basic Assurance Level and/or lower, it is permissible for the trusted roles for that CA not to have any specific clearance or

qualification beyond those normally applied to hiring employees of Bombardier, or of those normally stipulated for Bombardier contractors, providing that any such trusted roles do not have any access, privilege or permission on any CA operating at any other Assurance Level higher than the given Basic Assurance Level, and that any component of the Basic Assurance Level CA does not share a logical or physical location with a CA of any other Assurance Level higher than itself.

5.3.2 Background check procedures

For CAs operating at Assurance Levels other than only CBP levels, the stipulations in the remainder of this section apply.

All persons filling CA trusted roles, CSA trusted roles, and RA roles shall have completed a background investigation as allowed by applicable national law or regulation. The scope of the background check shall include the following areas covering the past five (5) years and should be refreshed every three (3) years:

- Employment;
- Education (Regardless of the date of award, the highest educational degree shall be verified);
- Place of residence;
- Law Enforcement; and
- References

Adjudication of the background investigation shall be performed in accordance with the requirements of the appropriate national adjudication authority.

The results of these checks shall not be released except as required in sections 9.3 and 9.4.

Background check procedures shall be described in the CPS.

5.3.3 Training requirements

All personnel performing duties with respect to the operation of a CA, CSA, or individuals performing Trusted Agent or RA roles shall receive comprehensive training.

Training shall be conducted in the following areas:

- CA/CSA/RA security principles and mechanisms
- All PKI software versions in use on the CA system, as appropriate to their duties
- All PKI duties they are expected to perform
- Disaster recovery and business continuity procedures

Documentation shall be maintained identifying all personnel who received training and the level of training completed.

5.3.4 Retraining frequency and requirements

Individuals responsible for trusted roles shall be aware of changes in the CA, CSA, or RA operations, as applicable. Any significant change to the operations shall have a training (awareness) plan, and the execution of such plan shall be documented. Examples of such changes are CA software or hardware upgrade, RA software upgrades, changes in automated security systems, and relocation of equipment.

5.3.5 Job rotation frequency and sequence

No Stipulation.

5.3.6 Sanctions for unauthorised actions

The Bombardier PMA shall ensure appropriate administrative and disciplinary actions are taken against personnel who violate this policy in accordance with local labour laws.

5.3.7 Independent contractor requirements

Sub-Contractor personnel employed to perform functions pertaining to CA, CSA, or RA operations shall meet applicable requirements set forth in this CP (e.g., all requirements of section 5.3).

5.3.8 Documentation supplied to personnel

The CA and CSA shall make available to its personnel the Certificate Policies they support, the CPS, and any relevant statutes, policies or contracts. Other technical, operations, and administrative documents (e.g., Administrator Manual, User Manual, etc.) shall be provided in order for the trusted personnel to perform their duties.

5.4 Audit Logging Procedures

Audit log files shall be generated for all events relating to the security of the CAs, CSAs, and RAs. Where possible, the security audit logs shall be automatically collected. Where this is not possible, a logbook, paper form, or other physical mechanism shall be used. All security audit logs, both electronic and non-electronic, shall be retained and made available during compliance audits. The security audit logs for each auditable event defined in this section shall be maintained in accordance with section 5.5.2.

5.4.1 Types of events recorded

All security auditing capabilities of the CA, CSA, and RA operating system and the CA, CSA, and RA applications required by this CP shall be enabled. As a result, most of the events identified in the table shall be automatically recorded.

At a minimum, each audit record shall include the following (either recorded automatically or manually for each auditable event):

- The type of event,
- The date and time the event occurred,

- Success or failure where appropriate,
- The identity of the entity and/or operator that caused the event,
- A message from any source requesting an action by a CA is an auditable event. The message must include message date and time, source, destination and contents.

The following events shall be audited:

Auditable Event	CA	CSA	RA
SECURITY AUDIT			
Any changes to the Audit parameters, e.g., audit frequency, type of event audited	X	X	X
Any attempt to delete or modify the Audit logs	X	X	X
Obtaining a third-party time-stamp	X	X	X
IDENTITY-PROOFING			
Successful and unsuccessful attempts to assume a role	X	X	X
The value of maximum number of authentication attempts is changed	X	X	X
The number of unsuccessful authentication attempts exceeds the maximum authentication attempts during user login	X	X	X
An Administrator unlocks an account that has been locked as a result of unsuccessful authentication attempts	X	X	X
An Administrator changes the type of authenticator, e.g., from a password to a biometric	X	X	X
LOCAL DATA ENTRY			
All security-relevant data that is entered in the system	X	X	X
REMOTE DATA ENTRY			
All security-relevant messages that are received by the system	X	X	X
DATA EXPORT AND OUTPUT			
All successful and unsuccessful requests for confidential and security-relevant information	X	X	X
KEY GENERATION			
Whenever the Component generates a key (not mandatory for single session or one-time use symmetric keys)	X	X	X
PRIVATE KEY LOAD AND STORAGE			
The loading of Component Private Keys	X	X	X

Auditable Event	CA	CSA	RA
All access to Certificate subject Private Keys retained within the CA for key recovery purposes	X	N/A	N/A
TRUSTED PUBLIC KEY ENTRY, DELETION AND STORAGE			
All changes to the trusted Component Public Keys, including additions and deletions	X	X	X
SECRET KEY STORAGE			
The manual entry of secret keys used for authentication	X	X	X
PRIVATE AND SECRET KEY EXPORT			
The export of private and secret keys (keys used for a single session or message are excluded)	X	X	X
CERTIFICATE REGISTRATION			
All Certificate requests	X	N/A	X
CERTIFICATE REVOCATION			
All Certificate revocation requests	X	N/A	X
CERTIFICATE STATUS CHANGE APPROVAL			
The approval or rejection of a Certificate status change request	X	N/A	N/A
CA CONFIGURATION			
Any security-relevant changes to the configuration of the Component	X	X	X
ACCOUNT ADMINISTRATION			
Roles and users are added or deleted	X	N/A	N/A
The access control privileges of a user account or a role are modified	X	N/A	N/A
CERTIFICATE PROFILE MANAGEMENT			
All changes to the Certificate profile	X	N/A	N/A
CERTIFICATE STATUS AUTHORITY MANAGEMENT			
All changes to the CSA profile (e.g., OCSP profile)	N/A	X	N/A
REVOCATION PROFILE MANAGEMENT			
All changes to the revocation profile	X	N/A	N/A
CERTIFICATE REVOCATION LIST PROFILE MANAGEMENT			

Auditable Event	CA	CSA	RA
All changes to the Certificate revocation list profile	X	N/A	N/A
MISCELLANEOUS			
Appointment of an individual to a Trusted Role	X	X	X
Designation of personnel for multiparty control	X	N/A	N/A
Installation of the Operating System	X	X	X
Installation of the PKI Application	X	X	X
Installation of hardware cryptographic modules	X	X	X
Removal of hardware cryptographic modules	X	X	X
Destruction of cryptographic modules	X	X	X
System Start-up	X	X	X
Logon attempts to PKI Application	X	X	X
Receipt of hardware / software	X	X	X
Attempts to set passwords	X	X	X
Attempts to modify passwords	X	X	X
Back up of the internal CA database	X	N/A	N/A
Restoration from back up of the internal CA database	X	N/A	N/A
File manipulation (e.g., creation, renaming, moving)	X	N/A	N/A
Posting of any material to a PKI Repository	X	N/A	N/A
Access to the internal CA database	X	X	N/A
All Certificate compromise notification requests	X	N/A	X
Loading tokens with Certificates	X	N/A	X
Shipment of Tokens	X	N/A	X
Zeroising Tokens	X	N/A	X
Re-key of the Component	X[3]	X	X
CONFIGURATION CHANGES			
Hardware	X	X	N/A
Software	X	X	X
Operating System	X	X	X
Patches	X	X	N/A
Security Profiles	X	X	X

[3] While this CP prohibits re-key of a Bombardier PKI CA, the audit control should still record any attempt to re-key the CA.

Auditable Event	CA	CSA	RA
PHYSICAL ACCESS / SITE SECURITY			
Personnel Access to room housing Component	X	N/A	N/A
Access to the Component	X	X	N/A
Known or suspected violations of physical security	X	X	X
ANOMALIES			
Software error conditions	X	X	X
Software check integrity failures	X	X	X
Receipt of improper messages	X	X	X
Misrouted messages	X	X	X
Network attacks (suspected or confirmed)	X	X	X
Equipment failure	X	N/A	N/A
Electrical power outages	X	N/A	N/A
Uninterruptible Power Supply (UPS) failure	X	N/A	N/A
Obvious and significant network service or access failures	X	N/A	N/A
Violations of Certificate Policy	X	X	X
Violations of Certification Practice Statement	X	X	X
Resetting Operating System clock	X	X	X

5.4.2 Frequency of processing audit logs

Audit logs shall be reviewed at least once every thirty (30) days, unless the CA is offline, in which case the audit logs shall be reviewed when the system is activated or every 30 days, whichever is later.

Statistically significant sample of security audit data generated by the CA, CSA, or RA since the last review shall be examined (where the confidence intervals for each category of security audit data are determined by the security ramifications of the category and the availability of tools to perform such a review), as well as a reasonable search for any evidence of malicious activity. The Audit Administrator shall explain all significant events in an audit log summary.

Such reviews involve verifying that the log has not been tampered with, there is no discontinuity or other loss of audit data, and then briefly inspecting all log entries, with a more thorough investigation of any alerts or irregularities in the logs.

Actions taken as a result of these reviews shall be documented.

5.4.3 Retention period for audit logs

Audit logs shall be retained onsite for at least sixty (60) days as well as being retained in

the manner described in section 5.5. For the CA and CSA, the Audit Administrator shall be the only person responsible to manage the audit log (e.g., review, backup, rotate, delete, etc.). For RA, a System Administrator other than the RA shall be responsible for managing the audit log.

5.4.4 Protection of audit logs

System configuration and procedures shall be implemented together to ensure that:

- Only authorised people shall have read access to the audit logs. For the CA, and CSA, the only authorised individual shall be the Audit Administrator. For an RA, the authorised individual shall be a system administrator other than the RA;
- Only authorised people may archive audit logs; and,
- Audit logs shall not be modified.

The person performing audit log archive need not have modify access, but procedures must be implemented to protect archived data from destruction prior to the end of the audit log retention period (note that deletion requires modification access).

Audit logs shall be moved to a safe, secure storage location separate from the CA equipment.

It is acceptable for the system to over-write audit logs after they have been backed up and archived.

5.4.5 Audit log backup procedures

Audit logs and audit summaries shall be backed up at least once every thirty (30) days, unless the CA is offline, in which case audit logs and audit summaries shall be backed up when the system is activated or every 30 days, whichever is later. A copy of the audit log shall be sent off-site in accordance with the CPS following review.

5.4.6 Audit collection system (internal vs. external)

The audit log collection system may or may not be external to the CA, CSA, or RA. Audit processes shall be invoked at system start-up, and cease only at system shutdown. Should it become apparent that an automated audit system has failed, and the integrity of the system or confidentiality of the information protected by the system is at risk, then the CA shall determine whether to suspend CA operation until the problem is remedied.

5.4.7 Notification to event-causing subject

This CP imposes no requirement to provide notice that an event was audited to the individual, organisation, device, or application that caused the event.

5.4.8 Vulnerability assessments

No stipulation beyond section 5.4.2.

5.5 Records Archival

5.5.1 Types of records archived

CA, CSA, and RA archive records shall be sufficiently detailed to establish the proper operation of the component or the validity of any Certificate (including those revoked or expired) issued by the CA.

Data To Be Archived	RootCA / CA	CSA	RA
Certification Practice Statement	X/X	X	X
Certificate Policy	X	X	X
Contractual obligations	X/X	X	X
System and equipment configuration	X/X	X	-
Modifications and updates to system or configuration	X/X	X	-
Certificate requests	X/X	-	-
Revocation requests	X/X	-	-
Subscriber identity authentication data as per section 3.2.3	N/A / X	N/A	X
Documentation of receipt and acceptance of Certificates, including Subscriber Agreements	X/X	N/A	X
Documentation of receipt of Tokens	N/A / X	N/A	X
All Certificates issued or published	X/X	N/A	N/A
Record of Component CA Re-key	N/A / N/A	X	X
All CRLs and CRLs issued and / or published	X/X	N/A	N/A
All Audit Logs	X/X	X	X
Other data or applications to verify archive contents	X/X	X	X
Documentation required by compliance auditors	X/X	X	X
Compliance Audit Reports	X	X	X

5.5.2 Retention period for archive

The retention period for archive data shall depend on the legal and business requirements and is set forth in the respective CPS. However, the archive data must be kept for a minimum retention period of ten (10) years and six (6) months.

If the original media cannot retain the data for the required period, a mechanism to periodically transfer the archived data to new media shall be defined by the archive site.

Applications required processing the archive data shall also be maintained for the minimum retention period specified above.

5.5.3 Protection of archive

No unauthorised user shall be permitted to write to, modify, or delete the archive. For the CA and CSA, the authorised individuals are Audit Administrators. For the RA digital archives, authorised individuals are someone other than the RA. The contents of the archive shall not be released except as determined by the Bombardier PMA for the Bombardier PKI CAs, or as required by law. Records of individual transactions may be released upon request of any Subscribers involved in the transaction or their legally recognised agents. Archive media shall be stored in a safe, secure storage facility separate from the component (CA, CSA, or RA) with physical and procedural security controls equivalent or better than those for the component. The archive shall also be adequately protected from environmental threats such as temperature, humidity, radiation, and magnetism.

5.5.4 Archive backup procedures

Adequate and regular backup procedures shall be in place so that in the event of loss or destruction of the primary archives, a complete set of backup copies held in a separate location will be available. The CPS or a referenced document shall describe how archive records are backed up, and how the archive backups are managed.

5.5.5 Requirements for time-stamping of records

CA archive records shall be automatically time-stamped as they are created. The CPS shall describe how system clocks used for time-stamping are maintained in synchrony with an authoritative time standard.

5.5.6 Archive collection system (internal or external)

No stipulation.

5.5.7 Procedures to obtain and verify archive information

Procedures detailing how to create, verify, package, transmit and store archive information shall be described in the applicable CPS.

5.6 Key Changeover

To minimise risk from compromise of a CA's private signing key, that key may be changed often; from that time on, only the new key shall be used for Certificate signing purposes. The older, but still valid, Certificate will be available to verify old signatures until all of the Certificates signed using the associated Private Key have also expired. If the old Private Key is used to sign CRLs, then the old key shall be retained and protected. The key

changeover processes shall be described in the applicable CPS.

The following table provides the maximum lifetimes for Certificates and associated Private Keys.

Key	2048 Bits		4096 Bit Keys	
	Private Key	Certificate	Private Key	Certificate
Bombardier Root CAs	20 years	20 years	20 years	20 years
Bombardier Sub CAs	10 years	13 years	10 years	13 years
Subscriber Identity or Signature	3 years	≤ 3 years	Not implemented	Not implemented
Subscriber Encryption	Unrestricted	≤ 3 years	Not implemented	Not implemented
LSAP Code Signing	3 years	≤ 3 years	Not implemented	Not implemented
Non-Aircraft Software Code Signing	3 years	≤ 3 years	Not implemented	Not implemented
DAD Signature	3 years	≤ 3 years	Not implemented	Not implemented
Role Encryption	Unrestricted	≤ 3 years	Not implemented	Not implemented
Server or Device Identity or Signature	3 years	≤ 3 years	Not implemented	Not implemented
Server or Device Encryption	Unrestricted	≤ 3 years	Not implemented	Not implemented
OCSP Responders	≤ 3 years	45 days	Not implemented	Not implemented
SCVP Servers	≤ 1 year or 500 000 signatures	≤ 3 years	Not implemented	Not implemented
TSA	≤ 1 year	≤ 20 years	Not implemented	Not implemented

No CA shall have a private key whose validity period exceeds 20 years. Cross-Certificates shall not have a validity period exceeding 10 years.

A CA shall not generate a Certificate for a Subscriber whose validity period would be longer than the CA Certificate validity period. As a consequence, the CA Key Pair shall be changed at the latest at the time of CA Certificate expiration minus Subscriber Certificate validity duration.

Notwithstanding the above table, in all cases the CA private key may be used to sign OCSP Certificates and CRLs until the CA Certificate expires.

5.7 Compromise and Disaster Recovery

5.7.1 Incident and compromise handling procedures

A formal disaster recovery plan shall exist for the Bombardier PKI Domain.

If a CA or CSA detects a potential cracking attempt or other form of compromise, it shall perform an investigation in order to determine the nature and the degree of damage. If the CA or CSA key is suspected of compromise, the procedures outlined in section 5.7.3 shall be followed. Otherwise, the scope of potential damage shall be assessed in order to determine if the CA or CSA needs to be rebuilt, only some Certificates need to be revoked, and/or the CA or CSA key needs to be declared compromised.

The Bombardier PMA members shall be notified if any of the following cases occur:

- suspected or detected compromise of a Bombardier CA system;
- physical or electronic attempts to penetrate a Bombardier CA system;
- denial of service attacks on a Bombardier CA component;
- any incident preventing a Bombardier CA from issuing a CRL within twenty-four (24) hours of the time specified in the next update field of its currently valid CRL.

The Bombardier PMA members and other domain PKI (who entered a MOA with Bombardier) PMA members shall be notified if any of the following cases occur:

- Revocation of a relevant CA certificate, such as for a CA cross-certified with the other domain's PKI, is planned;
- any incident preventing such a relevant CA from issuing a CRL within twenty-four (24) hours of the time specified in the next update field of its currently valid CRL.

This will allow the other PKI domains to protect their interests as Relying Parties.

The CA Operational Authority shall re-establish operational capabilities as quickly as possible in accordance with procedures set forth in the respective CPS.

5.7.2 Computing resources, software, and/or data are corrupted

If a CA or CSA equipment is damaged or rendered inoperative, but the signature keys are not destroyed; the operation shall be re-established as quickly as possible, giving priority to the ability to generate Certificate status information. Before returning to operation make sure the system's integrity has been restored.

If a CA cannot issue a CRL prior to the time specified in the next update field of its currently

valid CRL, then all CAs that have been issued Certificates by the CA shall be securely notified immediately. This will allow other CAs to protect their Subscribers' interests as Relying Parties.

If the ability to revoke Certificates is inoperable or damaged, the CA shall re-establish revocation capabilities as quickly as possible in accordance with procedures set forth in the respective CPS. If the CA's revocation capability cannot be established in a reasonable timeframe, the CA shall determine whether to request revocation of its Certificate(s). If the CA is a Root CA, the CA shall determine whether to notify all Subscribers that use the CA as a trust anchor to delete the trust anchor.

5.7.3 Entity Private Key compromise procedures

If a CA's signature keys are compromised, lost, or suspected to be compromised:

1. All cross certified CAs shall be securely notified at the earliest feasible time (so that entities may issue CRLs revoking any cross-certificates issued to the CA);
2. A new CA Key Pair shall be generated by the CA in accordance with procedures set forth in the applicable CPS;
3. New CA Certificates shall be requested in accordance with the initial registration process set elsewhere in this CP;
4. The CA shall request all subscribers to re-key using the procedures outlined in section 3.3.2; and
5. If the CA is a Bombardier Root CA, it shall provide the Subscribers the new trust anchor using secure means.

The Bombardier PMA shall also investigate what caused the compromise or loss, and what measures must be taken to preclude recurrence.

If a CSA key is compromised, all Certificates issued to the CSA shall be revoked, if applicable. The CSA will generate a new Key Pair and request new Certificate(s), if applicable. As a CSA operated by the Bombardier PKI may not be a trust anchor, there are no specific requirements regarding trust anchor propagation.

5.7.4 Business continuity capabilities after a disaster

In the case of a disaster whereby all of a CA's installations are physically damaged and all copies of the CA Signing Key are destroyed as a result, the CA shall request that its Certificates be revoked. The CA shall follow steps 2 through 5 in section 5.7.3 above.

5.8 CA, CSA, or RA Termination

In the event of termination of a CA, the CA shall request all Certificates issued to it be revoked.

In the event of a CA termination, the Bombardier PMA shall provide notice to all cross certified CAs prior to the termination. Additionally, in the case of a Bombardier Root CA or Bombardier Sub CA termination, cross-certified PKIs will be given as much advance notice as circumstances permit, and attempts to provide alternative sources of interoperation will

be sought.

A CA, CSA, and RA shall archive all audit logs and other records prior to termination.

A CA, CSA, and RA shall destroy all its Private Keys upon termination.

CA, CSA, and RA archive records shall be transferred to an appropriate authority such as the PMA responsible for the entity.

If a Bombardier Root CA is terminated, that Bombardier Root CA shall use secure means to notify the Subscribers to delete all trust anchors representing the terminated Bombardier Root CA.

6 Technical Security Controls

6.1 Key Pair Generation and Installation

Subject Public Keys shall meet the following requirements:

- RSA keys
  - Algorithm OID: rsaEncryption {1.2.840.113549.1.1.1}
  - Parameters: NULL
  - Modulus *m* and public exponent *e* where,
    - *m* is 2048, 3072, or 4096 bits; and
    - $2^{16} < e < 2^{256}$

6.1.1 Key pair generation

The following table provides the requirements for Key Pair generation for the various entities.

Entity	FIPS 140 Level	Hardware or Software	Key Storage Restricted to the Module on which the Key was Generated
CA	3	Hardware	Yes
RA	2	Hardware	Yes
SCVP Servers	3	Hardware	Yes
TSA	3	Hardware	Yes
OCSP Responder	2	Hardware	Yes
LSAP Code Signing	2	Hardware	Yes
Non-Aircraft Software Code Signing	2	Hardware	Yes
DAD Signature	2	Hardware	Yes
basic-software-256	No requirements	Software	No Requirement
basic-hardware-256	No requirements	Hardware	No Requirement
medium-softwareCBP-256	1	Software	No Requirement
medium-hardwareCBP-256	2[4]	Hardware	Device or

[4] For Aircraft Signature, Aircraft Authentication, and Aircraft Encryption Certificates, a formal certification to FIPS 140 Level 2 is not required, provided that compliance with the security objectives of FIPS 140 Level 2 is demonstrated.

			Human Subscriber Encryption: No Requirement Others: Yes

Random numbers for Medium Assurance Level keys shall be generated in FIPS 140 Level 2 validated hardware cryptographic modules.

When Private Keys are not generated on the token to be used, originally generated Private Keys shall be destroyed after they have been transferred to the token. This does not prohibit the key generating modules to further act as the key escrow module.

Multi-party control shall be used for CA Key Pair generation, as specified in section 5.2.2.

The CA Key Pair generation process shall create a verifiable audit trail that the security requirements for procedures were followed. The documentation of the procedure shall be detailed enough to show that appropriate role separation was used. An independent third party shall validate the process.

6.1.2 Private Key Delivered to a Subscriber

CAs shall generate their own Key Pair and therefore do not need Private Key delivery.

If Subscribers generate their own Key Pairs, then there is no need to deliver Private Keys, and this section does not apply.

When CAs or RAs generate keys on behalf of the Subscriber, then the Private Key shall be delivered securely to the Subscriber. Private keys may be delivered electronically or may be delivered on a hardware cryptographic module. In all cases, the following requirements shall be met:

- Anyone who generates a private signing key for a Subscriber shall not retain any copy of the key after delivery of the Private Key to the Subscriber.
- The Private Key shall be protected from activation, compromise, or modification during the delivery process.
- The Subscriber shall acknowledge receipt of the Private Key(s).
- Delivery shall be accomplished in a way that ensures that the correct tokens and activation data are provided to the correct Subscribers.
- For hardware modules, accountability for the location and state of the module shall be maintained until the Subscriber accepts possession of it.
- For electronic delivery of Private Keys, the key material shall be encrypted using a cryptographic algorithm and key size at least as strong as the Private Key. Activation data shall be delivered using a separate secure channel.

The CA or the RA shall maintain a record of the Subscriber acknowledgement of receipt of the token.

6.1.3 Public key delivery to Certificate issuer

Where the Subscriber or RA generates Key Pairs, the Public Key and the Subscriber's identity shall be delivered securely to the CA for Certificate issuance. The delivery mechanism shall bind the Subscriber's verified identity to the Public Key. If cryptography is used to achieve this binding, it shall be at least as strong as the Subscriber Key Pair.

6.1.4 CA Public Key delivery to Relying Parties

The Public Key of a trust anchor shall be provided to the Subscribers acting as Relying Parties in a secure manner so that the trust anchor is not vulnerable to modification or substitution. Acceptable methods for delivery of trust anchor include but are not limited to:

- The CA loading a trust anchor onto tokens delivered to Subscribers via secure mechanisms;
- Secure distribution of a trust anchor through secure out-of-band mechanisms;
- Comparison of Certificate hash (fingerprint) against trust anchor hash made available via authenticated out-of-band sources (note that fingerprints or hashes posted in-band along with the Certificate are not acceptable as an authentication mechanism); or
- Loading trust anchor from web sites secured with a currently valid Certificate of equal or greater Assurance Level than the Certificate being downloaded and the trust anchor is not in the certification chain for the Web site Certificate.

6.1.5 Key sizes

If the Bombardier PMA determines that the security of a particular algorithm may be compromised, it may require the CAs to revoke the affected Certificates. External PKI domains PMA may require Bombardier CAs to revoke the affected Certificates, according to the applicable MOA.

All Certificates, CRLs and protocols used by the PKI (e.g., Transport Layer Security (TLS)) shall use the following algorithm suites for the time periods indicated:

Cryptographic Function	Expires after 12/31/2010 But before 12/31/2030	Expires after 12/31/2030
Signature	2048 bit RSA per FIPS 186 For ECDSA, per FIPS 186, 224 bit prime field or 233 bit binary field	3072 or 4096 bit RSA per FIPS 186 For ECDSA, per FIPS 186, 256 bit prime field or 283 bit binary field
Hashing	SHA-256	SHA-256
Public Key Encryption	2048 bit RSA per PKCS 1	3072 or 4096 bit RSA per

	For ECDH, per SP 800-56A, 224 bit prime field or 233 bit binary field	PKCS 1 For ECDH, per SP 800-56A, 256 bit prime field or 283 bit binary field
Symmetric Encryption	3 Key TDES or AES	AES

Regardless, all CAs shall use 2048 bit RSA, or 224 bit prime field or 233 bit binary field, or stronger.

A CA or OCSP responder whose Certificate is signed using SHA-256 shall not use SHA-1 in its signatures, or rely on signatures using SHA-1.

CSAs shall use the same signature algorithms, key sizes, and hash algorithms as used by the relevant CA to sign its CRL.

6.1.6 Public key parameters generation and quality checking

RSA keys shall be generated in accordance with FIPS 186 (except for certificates at the Basic Assurance Levels).

ECDSA and ECDH keys shall be generated in accordance with FIPS 186. Curves from FIPS 186 shall be used.

6.1.7 Key usage purposes (as per X.509 v3 key usage field)

The use of a specific key is determined by the key usage extension in the X.509 Certificate. For all Certificates, the Certificate Profiles in section 10 specify the allowable values for this extension for different types of Certificates issued by the Bombardier CAs. This includes, but is not limited to, the following examples:

- Certificates to be used for authentication shall only set the digitalSignature bit, except in the case of Certificates used for devices that provide SSL/TLS protocol connections in which case the keyEncipherment bit may also be set;
- Certificates to be used for Digital Signatures shall set the digitalSignature and contentCommitment bits;
- Certificates to be used for encryption shall set the keyEncipherment bit;
- Certificates to be used for key agreement shall set the keyAgreement bit;
- CA Certificates shall include cRLSign and keyCertSign bits.

Public keys that are bound into Certificates shall be certified for use in signing or encrypting, but not both. This restriction is not intended to prohibit use of protocols (like the Secure Sockets Layer) that provide authenticated connections using Key Management Certificates and require setting both digitalSignature and keyEncipherment bits.

For Certificates issued to entities other than CAs, the extendedKeyUsage X.509 extension shall always be present and shall not contain the anyExtendedKeyUsage OID {2.5.29.37.0}.

The extended key usage shall meet the requirements stated in section 10.7. Extended Key Usage OIDs shall be consistent with key usage bits asserted.

6.2 Private Key Protection and Cryptographic Module Engineering Controls

6.2.1 Cryptographic module standards and controls

The relevant standards for cryptographic modules are FIPS 140, “Security Requirements for Cryptographic Modules”. The Bombardier PMA may determine that other comparable validation, certification, or verification standards are sufficient. These standards will be published by the Bombardier PMA. Cryptographic modules shall be validated to the FIPS 140 level identified in section 6.1, or validated, certified, or verified to requirements published by the Bombardier PMA; Additionally, the Bombardier PMA reserves the right to review technical documentation associated with any cryptographic modules under consideration for use by the CAs.

The table in section 6.1.1 summarises the minimum requirements for cryptographic modules; higher levels may be used. In addition, Private Keys for all Assurance Levels shall not exist outside of their cryptographic modules in plaintext form.

6.2.2 Private Key (n out of m) multi-person control

Use of a CA private signing key or CSA private signing key shall require action by at least two (2) persons.

6.2.3 Private Key escrow

Under no circumstances shall any Signature key be escrowed.

End-Entity Private Keys used solely for decryption shall be escrowed prior to the generation of the corresponding Certificates, with the exception of:

- decryption Private Keys associated with roles, where the encrypted data will not need to be recovered;
- decryption Private Keys associated with aircraft and/or aircraft equipment encryption Certificates which do not need to be escrowed; and
- decryption Private Keys associated with devices, where the encrypted data will not need to be recovered.

6.2.4 Private Key backup

6.2.4.1 Backup of CA Private Signature Key

The CA private signature keys shall be backed up under the same multi-person control as that used to generate and protect the original signature key. A single backup copy of the signature key shall be stored at or near the CA location.

A second backup copy shall be kept at the CA backup location.

Procedures for CA private signature key backup shall be included in the appropriate CPS and shall meet the multiparty control requirement of section 5.2.2.

6.2.4.2 Backup of Subscriber Private Signature Key

Human Subscriber private signature keys whose corresponding Public Key is contained in a Certificate asserting a software Assurance Level may be backed up or copied but must be held in the Subscriber's control. Storage must ensure security controls consistent with the protection provided by the subscriber's cryptographic module.

Human Subscriber private signature keys whose corresponding Public Key is contained in a Certificate asserting an Assurance Level other than those listed above for human Subscriber shall not be backed up or copied.

Device private signature keys whose corresponding Public Key is contained in a Certificate asserting medium-softwareCBP-256 Assurance Levels and/or lower may be backed up or copied but must be held in the control of the device's human sponsor.

Device signature keys whose corresponding Public Key is contained in a Certificate asserting medium-hardwareCBP-256 Assurance Levels and/or higher shall not be backed up or copied.

6.2.4.3 Backup of Subscriber Decryption Private Keys

Backed up Subscriber decryption private keys shall not be stored in plain text form outside the cryptographic module. Storage must ensure security controls consistent with the protection provided by the Subscriber's cryptographic module.

6.2.4.4 CSA Private Key Backup

If backed up, the CSA private signature keys shall be backed up under the same multi-person control as used to generate the CSA private signature keys and shall be accounted for and protected in the same manner as the original. An additional backup copy, if made, shall be kept under the same conditions at the CSA backup location. Procedures for CSA private signature key backup shall be included in the appropriate CPS.

6.2.5 Private Key archival

Private signature keys shall not be archived.

For some applications (e.g., protected aircraft to ground communications), the device key may be archived by the CA, upon crypto-period expiration and/or key replacement, to support recovery of encrypted messages, as necessary to comply with regulatory requirements regarding data retention. Such archives shall be described in a Bombardier Key Recovery Practise Statement (KRPS).

6.2.6 Private Key transfer into or from a cryptographic module

CA and CSA Private Keys shall be generated by and remain in an approved cryptographic module.

The CA and CSA Private Keys may be backed up in accordance with section 6.2.4.1.

Subscriber hardware assurance signing keys shall not be transferred from the module in which they are generated.

If a private key is transported from one cryptographic module to another, the private key must be encrypted during transport. Private keys must never exist in plaintext form outside the cryptographic module boundary.

Private or symmetric keys used to encrypt other private keys for transport must be protected from disclosure.

6.2.7 Private Key storage on cryptographic module

The cryptographic module may store Private Keys in any form as long as the keys are not accessible without authentication mechanism that is in compliance with FIPS 140 rating of the cryptographic module. Private Keys must be stored on a cryptographic module at least as strong as that referenced in section 6.1.1 for that key's generation.

6.2.8 Method of activating Private Key

The user of a cryptographic module must be authenticated to the cryptographic module before the activation of any Private Key(s), except as indicated below. Acceptable means of authentication include but are not limited to pass-phrases, PINs or biometrics. Entry of activation data shall be protected from disclosure (i.e., the data should not be displayed while it is entered).

6.2.9 Method of deactivating Private Key

The cryptographic modules that have been activated shall not be left unattended or otherwise available to unauthorised access. After use, the cryptographic module shall be deactivated, e.g., via a manual logout procedure, or automatically after a period of inactivity as defined in the applicable CPS. CA and CSA hardware cryptographic modules shall be removed and stored in a secure container when not in use. Hardware cryptographic modules used by RAs shall be removed and either stored in a secure container or kept on the person of the RA when not in use.

6.2.10 Method of destroying Private Key

Private signature keys shall be destroyed when they are no longer needed, or when the Certificates to which they correspond expire or are revoked. For software cryptographic modules, this can be done by overwriting the data. For hardware cryptographic modules, this usually requires executing a "zeroise" command. Physical destruction of hardware is generally not required.

6.2.11 Cryptographic Module Rating

See section 6.2.1.

6.3 Other Aspects of Key Pair Management

6.3.1 Public key archival

The Public Key is archived as part of the Certificate archival.

6.3.2 Certificate operational periods and Key Pair usage periods

See section 5.6.

6.3.3 LSAP Code Signing Keys (for signature of Aircraft EDS crates)

When issuing LSAP Code Signing Certificates, the Entity operating the CA shall ensure that there is a binding between the Role Certificate and the individual Subscriber to whom it is being issued. Such binding shall be commensurate with the Assurance Level of the Certificates being issued. The Entity operating the CA shall keep a record of this binding for a minimum of 30 years, or as further required by industry regulations, whichever is longest.

6.4 Activation Data

6.4.1 Activation data generation and installation

The activation data used to unlock Private Keys, in conjunction with any other access control, shall have an appropriate level of strength for the keys or data to be protected and shall meet the applicable security policy requirements of the crypto module used to store the keys. Subscriber activation data may be user selected. For CAs, it shall either entail the use of biometric data or satisfy the policy-enforced at/by the cryptographic module. If the activation data must be transmitted, it shall be via an appropriately protected channel, and distinct in time and place from the associated cryptographic module.

When a CA uses passwords as activation data for the CA signing key, at a minimum the activation data shall be changed upon CA re-key.

6.4.2 Activation data protection

Data used to unlock Private Keys shall be protected from disclosure by a combination of cryptographic and physical access control mechanisms. Activation data should either be biometric in nature or memorised, not written down. If written down, it shall be secured at the level of the data that the associated cryptographic module is used to protect and shall not be stored with the cryptographic module. The protection mechanism shall include a facility to temporarily lock the account, or terminate the application, after a predetermined number of failed login attempts as set forth in the respective CPS.

6.4.3 Other aspects of activation data

CAs, CSAs, and RAs shall change the activation data whenever the token is re-keyed or returned from maintenance.

6.5 Computer Security Controls

6.5.1 Specific computer security technical requirements

The following computer security functions may be provided by the operating system, or through a combination of operating system, software, and physical safeguards. The CA, CSA, and RA shall include the following functionality:

- Require authenticated logins
- Provide Discretionary Access Control
- Provide a security audit capability
- Prohibit object re-use
- Require use of cryptography for session communication and database security
- Require a trusted path for identification and authentication
- Provide domain isolation for process
- Provide self-protection for the operating system
- Require self-test security related CA services (e.g., check the integrity of the audit logs)

When CA equipment is hosted on evaluated platforms in support of computer security assurance requirements then the system (hardware, software, operating system) shall, when possible, operate in an evaluated configuration. At a minimum, such platforms shall use the same version of the computer operating system as that which received the evaluation rating.

The CA-computer system shall be configured with minimum of the required accounts, network services, and no remote login functionality.

The Bombardier Root CAs shall be operated offline with no network connections installed.

6.5.2 Computer security rating

No Stipulation.

6.6 Life Cycle Technical Controls

6.6.1 System development controls

The System Development Controls for the CA and CSA are as follows:

- Use software that has been designed and developed under a formal, documented development methodology.
- Hardware and software procured shall be purchased in a fashion to reduce the likelihood that any particular component was tampered with (e.g., by ensuring the equipment was randomly selected at time of purchase).

- Hardware and software developed shall be developed in a controlled environment, and the development process shall be defined and documented. This requirement does not apply to commercial off-the-shelf hardware or software.
- All hardware must be shipped or delivered via controlled methods that provide a continuous chain of accountability, from the purchase location to the operations location.
- The hardware and software shall be dedicated to performing the PKI activities. There shall be no other applications, hardware devices, network connections, or component software installed which are not parts of the PKI operation.
- Proper care shall be taken to prevent malicious software from being loaded onto the equipment. Only applications required to perform the PKI operations shall be obtained from sources authorised by local policy. CA, CSA, and RA hardware and software shall be scanned for malicious code on first use and periodically thereafter.
- Hardware and software updates shall be purchased or developed in the same manner as original equipment, and be installed by trusted and trained personnel in a defined manner.

6.6.2 Security management controls

The configuration of the CA and CSA systems as well as any modifications and upgrades shall be documented and controlled.

There shall be a mechanism for detecting unauthorised modification to the CA and CSA software or configuration.

A formal configuration management methodology shall be used for installation and on-going maintenance of the CA and CSA systems. The CA and CSA software, when first loaded, shall be verified as being that supplied from the vendor, with no modifications, and be the version intended for use.

In addition, only applications required to perform the organisation's mission shall be loaded on the RA workstation, and all such software shall be obtained from sources authorized by local policy.

6.6.3 Life cycle security controls

No stipulation.

6.7 Network Security Controls

The Bombardier Root CAs and their internal PKI Repositories shall be offline.

Bombardier Sub Signing CAs, CSAs, and RAs shall employ appropriate security measures to ensure they are guarded against denial of service and intrusion attacks. Such measures shall include the use of guards, firewalls and filtering routers. Unused network ports and services shall be turned off. Any network software present shall be necessary to the functioning of the CA.

Any boundary control devices used to protect the network on which PKI equipment is

hosted shall deny all but the necessary services to the PKI equipment even if those services are enabled for other devices on the network.

6.8 Time-Stamping

All CA and CSA components shall regularly synchronise with a time service. Time derived from the time service shall be used for establishing the time of:

- Initial validity time of a Subscriber's Certificate
- Revocation of a Subscriber's Certificate
- Posting of CRL updates
- OCSP or other CSA responses

Asserted times shall be accurate to within three (3) minutes. Electronic or manual procedures may be used to maintain system time. Clock adjustments are auditable events as listed in section 5.4.1.

7 Certificate, CRL, and OCSP Profiles

7.1 CERTIFICATE PROFILE

Section 10 contains the Certificate formats.

7.1.1 Version number(s)

The CAs shall issue X.509 v3 Certificates (populate version field with integer "2").

7.1.2 Certificate extensions

Bombardier CAs' critical private extensions shall be interoperable in their intended community of use.

Bombardier Sub CA and Subscriber Certificates may include any extensions as specified by RFC 5280 in a Certificate, but must include those extensions required by this CP. Any optional or additional extensions shall be non-critical and shall not conflict with the Certificate and CRL profiles defined in this CP.

7.1.3 Algorithm object identifiers

Certificates issued under this CP shall use the following OIDs for signatures:

sha256WithRSAEncryption	{iso(1) member-body(2) us(840) rsadsi(113549) pkcs(1) pkcs-1(1) 11}
Ecdsa-with-Sha256	{iso(1) member-body(2) us(840) ansi-X9-62(10045) signatures(4) specified(3) sha256(2)}

Certificates under this CP shall use the following OID for identifying the subject Public Key information:

rSAEncryption	{iso(1) member-body(2) us(840) rsadsi(113549) pkcs(1) pkcs-1(1) 1}
id-ecPublicKey	{iso(1) member-body(2) us(840) ansi-X9-62(10045) public-key-type(2) 1}

7.1.4 Name forms

The subject and issuer fields of the Certificate shall be populated with a unique Distinguished Name in accordance with one or more of the X.500 series standards, with the attribute type as further constrained by RFC 5280. Subject and Issuer fields shall include attributes as detailed in the tables below

Subject Name Form for CAs

OPTION	USAGE	ATTRIBUTE	REQUIRED COUNT	CONTENT

1	Required	CN	0…1	Descriptive name for CA, e.g., “CN=XYZ Inc CA”
	Optional	OU	0…N	As needed
	Recommended	OU	0…1	“Certification Authorities” or similar text
	Required	O	1	Issuer name, e.g., “O=XYZ Inc”
	Optional	ST	0…1	State or Province Name, e.g., “ST=California”
	Required	C	1	Country name, e.g., “C=US”
2	Required	CN	0…1	Descriptive name for CA, e.g., “CN=XYZ Inc CA”
	Optional	OU	0…N	As needed
	Recommended	OU	0…1	“Certification Authorities” or similar text
	Optional	O	0…1	Issuer name, e.g., “O=XYZ Inc”
	Optional	ST	0…1	State or Province name, e.g., “ST=California”
	Optional	C	0…1	Country name, e.g., “C=US”
	Required	DC	1	Domain name, e.g., “DC=xyzinc”
	Required	DC	1…N	Domain root label(s), e.g., “DC=com” or, “DC=com, DC=au”, etc.

Subject Name Form (Other Subscribers)

OPTION	USAGE	ATTRIBUTE	REQUIRED COUNT	CONTENT
1	Required	See Content description	1…N	Additional naming attributes for uniquely identifying the subject including common name, serialNumber, email, etc.
	Optional	OU	0…N	As needed
	Required	O	1	Issuer name, e.g., “O=XYZ Inc” exactly as it appears in the CA Certificate of the Issuer
	Required	C	1	Country name, e.g., “C=US” exactly as it appears in the CA Certificate of the Issuer
2	Required	See Content	1…N	Additional naming attributes for uniquely identifying the subject including common name,

OPTION	USAGE	ATTRIBUTE	REQUIRED COUNT	CONTENT
		description		serialNumber, email, etc.
	Optional	OU	0…N	As needed
	Optional	O	0…1	Issuer name, e.g., “O=XYZ Inc” exactly as it appears in the CA Certificate(s)
	Required	DC	1	Domain name, e.g., “DC=xyzinc” exactly as it appears in the CA Certificate of the Issuer
	Required	DC	1…N	Domain root label(s), e.g., “DC=com” or, “DC=com, DC=au”, etc. exactly as it appears in the CA Certificate of the Issuer

When multiple values exist for an attribute in a DN, the DN shall be encoded so that each attribute value is encoded in a separate relative distinguished name.

Aircraft Identification shall be an identifier registered in an aerospace industry-recognized registry and verifiable by the CA (e.g.: aircraft registration / tail number).

Aircraft Equipment Identification shall be an identifier registered in an aerospace industry-recognized registry and verifiable by the CA (e.g.: equipment registration number).

LSAP Code Signing Certificates always have the following Subject DN, which describes the role associated with the Certificate:

OPTION	USAGE	ATTRIBUTE	REQUIRED COUNT	CONTENT
1	Required	CN	1	“LSAP Signing – SIG”
	Required	OU	1	Affiliated Organisation name
	Required	OU	1	“Roles”
	Required	O	1	“Bombardier Inc.”
	Required	C	1	“CA”

The LSAP Code Signing Certificate’s Subject Alternative Name extension contains a Directory Address entry that is the exact Subject DN of the Identity Certificate of the Subscriber to whom the certificate is issued.

Non-Aircraft Software Code Signing Certificates always have the following Subject DN, which describes the role associated with the Certificate:

OPTION	USAGE	ATTRIBUTE	REQUIRED COUNT	CONTENT
1	Required	CN	1	“Non-Aircraft Software Signing – SIG”
	Required	OU	1	Affiliated Organisation name

OPTION	USAGE	ATTRIBUTE	REQUIRED COUNT	CONTENT
	Required	OU	1	“Roles”
	Required	O	1	“Bombardier Inc.”
	Required	C	1	“CA”

The Non-Aircraft Software Code Signing Certificate’s Subject Alternative Name extension contains the publicID (assigned by the RA system) found in the sN field of the DN of the Identity Certificate of the Subscriber to whom the Certificate is issued.

DAD Signature Certificates always have the following Subject DN, which describes the role associated with the Certificate:

OPTION	USAGE	ATTRIBUTE	REQUIRED COUNT	CONTENT
1	Required	CN	1	“DAD Signature - XXXXXXX - SIG” where “XXXXXXX” is the appropriate DAO Reference Number
	Required	OU	1	Affiliated Organisation name
	Required	OU	1	“Roles”
	Required	O	1	“Bombardier Inc.”
	Required	C	1	“CA”

The DAD Signature Certificate’s Subject Alternative Name extension contains a Directory Address entry that is the exact Subject DN of the Identity Certificate of the Subscriber to whom the certificate is issued.

7.1.5 Name constraints

The CAs may assert critical or non-critical name constraints beyond those specified in the Certificate Formats in section 10 subject to the requirements above.

The Bombardier CAs shall not obscure a Subscriber Subject name. Issuer names shall not be obscured. Bombardier CAs may assert critical or non-critical name constraints beyond those specified in the Certificate Formats.

7.1.6 Certificate Policy object identifier

CA and Subscriber Certificates issued under this CP shall assert one or more of the Certificate Policy OIDs listed in section 1.2 of this document.

A CA Certificate shall contain the policy OIDs of all policies under which it issues Certificates.

For non-CA Certificates, the Certificate asserting a policy OID shall also assert all lower assurance policy OIDs, within the restrictions outlined below. (Refer to Figure 2 in section 1.2 for the Assurance Level hierarchy.)

The following restrictions apply to the aforementioned requirements:

- A “CBP” Certificate shall not assert a non-“CBP” policy OID;
- LSAP Code Signing Certificates used for the signature of Aircraft EDS crates shall assert only the medium-hardwareCBP-256 policy OID;
- Non-Aircraft Software Code Signing Certificates used for the signature of non-aircraft software shall assert only the medium-hardwareCBP-256 policy OID; and
- DAD Signature Certificates used for the signature of design documents shall assert only the medium-hardwareCBP-256 policy OID.

Thus, for example, a CA issuing Certificates at all Assurance Levels shall assert the following OIDs in Certificates it issues:

ASSURANCE LEVEL	OIDS ASSERTED
basic-software-256	1.3.6.1.4.1.43804.3.6.2.3
basic-hardware-256	1.3.6.1.4.1.43804.3.6.2.4 1.3.6.1.4.1.43804.3.6.2.3
medium-softwareCBP-256	1.3.6.1.4.1.43804.3.6.2.5
medium-hardwareCBP-256	1.3.6.1.4.1.43804.3.6.2.6 1.3.6.1.4.1.43804.3.6.2.5

OCSP Responder Certificates shall assert all the policy OIDs of the Certificates for which the corresponding OCSP Responder provides a revocation status.

7.1.7 Usage of Policy Constraints extension

The Bombardier PKI policy domain shall follow the Certificate formats described in this CP, since inhibiting policy mapping may limit interoperability.

7.1.8 Policy qualifiers syntax and semantics

Certificates issued under this CP may contain policy qualifiers such as user notice, policy name, CP and CPS pointers.

7.1.9 Processing semantics for the critical Certificate Policies extension

Processing semantics for the critical Certificate Policy extension shall conform to X.509 certification path processing rules. Where such rules conflict with IETF RFC 5280, RFC 5280 shall be followed.

7.2 CRL PROFILE

7.2.1 Version number(s)

CAs shall issue X.509 version two (v2) CRLs (populate version field with integer "1").

7.2.2 CRL and CRL entry extensions

Critical private extensions shall be interoperable in their intended community of use.

Section 10 contains the CRL formats.

7.3 OCSP PROFILE

OCSP requests and responses shall be in accordance with RFC 6960. Section 10 contains the OCSP request and response formats.

7.3.1 Version number(s)

The version number for request and responses shall be v1.

7.3.2 OCSP extensions

Responses shall support the nonce extension.

8 Compliance Audit and Other Assessments

CAs shall have a compliance audit mechanism in place to ensure that the requirements of their CP/CPS and the provisions of the contracts (including MOA) with cross-certified CAs are being implemented and enforced.

8.1 Frequency or circumstances of assessment

The OA has the right to require unscheduled compliance inspections of subordinate CA, CSA, or RA operations to validate that the subordinate entities are operating in accordance with the security practices and procedures described in their respective CPS.

The Bombardier PMA has the right to require unscheduled compliance audits of all entities in the Bombardier PKI. The Bombardier PMA shall state the reason for any unscheduled compliance audit. This compliance audit allows the Bombardier PMA to authorise or not (regarding the audit results) the Bombardier CAs to operate under this CP.

In the context of cross-certification, audits shall be requested as stated in the respective contracts and/or MOA.

8.2 Identity and qualifications of assessor

The compliance auditor shall demonstrate competence in the field of compliance audits, and shall be thoroughly familiar with the requirements of this CP. The compliance auditor must perform such compliance audits as a primary responsibility. The applicable CPS shall identify the compliance auditor and justify the compliance auditor's qualifications.

8.3 Assessor’s relationship to assessed entity

The compliance auditor shall be a firm, which is independent from Bombardier Aerospace and its affiliated companies, as well as sub-contractors operating the Bombardier PKI. The Bombardier PMA shall determine whether a compliance auditor meets this requirement.

8.4 Topics covered by assessment

The purpose of a compliance audit shall be to verify that a component operates in accordance with this CP, the applicable CPSs, and the applicable MOAs.

The compliance audit must include an assessment of the applicable CPS against this CP, to determine that the CPS adequately addresses and implements the requirements of the CP.

8.5 Actions taken as a result of deficiency

The Bombardier PMA or cross certified PKI PMAs may determine that a CA is not complying with its obligations set forth in this CP or the respective contracts (including MOAs) with cross-certified PKIs.

When such a determination is made, the PMA may suspend operation, may revoke the CA, or take other actions as appropriate. The respective CPS shall provide the appropriate procedures.

When the compliance auditor finds a discrepancy between how the CA is designed or is being operated or maintained, and the requirements of this CP, any contract with cross-certified PKIs, or the applicable CPS, the following actions shall be performed:

- The compliance auditor shall note the discrepancy;
- The compliance auditor shall notify the Bombardier PMA of the discrepancy;
- The Bombardier PMA shall notify any affected cross-certified external PKI domains' PMAs promptly; and
- The party responsible for correcting the discrepancy shall determine what further notifications or actions are necessary pursuant to the requirements of this CP and the respective contracts, and then proceed to make such notifications and take such actions without delay.

Depending upon the nature and severity of the discrepancy and how quickly it can be corrected, the PMA may decide to halt temporarily operation of the CA, to revoke a Certificate issued by the CA, or take other actions it deems appropriate. The PMA shall develop procedures for making and implementing such determinations.

8.6 Communication of results

An Audit Compliance Report package, including identification of corrective measures taken or being taken by the component, shall be provided to the PMA as set forth in section 8.1. This package shall be prepared in accordance with the "Compliance Audit Reference Documents" and must include an assertion from the PMA that all PKI components have been audited – including any components that may be separately managed and operated. The package shall identify the versions of the CP and CPS used in the assessment. Additionally, where necessary, the results shall be communicated as set forth in 8.5 above.

PRACTICE NOTE:

The different components of the infrastructure may be audited separately. In these cases, the Compliance Audit Package will contain multiple audit reports, one for each separately audited component

9 Other Business and Legal Matters

9.1 Fees

9.1.1 Certificate issuance or renewal fees

Bombardier Aerospace is entitled to charge end-user Subscribers for the issuance, management, modification, re-key, and renewal of Certificates provided by the Bombardier PKI.

9.1.2 Certificate access fees

The management of Bombardier Aerospace shall decide on any fees related to the Bombardier PKI services.

There shall be no fee associated with Relying Party access to Certificates in the Bombardier PKI Directory.

9.1.3 Revocation or status information access fees

The management of Bombardier Aerospace shall decide on any fees related to the Bombardier PKI services.

There shall be no fee associated with Relying Party access to revocation or status information.

9.1.4 Fees for other services

The management of Bombardier Aerospace shall decide on any fees related to the Bombardier PKI services.

9.1.5 Refund policy

Bombardier Aerospace offers no refunds on issued Certificates.

9.2 Financial responsibility

9.2.1 Insurance coverage

Bombardier Aerospace shall maintain reasonable levels of insurance coverage as required by applicable laws.

9.2.2 Other assets

Bombardier Aerospace shall maintain sufficient financial resources to maintain operations and fulfil duties.

9.2.3 Insurance or warranty coverage for End-Entities

No stipulation.

9.3 Confidentiality of business information

Subscribers acknowledge that any information made public in a Certificate is deemed not private. In that respect, Certificates, OCSP responses, CRLs and personal or corporate information appearing in them and in public directories are not considered as private or confidential.

Personal and corporate information, which does not appear in Certificates and in public directories, held by a CA or an RA is considered confidential and shall not be disclosed by the CA or RA. Unless required by law or court order, any disclosure of such information requires Subscriber's written prior consent.

The treatment of confidential business information provided to external PKIs in the context of submitting an application for cross certification will be in accordance with the terms of the agreements entered into between the applicable entity and Bombardier Aerospace

Each CA shall maintain the confidentiality of confidential business information that is clearly marked or labelled as confidential or by its nature should reasonably be understood to be confidential, and shall treat such information with the same degree of care and security as the CA treats its own most confidential information.

9.4 Privacy of personal information

For the purposes of the PKI related services, the Bombardier PKI collects, stores, processes and discloses personally identifiable information in accordance with applicable laws and regulations, specifically PIPEDA, the EU Data Protection Directive 95/46/EC and the Bombardier Corporate Data Privacy Policy.

Subscribers and End-Entities must be given access and the ability to correct or modify their personal or organisation information upon appropriate request to the issuing CA. Such information must be provided only after taking proper steps to authenticate the identity of the requesting party.

9.5 Intellectual property rights

The Bombardier PKI owns and reserves all intellectual property rights associated with its own products and services that it has not explicitly transferred or released to another party.

The Bombardier PKI Operational Authority shall not violate intellectual property rights held by others.

9.5.1 Property Rights in Certificates and Revocation Information

Bombardier CAs retain all Intellectual Property Rights in and to the Certificates and revocation information that they issue.

Bombardier grants permission to reproduce and distribute its Certificates on a nonexclusive royalty-free basis, provided that they are reproduced in full and that use of Certificates is subject to a Relying Party Agreement with the relevant CA. Bombardier shall grant permission to use revocation information to perform Relying Party functions, subject to applicable contractual agreements.

The Subscriber, who has a Certificate delivered by Bombardier PKI, retains all intellectual rights it has on the information contained in the Certificate delivered by a Bombardier CA (subject name). An external CA, which cross-certifies with the Bombardier PKI, retains all intellectual rights it owns on the information contained in the CA Certificate delivered by Bombardier PCAs (CA distinguished name, Public Key, policy OID …)

9.5.2 Property Rights in this CP and related CPSs

Bombardier asserts that it owns and/or has licensed the Intellectual Property Rights to this CP and related CPS. Furthermore, Bombardier reserves all Intellectual Property Rights in this CP and related CPSs to be granted to Licensors at its discretion in conjunction with all applicable agreements and licenses.

9.5.3 Property Rights in Names

The Certificates may contain copyrighted material, trademarks and other proprietary information, and no commercial exploitation or unauthorised use of the material or information in or via the Certificates is permitted, except as may be provided in this CP or in any applicable agreement. In the event of any permitted use or copying of trademarks and/or copyrighted material, no deletions or changes in proprietary notices shall be made without written authorisation from the owner.

9.5.4 Property Rights in Keys

Key pairs corresponding to Certificates of cross-certified CAs and Subscribers are the property of the cross-certified CAs and Subscribers that are the respective subjects of these Certificates, subject to the rights of Subscribers regardless of the physical medium within which they are stored and protected. Such persons retain all Intellectual Property Rights in and to these Key Pairs. Notwithstanding the foregoing, Bombardier Root CAs' root Public Keys and the root Certificates containing them, including all PCA Public Keys and self-signed Certificates, are the property of Bombardier.

9.6 Representations and warranties

The Bombardier PKI provides its services in accordance with applicable laws and regulations.

Additional representations and warranties of Bombardier PKI and contractual partners are contained in the respective contractual documents. This includes agreement on responsibility for export compliance.

9.6.1 CA representations and warranties

9.6.1.1 The Bombardier Root CAs

The Bombardier OA represents that, to its knowledge:

- Their Certificates meet all material requirements of this CP, and
- Revocation services and use of a repository conform to the applicable CPS in all

material aspects.

The applicable agreements may include additional representations and warranties.

9.6.1.2 Bombardier Subordinate or Cross-Certified CAs

Signing Subordinate and Cross-Certified CAs represent and warrant that:

- There are no material misrepresentations of fact in the cross-certificates known to or originating from the entity approving the Cross Certification Applications or issuing the cross-certificates,
- There are no errors in the information in the cross-certificate that were introduced by the entity approving the Cross Certification Application or issuing the cross-certificate as a result of a failure to exercise reasonable care in managing the Certificate Application or creating the Certificate,
- Their CA signing key is protected and that no unauthorised person has ever had access to the Private Key,
- All representations made by the Subordinate CA or Cross-Certified CA in the applicable agreements are true and accurate, and
- All information supplied by the Subscriber in connection with, and/or contained in the Certificate has been duly verified,
- The Certificate is being used exclusively for authorised purposes, consistent with this and any other applicable CP or CPS.

9.6.2 Subscriber representations and warranties

A Bombardier CA shall require the Subscribers to sign a document containing the requirements the Subscriber shall meet respecting protection of the Private Key and use of the Certificate before being issued the Certificate. Subscribers shall agree to the following:

- Accurately represent themselves in all communications with the PKI authorities.
- Protect their Private Keys at all times and prevent them from unauthorised access in accordance with this policy, as stipulated in their Subscriber Agreement.
- Promptly notify the appropriate CA upon suspicion of loss or compromise of their Private Keys. Such notification shall be made directly or indirectly through mechanisms consistent with this CP.
- Abide by all the terms, conditions, and restrictions levied on the use of their Private Keys and Certificates, as set forth in this CP and the Subscriber Agreement.
- Use Certificates provided by the Bombardier CAs only for authorised and legal purposes in accordance with this CP.
- Comply with all export laws and regulations for dual usage goods as may be applicable, as relates to the usage and transport of keys, Certificates and algorithms mandated by this CP.

- Cease to use Bombardier Certificates if they become invalid and remove them from any applications and/or devices they have been installed on.

Device Sponsors (as described in section 5.2.1.4) shall assume the obligations of Subscribers for the Certificates associated with their components.

9.6.3 Relying Party representations and warranties

Parties who rely upon the Certificates issued under a policy defined in this document shall:

- use the Certificate for the purpose for which it was issued, as indicated in the Certificate information (e.g., the key usage extension);
- check each Certificate for validity, using procedures described in section 6 of RFC 5280, prior to reliance;
- establish trust in the CA who issued a Certificate by verifying the Certificate path in accordance with the guidelines set by the X.509 Version 3 Amendment;
- preserve original signed data, the applications necessary to read and process that data, and the cryptographic applications needed to verify the digital signatures on that data for as long as it may be necessary to verify the signature on that data.

9.6.4 Representations and warranties of other participants

The Bombardier PMA shall insure that Repositories that support a CA in posting information as required by this policy shall:

- maintain availability of the information as required by the Certificate information posting and retrieval stipulations of this CP; and
- provide access control mechanisms sufficient to protect repository information as described in section 2.4.

An OCSP Responder that has been issued a Bombardier PKI CA Certificate shall conform to the stipulations of this document including operating under a CPS that has been approved by the Bombardier PMA. Such OCSP Responders which are found to have acted in a manner inconsistent with these obligations are subject to action as described in section 8.5

Affiliated Organisations shall authorize the affiliation of Subscribers with that Organisation, and shall inform the CA of any severance of affiliation with any current Subscriber.

9.7 Disclaimers of warranties

To the extent permitted by applicable law, Policy Mapping Agreements, cross-certificates Agreements, Memorandums of Agreement, and any other related agreements may contain disclaimers of all warranties (other than any express warranties contained in such agreements or set forth in this CP).

EXCEPT FOR THE EXPLICIT REPRESENTATIONS, WARRANTIES, AND CONDITIONS PROVIDED IN THIS CP OR THOSE BETWEEN BOMBARDIER AND ITS CUSTOMERS UNDER SEPARATE AGREEMENTS, (A) CERTIFICATES ISSUED BY BOMBARDIER AND THE BOMBARDIER PKI ARE PROVIDED "AS IS", AND BOMBARDIER, ITS EMPLOYEES, OFFICERS,

AGENTS, REPRESENTATIVES, AND DIRECTORS DISCLAIM ALL OTHER WARRANTIES, CONDITIONS AND OBLIGATIONS OF EVERY TYPE (INCLUDING, WITHOUT LIMITATION, ANY WARRANTIES OF MERCHANTABILITY, NON-INFRINGEMENT, TITLE, SECURITY, SATISFACTORY QUALITY, OR FITNESS FOR A PARTICULAR PURPOSE, OR ACCURACY OF INFORMATION PROVIDED), AND FURTHER DISCLAIM ANY AND ALL LIABILITY FOR NEGLIGENCE, FAILURE TO WARN, OR LACK OF REASONABLE CARE AND (B) THE ENTIRE RISK OF THE USE OF ANY BOMBARDIER CERTIFICATES, ANY SERVICES PROVIDED BY BOMBARDIER, OR THE VALIDATION OF ANY DIGITAL SIGNATURES LIES WITH THE APPLICABLE PARTICIPANT.

9.8 Limitations of liability

The liability (and/or limitation thereof) of Subscribers shall be as set forth in the applicable Subscriber Agreement, subject to the applicable law governing the relationship between the parties.

The liability (and/or limitation thereof) of Bombardier to other PKI domains' CAs to which Bombardier CAs issue Certificates shall be set forth in the applicable agreements.

The liability (and/or limitation thereof) of Relying Parties shall be as set forth in the applicable Relying Party Agreements between the applicable CA and the Relying Party.

FOR BASIC ASSURANCE CERTIFICATES, ALL LIABILITY ARISING OUT OF OR RELATING TO IMPROPER ACTIONS BY THE BOMBARDIER CA ARE DISCLAIMED, AS PERMITTED BY LAW.

FOR ALL OTHER CERTIFICATES OF OTHER ASSURANCE LEVELS, THE TOTAL, AGGREGATE LIABILITY OF EACH BOMBARDIER CA ARISING OUT OF OR RELATED TO IMPROPER ACTIONS BY THE BOMBARDIER CA SHALL BE LIMITED TO ONE THOUSAND DOLLARS ($1,000 USD) PER TRANSACTION AND

THE TOTAL LIABILITY OF BOMBARDIER SHALL NOT EXCEED A MAXIMUM OF ONE MILLION DOLLARS ($1 MILLION USD) IN AGGREGATE.

9.9 Indemnities

9.9.1 Indemnification by Customer CAs

To the extent permitted by applicable law, other PKI domains CAs issued Certificates by Bombardier agree to indemnify and hold Bombardier harmless from any acts or omissions resulting in liability, any loss or damage, and any suits and expenses of any kind including reasonable attorneys' fees that Bombardier may incur as a result of:

- Falsehood or misrepresentation of fact by the other PKI domains CA in the applicable contractual agreements; or
- Failure by the other PKI domains CA to disclose a material fact in any applicable contractual agreement, if the misrepresentation or omission was made negligently or with intent to deceive any party; or
- The other PKI domains CA's failure to protect the other PKI domains CA Private Key, to use a Trustworthy System, or to otherwise take the precautions necessary to

prevent the compromise, loss, disclosure, modification, or unauthorised use of the other PKI domains CA Private Key; or

- The other PKI domains CA's use of a name (including without limitation within a common name, domain name, or e-mail address) that infringes upon the Intellectual Property Rights of a third party.

Any applicable agreement may include additional indemnity obligations.

9.9.2 Indemnification by Relying Parties

To the extent permitted by applicable law, and any applicable contractual agreements, Relying Party agrees to indemnify and hold Bombardier harmless from any acts or omissions resulting in liability, any loss or damage, and any suits and expenses of any kind including reasonable attorneys' fees that Bombardier may incur as a result of:

- The Relying Party's failure to perform the obligations of a Relying Party,
- The Relying Party's reliance on a Certificate that is not reasonable under the circumstances, or
- The Relying Party's failure to check the status of such Certificate to determine if the Certificate is expired or revoked.

Any applicable contractual agreement with Bombardier may include additional indemnity obligations.

9.9.3 Indemnification by Subscribers

To the extent permitted by applicable law, Subscriber agrees to indemnify and hold Bombardier harmless from any acts or omissions resulting in liability, any loss or damage, and any suits and expenses of any kind including reasonable attorneys' fees that Bombardier may incur as a result of:

- Falsehood or misrepresentation of fact by the Subscriber on the Subscriber's Certificate Application; or
- Fraudulent or negligent use of Certificates by the Subscriber; or
- Unauthorised use of the Certificates by Subscribers including use of Certificates beyond the prescribed use defined by this CP; or
- Failure by the Subscriber to disclose a material fact on the Certificate Application, if the misrepresentation or omission was made negligently or with intent to deceive any party; or
- The Subscriber's failure to protect the Subscriber's Private Key, to use a Trustworthy System, or to otherwise take the precautions necessary to prevent the compromise, loss, disclosure, modification, or unauthorised use of the Subscriber's Private Key; or
- The Subscriber's use of a name (including without limitation within a common name, domain name, or e-mail address) that infringes upon the Intellectual Property Rights of a third party.

The applicable Subscriber Agreement may include additional indemnity obligations.

This indemnification clause shall not be applicable for Bombardier Employees.

9.10 Term and termination

9.10.1 Term

This CP becomes effective upon its execution by the Bombardier PMA and publication in the appropriate directory (as defined in section 2). Amendments to this CP shall become effective upon execution by the Bombardier PMA and publication in the appropriate Repository (as defined in section 2).

9.10.2 Termination

While this CP may be amended from time to time, it shall remain in force until replaced by a newer version.

Bombardier may decide to terminate this CP at any time. All entities shall be notified 6 (six) months prior to the effective termination of this CP.

9.10.3 Effect of termination and survival

Upon termination of this CP, CAs cross-certified with or subordinate to Bombardier PKI CAs are nevertheless bound by its terms for all Certificates issued for the remainder of the validity periods of such Certificates. The following sections of this CP shall survive any termination or expiration of this CP: 2.1, 2.2, 5.4, 5.5, 6.2-6.4, 6.8, 9.2-9.4, 9.7-9.10, 9.13-9.16.

9.11 Individual notices and communications with participants

Unless otherwise specified by agreement between the parties, Bombardier PKI OA shall use commercially reasonable methods to communicate with cross certified CAs, taking into account the criticality and subject matter of the communication.

9.12 Amendments

9.12.1 Procedure for amendment

The Bombardier PMA shall review this CP and the respective CPS at least once every year. Additional reviews may be enacted at any time at the discretion of the Bombardier PMA.

If the Bombardier PMA wishes to recommend amendments or corrections to the CP or CPS, such modifications shall be circulated to appropriate parties identified by the Bombardier PMA. Comments from such parties will be collected and considered by the Bombardier PMA in a fashion prescribed by the Bombardier PMA.

Following approval by the Bombardier PMA, public notification of amendments shall be made.

Notwithstanding the foregoing, if the Bombardier PMA believes that material amendments to the CP are necessary immediately to stop or prevent a breach of the security of Bombardier, the Bombardier PMA shall be entitled to make such amendments effective immediately upon publication in the Repository without having to circulate the amendments prior to their adoption.

9.12.2 Notification mechanism and period

Errors, updates and anticipated changes to the CP and CPS resulting from reviews are provided to the Bombardier PMA by the OA Administrator. In addition, the OA Administrator shall communicate changes to every affected entity, including cross-certified PKIs, via a designated point of contact, including a description of the change.

This CP and any subsequent changes shall be made publicly available within fourteen (14) days of approval by the Bombardier PMA.

The most up to date copy of this CP can be found at:

https://pubextpki.aero.bombardier.com/CertificatePolicy.pdf

9.12.3 Circumstances under which OID must be changed

Certificate Policy OIDs shall be changed if the Bombardier PMA determines that a change in the CP reduces the level of assurance provided.

9.13 Dispute resolution provisions

9.13.1 Disputes among the Bombardier PMA/OA and Third Parties

Provisions for resolving disputes between the Bombardier PKI PMA/OA and contractually linked entities shall be set forth in the applicable agreements between the parties.

9.13.2 Alternate Dispute Resolution Provisions

In case of any dispute or disagreement between two or more participants arising out of or related to this CP, the Disputing Parties will use their best efforts to settle the dispute or disagreement through mediation or good faith negotiations following notice from one disputing party to the other. If the dispute is not successfully resolved by negotiation between the entities or the parties within sixty (60) days following the date of such notice, it shall be settled by final and binding arbitration before a single arbitrator knowledgeable in the information technology industry in accordance with the then existing Rules of Conciliation and Arbitration of the International Chamber of Commerce (ICC). The place of arbitration shall be defined in the relevant agreement between contracting parties. In the absence of such agreement, the place of arbitration shall be Montreal, Quebec, Canada.

This provision does not limit the right of a party to obtain other recourse and relief under any applicable law for disputes or disagreements that do not arise out of or which are not related to this CP.

9.14 Governing law

Subject to any limits appearing in applicable law, the criminal laws of Canada and the civil laws of the Province of Quebec, shall govern the enforceability, construction, interpretation, and validity of this CP, irrespective of contract or other choice of law provisions and without the requirement to establish a commercial nexus in Canada or Quebec.

This governing law provision applies only to this CP. Agreements incorporating the CP by reference may have their own governing law provisions, provided that this section 9.14 governs the enforceability, construction, interpretation, and validity of the terms of the CP separate and apart from the terms of such other agreements, subject to any limitations appearing in applicable law.

9.15 Compliance with applicable law

This CP is subject to applicable national, state, local and foreign laws, rules, regulations, ordinances, decrees, and orders including, but not limited to, restrictions on exporting or importing software, hardware, or technical information.

Parties agree to conform to applicable laws and regulations.

9.16 Miscellaneous provisions

9.16.1 Entire agreement

No stipulations.

9.16.2 Assignment

Except as otherwise provided under the applicable agreements, no party may assign or delegate this CP or any of its rights or duties under this CP, without the prior written consent of the other party, except that Bombardier may assign and delegate this CP to any party of its choosing.

9.16.3 Severability

If any provision of this CP is held to be invalid by a court of competent jurisdiction, then the remaining provisions will nevertheless remain in full force and effect.

9.16.4 Enforcement (attorneys' fees and waiver of rights)

Failure or delay at any time to enforce any right hereunder shall not constitute a waiver of such right or affect the validity of the CP or any part thereof, nor shall it prejudice the rights to enforce such right at a subsequent time.

9.16.5 Force Majeure

Bombardier shall not be liable for any failure or delay in its performance under this CP due to causes that are beyond its reasonable control, including, but not limited to, an act of God, act of civil or military authority, natural disasters, fire, epidemic, flood, earthquake,

riot, war, failure of equipment, failure of telecommunications lines, lack of Internet access, sabotage, and governmental action or any unforeseeable events or situations.

BOMBARDIER HAS NO LIABILITY FOR ANY DELAYS, NON-DELIVERIES, NON-PAYMENTS, MIS-DELIVERIES OR SERVICE INTERRUPTIONS CAUSED BY ANY THIRD PARTY ACTS OR THE INTERNET INFRASTRUCTURE OR ANY NETWORK EXTERNAL TO BOMBARDIER.

9.17 Other provisions

No stipulation.

10 Certificate, CRL, and OCSP Formats

This section contains the formats for the various PKI objects such as Certificates, CRLs, and OCSP requests and responses. The section only contains Certificate profiles based on RSA. For algorithm identifiers, parameter encoding, Public Key encoding, and signature encoding for ECDSA and ECDH, IETF RFC 3279 shall be used.

Certificates and CRLs issued under a policy OID of this CP may contain extensions not listed in the profiles in this section only upon Bombardier PMA approval.

First entries in the caIssuers field of the AIA extension and CRL DP shall point to a resource that is publicly available using HTTP. If LDAP pointers are used, they shall appear only after the HTTP pointers.

For attribute values other than dc and e-mail address: All CA Distinguished Names (in various fields such as Issuer, Subject, Subject Alternative Name, Name constraints, etc.) shall be encoded as printable string. All Subscriber DN portions that name constraints apply to, shall be encoded as printable string. Other portions of the Subscriber DN shall be encoded as printable string if possible. If a portion cannot be encoded as printable string, then and only then shall it be encoded using a different format and that format shall be UTF8.

All dc and email address attribute values shall be encoded as IA5 string.

CAs may issue partitioned CRLs as long as the CRLs are not indirect CRLs, are not partitioned by reason code, and CRL DP and Issuing Distribution Point do not assert name relative to issuer. If the Entity PKI provides OCSP services for a CA, that CA must also issue a full and complete CRL (i.e., a CRL without Issuing Distribution Point extension) for use by the OCSP Responder.

The CRL distribution point extension shall only populate the distributionPoint field. The distributionPoint field shall contain one or more HTTP (i.e., of the form http://…) URI(s) and may be followed by one or more LDAP (i.e., of the form ldap://…) URI(s). The reasons and cRLIssuer fields shall not be populated. The CRL shall point to a full and complete CRL or a Distribution Point based partitioned CRL. The Distribution Point field shall contain a full name (i.e., the Distribution Point field shall not contain nameRelativeToCRLIssuer).

Global Unique Identifier (GUID) used in Certificates shall conform to RFC 4122 requirement. Since GUID is associated with a card, the same GUID shall be asserted as UUID in all applicable Certificates and in all applicable other signed objects on the card.

10.1 PKI component Certificates

10.1.1 Bombardier Self-Signed Roots (Trust Anchors)

Field	**Value**
Version	V3 (2)
Serial Number	Must be unique
Issuer Signature Algorithm	sha256WithRSAEncryption {1.2.840.113549.1.1.11}
Issuer Distinguished Name	Unique X.500 Subject CA DN conforming to section 7.1.4 of this CP
Validity Period	Expressed in UTCTime until 2049
Subject Distinguished Name	Unique X.500 Subject CA DN conforming to section 7.1.4 of this CP
Subject Public Key Information	4096 bit RSA key modulus, rsaEncryption {1.2.840.113549.1.1.1}
Issuer's Signature	sha256WithRSAEncryption {1.2.840.113549.1.1.11}
Extension	**Value**
Subject Key Identifier	c=no; Octet String
Key Usage	c=yes; keyCertSign, cRLSign, DigitalSignature, contentCommitment
Basic Constraints	c=yes; cA=True; path length constraint absent

10.1.2 Bombardier Subordinate CAs

Field	**Value**
Version	V3 (2)
Serial Number	Must be unique
Issuer Signature Algorithm	sha256WithRSAEncryption {1.2.840.113549.1.1.11}
Issuer Distinguished Name	Unique X.500 Issuer CA DN conforming to section 7.1.4 of this CP
Validity Period	Refer to the table in section 5.6, expressed in UTCTime until 2049
Subject Distinguished Name	Unique X.500 Subject CA DN conforming to section 7.1.4 of this CP
Subject Public Key Information	Refer to section 6.1
Issuer's Signature	sha256WithRSAEncryption {1.2.840.113549.1.1.11}
Extension	**Value**
Authority Key Identifier	c=no; Octet String (same as subject key identifier in Issuing CA Certificate)
Subject Key Identifier	c=no; Octet String (same as in PKCS-10 request from the subject CA)
Key Usage	c=yes; keyCertSign, cRLSign, DigitalSignature, contentCommitment
Certificate Policies	c=no; As per section 7.1.6
Basic Constraints	c=yes; cA=True; pathLength = 0;
Name Constraints	c=no; PERMITTED: at least DIRNAME equal to the last two RDN values of the Subject DN
Authority Information Access	c=no; id-ad-caIssuers access method entry contains HTTP URL for .p7c file containing Certificates issued to Issuing CA, may be followed by LDAP URL pointer to the caCertificate attribute of the Issuing CA; id-ad-ocsp access method entry contains HTTP URL for the Issuing CA
CRL Distribution Points	c = no;

10.1.3 OCSP Responder Certificate

The following table contains the OCSP Responder Certificate profile assuming that the same CA using the same key as the Subscriber Certificate issues the OCSP Responder Certificate.

Field	**Value**
Version	V3 (2)
Serial Number	Must be unique
Issuer Signature Algorithm	sha256 WithRSAEncryption {1.2.840.113549.1.1.11}
Issuer Distinguished Name	Unique X.500 Issuing CA DN conforming to section 7.1.4 of this CP
Validity Period	Issued monthly or more frequently with a validity period no longer than 45 days from date of issue expressed in UTCTime until 2049
Subject Distinguished Name	Unique X.500 OCSP Responder (subject) DN conforming to section 7.1.4 of this CP
Subject Public Key Information	2048 bit RSA key modulus, rsaEncryption
Issuer's Signature	sha256WithRSAEncryption {1.2.840.113549.1.1.11}
Extension	**Value**
Authority Key Identifier	c=no; Octet String (same as subject key identifier in Issuing CA Certificate)
Subject Key Identifier	c=no; Octet String (same as in PKCS-10 request or calculated by the Issuing CA)
Key Usage	c=yes; contentCommitment, digitalSignature
Extended Key Usage	c=yes; As per section 10.7
Certificate Policies	c=no; As per section 7.1.6
Subject Alternative Name	HTTP URL for the OCSP Responder
No Check id-pkix-ocsp-nocheck; {1 3 6 1 5 5 7 48 1 5}	c=no; Null
Authority Information Access	c=no; id-ad-caIssuers access method entry contains HTTP URL for .p7c file containing Certificates issued to issuing CA, may be followed by LDAP URL pointer to the caCertificate attribute of the Issuing CA

10.1.4 SCVP Server Certificate

The following table contains the SCVP Server Certificate profile assuming that the same CA using the same key as the Subscriber Certificate issues the SCVP Server Certificate.

Field	**Value**
Version	V3 (2)
Serial Number	Must be unique
Issuer Signature Algorithm	sha256 WithRSAEncryption {1.2.840.113549.1.1.11}
Issuer Distinguished Name	Unique X.500 Issuing CA DN conforming to section 7.1.4 of this CP
Validity Period	No longer than 3 years from date of issue expressed in UTCTime until 2049
Subject Distinguished Name	Unique X.500 SCVP Server (subject) DN conforming to section 7.1.4 of this CP
Subject Public Key Information	2048 bit RSA key modulus, rsaEncryption
Issuer's Signature	sha256WithRSAEncryption {1.2.840.113549.1.1.11}
Extension	**Value**
Authority Key Identifier	c=no; Octet String (same as subject key identifier in Issuing CA Certificate)
Subject Key Identifier	c=no; Octet String (same as in PKCS-10 request or calculated by the Issuing CA)
Key Usage	c=yes; contentCommitment, digitalSignature
Extended Key Usage	c=yes; As per section 10.7
Certificate Policies	c=no; As per section 7.1.6
Subject Alternative Name	c=no; HTTP URL for the SCVP Server

10.1.5 TSA Certificate

The following table contains the TSA Certificate profile assuming that the Root CA issues the TSA Certificate.

Field	**Value**
Version	V3 (2)
Serial Number	Must be unique
Issuer Signature Algorithm	sha256 WithRSAEncryption {1.2.840.113549.1.1.11}
Issuer Distinguished Name	Unique X.500 Issuing CA DN conforming to section 7.1.4 of this CP
Validity Period	No longer than issuing Root-CA (up to 20 years)
Subject Distinguished Name	Unique subject DN conforming to section 7.1.4 of this CP
Subject Public Key Information	PublicKeyAlgorithm: <set by issuing CA> signatureValue: <created at certificate issuance>
Issuer's Signature	sha256WithRSAEncryption {1.2.840.113549.1.1.11}
Extension	**Value**
Authority Key Identifier	critical=no; <SKI of issuing CA's Signing Certificate>
Subject Key Identifier	c=no; <created at certificate issuance>
Key Usage	c=yes; digitalSignature, contentCommitment
Extended Key Usage	c=yes; id-kp-timeStamping {1.3.6.1.5.5.7.3.8}
Certificate Policies	c=no; Policy OID from issuing CA
Authority Information Access	c=no; caIssuers: <from issuing CA> OCSP: <optional from issuing CA>
CRL Distribution Point	c=no

10.2 End-Entity Certificates

This section describes the values that populate each field of the Certificates issued by the Bombardier PKI CAs.

10.2.1 Subscriber Identity Certificate

Field	**Value**
Version	V3 (2)
Serial Number	Must be unique
Issuer Signature Algorithm	sha256 WithRSAEncryption {1.2.840.113549.1.1.11}
Issuer Distinguished Name	Unique X.500 Issuing CA DN conforming to section 7.1.4 of this CP
Validity Period	No longer than 3 years from date of issue expressed in UTCTime until 2049
Subject Distinguished Name	Unique X.500 subject DN conforming to section 7.1.4 of this CP
Subject Public Key Information	2048 bit RSA key modulus, rsaEncryption {1.2.840.113549.1.1.1}
Issuer's Signature	sha256WithRSAEncryption {1.2.840.113549.1.1.11}
Extension	**Value**
Authority Key Identifier	c=no; Octet String (same as subject key identifier in Issuing CA Certificate)
Subject Key Identifier	c=no; Octet String (same as in PKCS-10 request or calculated by the Issuing CA per RFC 5280 method 1 or other method)
Key Usage	c=yes; digitalSignature (always present)
Extended Key Usage	c=no; As per section 10.7
Certificate Policies	c=no; As per section 7.1.6
Subject Alternative Name	c=no; URI (optional), otherName::principalName(1.3.6.1.4.1.311.20.2.3, optional, ASN1-encoded UTF-8 string); RFC822 email address (optional); others optional
Authority Information Access	c=no; id-ad-caIssuers access method entry contains HTTP URL for .p7c file containing Certificates issued to Issuing CA, may be followed by LDAP URL pointer to the caCertificate attribute of the Issuing CA; id-ad-ocsp access method entry contains HTTP URL for the Issuing CA OCSP Responder

Field	Value
CRL Distribution Points	c = no

10.2.2 Subscriber Signature Certificate

Field	**Value**
Version	V3 (2)
Serial Number	Must be unique
Issuer Signature Algorithm	sha256WithRSAEncryption {1.2.840.113549.1.1.11}
Issuer Distinguished Name	Unique X.500 Issuing CA DN conforming to section 7.1.4 of this CP
Validity Period	No longer than 3 years from date of issue expressed in UTCTime until 2049
Subject Distinguished Name	Unique X.500 subject DN conforming to section 7.1.4 of this CP
Subject Public Key Information	2048 bit RSA key modulus, rsaEncryption {1.2.840.113549.1.1.1}
Issuer's Signature	sha256WithRSAEncryption {1.2.840.113549.1.1.11}
Extension	**Value**
Authority Key Identifier	c=no; Octet String (same as subject key identifier in Issuing CA Certificate)
Subject Key Identifier	c=no; Octet String (same as in PKCS-10 request or calculated by the Issuing CA)
Key Usage	c=yes; digitalSignature (always present), contentCommitment (always present)
Extended Key Usage[5]	c=no; As per section 10.7
Certificate Policies	c=no; As per section 7.1.6
Subject Alternative Name	c=no; RFC822 email address (required); URI (optional); others optional
Authority Information Access	c=no; id-ad-caIssuers access method entry contains HTTP URL for .p7c file containing Certificates issued to Issuing CA, may be followed by LDAP URL pointer to the caCertificate attribute of the Issuing CA; id-ad-ocsp access method entry contains HTTP URL for the Issuing CA OCSP Responder
CRL Distribution Points	c = no

[5] Included to support EKU for Smart Card Logon

10.2.3 Subscriber Encryption Certificate

Field	**Value**
Version	V3 (2)
Serial Number	Must be unique
Issuer Signature Algorithm	sha256WithRSAEncryption {1.2.840.113549.1.1.11}
Issuer Distinguished Name	Unique X.500 Issuing CA DN conforming to section 7.1.4 of this CP
Validity Period	No longer than 3 years from date of issue expressed in UTCTime until 2049
Subject Distinguished Name	Unique X.500 subject DN conforming to section 7.1.4 of this CP
Subject Public Key Information	2048 bit RSA key modulus, rsaEncryption {1.2.840.113549.1.1.1}
Issuer's Signature	sha256WithRSAEncryption {1.2.840.113549.1.1.11}
Extension	**Value**
Authority Key Identifier	c=no; Octet String (same as subject key identifier in Issuing CA Certificate)
Subject Key Identifier	c=no; Octet String (same as in PKCS-10 request or calculated by the Issuing CA)
Key Usage	c=yes; keyEncipherment (required), dataEncipherment (optional)
Extended Key Usage	c=no; As per section 10.7
Certificate Policies[6]	c=no; As per section 7.1.6
Subject Alternative Name	c=no; RFC822 email address (required); URI (optional), others optional
Authority Information Access	c=no; id-ad-caIssuers access method entry contains HTTP URL for .p7c file containing Certificates issued to Issuing CA, may be followed by LDAP URL pointer to the caCertificate attribute of the Issuing CA; id-ad-ocsp access method entry contains HTTP URL for the Issuing CA OCSP Responder
CRL Distribution Points	c = no

[6] Only software OID asserted to support key recovery to software tokens

10.2.4 Non-Aircraft Software Code Signing Certificate

Field	**Value**
Version	V3 (2)
Serial Number	Must be unique
Issuer Signature Algorithm	sha256 WithRSAEncryption {1.2.840.113549.1.1.11}
Issuer Distinguished Name	Unique X.500 Issuing CA DN conforming to section 7.1.4 of this CP
Validity Period	expressed in UTCTime until 2049. As per section 5.6 of this CP
Subject Distinguished Name	Unique X.500 subject DN conforming to section 7.1.4 of this CP
Subject Public Key Information	2048 bit RSA key modulus, rsaEncryption {1.2.840.113549.1.1.1}
Issuer Unique Identifier	Not Present
Subject Unique Identifier	Not Present
Issuer's Signature	sha256WithRSAEncryption {1.2.840.113549.1.1.11}
Extension	**Value**
Authority Key Identifier	c=no; Octet String (same as subject key identifier in Issuing CA Certificate)
Subject Key Identifier	c=no; Octet String (same as in PKCS-10 request or calculated by the Issuing CA)
Key Usage	c=yes; digitalSignature (always present), contentCommitment (optional)
Extended key usage	c=yes; As per section 10.7
Certificate Policies	c=no; As per section 7.1.6
Subject Alternative Name	c=no; publicID found in the sN field of the DN of the ID certificate issued to the person controlling the Code Signing Private Key
CRL Distribution Points	c = no
Authority Information Access	c=no; id-ad-caIssuers access method entry contains HTTP URL for .p7c file containing Certificates issued to Issuing CA, may be followed by LDAP URL pointer to the caCertificate attribute of the Issuing CA; id-ad-ocsp access method entry contains HTTP URL for the Issuing CA OCSP Responder

10.2.5 LSAP Code Signing Certificate

Field	**Value**
Version	V3 (2)
Serial Number	Must be unique
Issuer Signature Algorithm	sha256 WithRSAEncryption {1.2.840.113549.1.1.11}
Issuer Distinguished Name	Unique X.500 Issuing CA DN conforming to section 7.1.4 of this CP
Validity Period	expressed in UTCTime until 2049. As per section 5.6 of this CP
Subject Distinguished Name	Unique X.500 subject DN conforming to section 7.1.4 of this CP
Subject Public Key Information	2048 bit RSA key modulus, rsaEncryption {1.2.840.113549.1.1.1}
Issuer Unique Identifier	Not Present
Subject Unique Identifier	Not Present
Issuer's Signature	sha256WithRSAEncryption {1.2.840.113549.1.1.11}
Extension	**Value**
Authority Key Identifier	c=no; Octet String (same as subject key identifier in Issuing CA Certificate)
Subject Key Identifier	c=no; Octet String (same as in PKCS-10 request or calculated by the Issuing CA)
Key Usage	c=yes; digitalSignature (always present), contentCommitment (always present)
Extended key usage	c=yes; As per section 10.7
Certificate Policies	c=no; As per section 7.1.6
Subject Alternative Name	c=no; DN of the person controlling the Code Signing Private Key
CRL Distribution Points	c = no
Authority Information Access	c=no; id-ad-caIssuers access method entry contains HTTP URL for .p7c file containing Certificates issued to Issuing CA, may be followed by LDAP URL pointer to the caCertificate attribute of the Issuing CA; id-ad-ocsp access method entry contains HTTP URL for the Issuing CA OCSP Responder

10.2.6 DAD Signature Certificate

Field	**Value**
Version	V3 (2)
Serial Number	Must be unique
Issuer Signature Algorithm	sha256 WithRSAEncryption {1.2.840.113549.1.1.11}
Issuer Distinguished Name	Unique X.500 Issuing CA DN conforming to section 7.1.4 of this CP
Validity Period	expressed in UTCTime until 2049. As per section 5.6 of this CP
Subject Distinguished Name	Unique X.500 subject DN conforming to section 7.1.4 of this CP
Subject Public Key Information	2048 bit RSA key modulus, rsaEncryption {1.2.840.113549.1.1.1}
Issuer Unique Identifier	Not Present
Subject Unique Identifier	Not Present
Issuer's Signature	sha256WithRSAEncryption {1.2.840.113549.1.1.11}
Extension	**Value**
Authority Key Identifier	c=no; Octet String (same as subject key identifier in Issuing CA Certificate)
Subject Key Identifier	c=no; Octet String (same as in PKCS-10 request or calculated by the Issuing CA)
Key Usage	c=yes; digitalSignature (always present), contentCommitment (always present)
Extended key usage	c=yes; As per section 10.7
Certificate Policies	c=no; As per section 7.1.6
Subject Alternative Name	c=no; DN of the person controlling the DAD Signature Private Key
CRL Distribution Points	c = no
Authority Information Access	c=no; id-ad-caIssuers access method entry contains HTTP URL for .p7c file containing Certificates issued to Issuing CA, may be followed by LDAP URL pointer to the caCertificate attribute of the Issuing CA; id-ad-ocsp access method entry contains HTTP URL for the Issuing CA OCSP Responder

10.2.7 Device or Server Identity Certificate

Field	**Value**
Version	V3 (2)
Serial Number	Must be unique
Issuer Signature Algorithm	sha256WithRSAEncryption {1.2.840.113549.1.1.11}
Issuer Distinguished Name	Unique X.500 Issuing CA DN conforming to section 7.1.4 of this CP
Validity Period	3 years from date of issue expressed in UTCTime until 2049
Subject Distinguished Name	Unique X.500 subject DN conforming to section 7.1.4 of this CP cn={ Host URL | Host IP Address | Host Name }
Subject Public Key Information	2048 bit RSA key modulus, rsaEncryption {1.2.840.113549.1.1.1}
Issuer's Signature	sha256WithRSAEncryption {1.2.840.113549.1.1.11}
Extension	**Value**
Authority Key Identifier	c=no; Octet String (same as subject key identifier in Issuing CA Certificate)
Subject Key Identifier	c=no; Octet String (same as in PKCS-10 request or calculated by the Issuing CA)
Key Usage	c=yes; digitalSignature (required), keyEncipherment (optional)
Extended key usage	c=no; As per section 10.7
Certificate Policies	c=no; As per section 7.1.6
Subject Alternative Name	c=no; always present, Host URL | IP Address | Host Name
Authority Information Access	c=no; id-ad-caIssuers access method entry contains HTTP URL for .p7c file containing Certificates issued to Issuing CA, may be followed by LDAP URL pointer to the caCertificate attribute of the Issuing CA; id-ad-ocsp access method entry contains HTTP URL for the Issuing CA OCSP Responder
CRL Distribution Points	c = no

10.2.8 Device or Server Signature Certificate

Field	**Value**
Version	V3 (2)
Serial Number	Must be unique
Issuer Signature Algorithm	sha256WithRSAEncryption {1.2.840.113549.1.1.11}
Issuer Distinguished Name	Unique X.500 Issuing CA DN conforming to section 7.1.4 of this CP
Validity Period	3 years from date of issue expressed in UTCTime until 2049
Subject Distinguished Name	Unique X.500 subject DN conforming to section 7.1.4 of this CP cn={ Host URL | Host IP Address | Host Name }
Subject Public Key Information	2048 bit RSA key modulus, rsaEncryption {1.2.840.113549.1.1.1}
Issuer's Signature	sha256WithRSAEncryption {1.2.840.113549.1.1.11}
Extension	**Value**
Authority Key Identifier	c=no; Octet String (same as subject key identifier in Issuing CA certificate)
Subject Key Identifier	c=no; Octet String (same as in PKCS-10 request or calculated by the Issuing CA)
Key Usage	c=yes; digitalSignature (always present), contentCommitment (optional)
Certificate Policies	c=no; As per section 7.1.6
Subject Alternative Name	c=no; always present, RFC822 email address | Host URL | IP Address | Host Name
Authority Information Access	c=no; id-ad-caIssuers access method entry contains HTTP URL for .p7c file containing Certificates issued to Issuing CA, may be followed by LDAP URL pointer to the caCertificate attribute of the Issuing CA; id-ad-ocsp access method entry contains HTTP URL for the Issuing CA OCSP Responder
CRL Distribution Points	c = no

10.2.9 Device or Server Encryption Certificate

Field	Value
Version	V3 (2)
Serial Number	Must be unique
Issuer Signature Algorithm	sha256WithRSAEncryption {1.2.840.113549.1.1.11}
Issuer Distinguished Name	Unique X.500 Issuing CA DN conforming to section 7.1.4 of this CP
Validity Period	3 years from date of issue expressed in UTCTime until 2049
Subject Distinguished Name	Unique X.500 subject DN conforming to section 7.1.4 of this CP cn={ Host URL | Host IP Address | Host Name }
Subject Public Key Information	2048 bit RSA key modulus, rsaEncryption {1.2.840.113549.1.1.1}
Issuer's Signature	sha256WithRSAEncryption {1.2.840.113549.1.1.11}
Extension	**Value**
Authority Key Identifier	c=no; Octet String (same as subject key identifier in Issuing CA Certificate)
Subject Key Identifier	c=no; Octet String (same as in PKCS-10 request or calculated by the Issuing CA)
Key Usage	c=yes; keyEncipherment (required), dataEncipherment (optional)
Extended Key Usage	c=no; As per section 10.7
Certificate Policies[7]	c=no; As per section 7.1.6
Subject Alternative Name	c=no; always present, Host URL | IP Address | Host Name
Authority Information Access	c=no; id-ad-caIssuers access method entry contains HTTP URL for .p7c file containing Certificates issued to Issuing CA, may be followed by LDAP URL pointer to the caCertificate attribute of the Issuing CA; id-ad-ocsp access method entry contains HTTP URL for the Issuing CA OCSP Responder
CRL Distribution Points	c = no

[7] Only software OID asserted to support key recovery to software tokens

10.2.10 Aircraft or Aircraft Equipment Identity Certificate

Field	**Value**
Version	V3 (2)
Serial Number	Must be unique
Issuer Signature Algorithm	sha256WithRSAEncryption {1.2.840.113549.1.1.11}
Issuer Distinguished Name	Unique X.500 Issuing CA DN conforming to section 7.1.4 of this CP
Validity Period	3 years from date of issue expressed in UTCTime until 2049
Subject Distinguished Name	Unique X.500 subject DN conforming to section 7.1.4 of this CP cn={ Aircraft Identification | Aircraft Equipment Identification (see 7.1.4) }
Subject Public Key Information	2048 bit RSA key modulus, rsaEncryption
Issuer's Signature	sha256WithRSAEncryption {1.2.840.113549.1.1.11}
Extension	**Value**
Authority Key Identifier	c=no; Octet String (same as subject key identifier in Issuing CA Certificate)
Subject Key Identifier	c=no; Octet String (same as in PKCS-10 request or calculated by the Issuing CA)
Key Usage	c=yes; digitalSignature (required), keyEncipherment (optional)
Extended key usage	optional; c=no;
Certificate Policies	c=no; As per section 7.1.6
Subject Alternative Name	c=no; always present, Aircraft Identification | Aircraft Equipment Identification (see 7.1.4)
Authority Information Access	c=no; id-ad-caIssuers access method entry contains HTTP URL for .p7c file containing Certificates issued to Issuing CA, may be followed byLDAP URL pointer to the caCertificate attribute of the Issuing CA; id-ad-ocsp access method entry contains HTTP URL for the Issuing CA OCSP Responder
CRL Distribution Points	c = no

10.2.11 Aircraft or Aircraft Equipment Signature Certificate

Field	**Value**
Version	V3 (2)
Serial Number	Must be unique
Issuer Signature Algorithm	sha256WithRSAEncryption {1.2.840.113549.1.1.11}
Issuer Distinguished Name	Unique X.500 Issuing CA DN conforming to section 7.1.4 of this CP
Validity Period	3 years from date of issue expressed in UTCTime until 2049
Subject Distinguished Name	Unique X.500 subject DN conforming to section 7.1.4 of this CP cn={ Aircraft Identification | Aircraft Equipment Identification (see 7.1.4) }
Subject Public Key Information	2048 bit RSA key modulus, rsaEncryption
Issuer's Signature	sha256WithRSAEncryption {1.2.840.113549.1.1.11}
Extension	**Value**
Authority Key Identifier	c=no; Octet String (same as subject key identifier in Issuing CA certificate)
Subject Key Identifier	c=no; Octet String (same as in PKCS-10 request or calculated by the Issuing CA)
Key Usage	c=yes; digitalSignature (always present), contentCommitment (optional)
Extended key usage	optional; c=no;
Certificate Policies	c=no; As per section 7.1.6
Subject Alternative Name	c=no; always present, Aircraft Identification | Aircraft Equipment Identification (see 7.1.4)
Authority Information Access	c=no; id-ad-caIssuers access method entry contains HTTP URL for .p7c file containing Certificates issued to Issuing CA, may be followed by LDAP URL pointer to the caCertificate attribute of the Issuing CA; id-ad-ocsp access method entry contains HTTP URL for the Issuing CA OCSP Responder
CRL Distribution Points	c = no

10.2.12 Aircraft or Aircraft Equipment Encryption Certificate

Field	**Value**
Version	V3 (2)
Serial Number	Must be unique
Issuer Signature Algorithm	sha256 WithRSAEncryption {1.2.840.113549.1.1.11}
Issuer Distinguished Name	Unique X.500 Issuing CA DN conforming to section 7.1.4 of this CP
Validity Period	3 years from date of issue expressed in UTCTime until 2049
Subject Distinguished Name	Unique X.500 subject DN conforming to section 7.1.4 of this CP cn={ Aircraft Identification | Aircraft Equipment Identification (see 7.1.4) }
Subject Public Key Information	2048 bit RSA key modulus, rsaEncryption
Issuer's Signature	sha256WithRSAEncryption {1.2.840.113549.1.1.11}
Extension	**Value**
Authority Key Identifier	c=no; Octet String (same as subject key identifier in Issuing CA Certificate)
Subject Key Identifier	c=no; Octet String (same as in PKCS-10 request or calculated by the Issuing CA)
Key Usage	c=yes; keyEncipherment (required), dataEncipherment (optional)
Extended key usage	c=no; as per section 10.7
Certificate Policies[8]	c=no; As per section 7.1.6
Subject Alternative Name	c=no; always present, Aircraft Identification | Aircraft Equipment Identification (see 7.1.4)
Authority Information Access	c=no; id-ad-caIssuers access method entry contains HTTP URL for .p7c file containing Certificates issued to Issuing CA, may be followed byLDAP URL pointer to the caCertificate attribute of the Issuing CA; id-ad-ocsp access method entry contains HTTP URL for the Issuing CA OCSP Responder
CRL Distribution Points	c = no

[8] Only software OID asserted to support key recovery to software tokens

10.2.13 Role Signature Certificate

Field	**Value**
Version	V3 (2)
Serial Number	Must be unique
Issuer Signature Algorithm	sha256WithRSAEncryption {1.2.840.113549.1.1.11}
Issuer Distinguished Name	Unique X.500 Issuing CA DN conforming to section 7.1.4 of this CP
Validity Period	No longer than 3 years from date of issue expressed in UTCTime until 2049
Subject Distinguished Name	Unique X.500 subject DN for role conforming to Section 7.1.4 of this CP
Subject Public Key Information	2048 bit RSA key modulus, rsaEncryption {1.2.840.113549.1.1.1}
Issuer's Signature	sha256WithRSAEncryption {1.2.840.113549.1.1.11}
Extension	**Value**
Authority Key Identifier	c=no; Octet String (same as subject key identifier in Issuing CA Certificate)
Subject Key Identifier	c=no; Octet String (same as in PKCS-10 request or calculated by the Issuing CA)
Key Usage	c=yes; digitalSignature (always present), contentCommitment (always present)
Extended Key Usage	c=no; As per section 10.7
Certificate Policies	c=no; As per section 7.1.6
Subject Alternative Name	c = no; DN of the person controlling the role signing private key; RFC822 email address of role (Optional)
CRL Distribution Points	c = no
Authority Information Access	c=no; id-ad-caIssuers access method entry contains HTTP URL for .p7c file containing Certificates issued to Issuing CA, may be followed by LDAP URL pointer to the caCertificate attribute of the Issuing CA; id-ad-ocsp access method entry contains HTTP URL for the Issuing CA OCSP Responder

10.2.14 Role Encryption Certificate

Field	**Value**
Version	V3 (2)
Serial Number	Must be unique
Issuer Signature Algorithm	sha256WithRSAEncryption {1.2.840.113549.1.1.11}
Issuer Distinguished Name	Unique X.500 Issuing CA DN conforming to section 7.1.4 of this CP
Validity Period	No longer than 3 years from date of issue expressed in UTCTime until 2049
Subject Distinguished Name	Unique X.500 subject DN for role conforming to Section 7.1.4 of this CP
Subject Public Key Information	2048 bit RSA key modulus, rsaEncryption {1.2.840.113549.1.1.1}
Issuer's Signature	sha256WithRSAEncryption {1.2.840.113549.1.1.11}
Extension	**Value**
Authority Key Identifier	c=no; Octet String (same as subject key identifier in Issuing CA Certificate)
Subject Key Identifier	c=no; Octet String (same as in PKCS-10 request or calculated by the Issuing CA)
Key Usage	c=yes; keyEncipherment
Extended Key Usage	c=no; As per section 10.7
Certificate Policies[9]	c=no; As per section 7.1.6
Subject Alternative Name	c = no; DN of the person controlling the role private key; RFC822 email address of role (required); others optional
CRL Distribution Points	c = no
Authority Information Access	c=no; id-ad-caIssuers access method entry contains HTTP URL for .p7c file containing Certificates issued to Issuing CA, , may be followed by LDAP URL pointer to the caCertificate attribute of the Issuing CA; id-ad-ocsp access method entry contains HTTP URL for the Issuing CA OCSP Responder

[9] Only software OID asserted to support key recovery to software tokens

10.3 CRL Format

10.3.1 Full and Complete CRL

If the CA provides OCSP Responder Services, the CA shall make a full and complete CRL available to the OCSP Responders as specified below. This CRL may also be provided to the relying parties.

Field	**Value**
Version	V2 (1)
Issuer Signature Algorithm	sha256 WithRSAEncryption {1.2.840.113549.1.1.11}
Issuer Distinguished Name	Unique X.500 Issuing CA DN conforming to section 7.1.4 of this CP
thisUpdate	expressed in UTCTime until 2049
nextUpdate	expressed in UTCTime until 2049 (>= thisUpdate + CRL issuance frequency)
Revoked Certificates list	0 or more 2-tuple of Certificate serial number and revocation date (in Generalized Time)
Issuer's Signature	sha256WithRSAEncryption {1.2.840.113549.1.1.11}
CRL Extension	**Value**
CRL Number	c=no; monotonically increasing integer (never repeated)
Authority Key Identifier	c=no; Octet String (same as in Authority Key Identifier field in Certificates issued by the CA)
CRL Entry Extension	**Value**
Reason Code	c=no; optional, must be included when reason code = key compromise or CA compromise

10.3.2 Distribution Point Based Partitioned CRL

Not Supported

10.4 OCSP Request Format

Requests sent to Issuer PKI OCSP Responders are not required to be signed, but may be at the discretion of the Issuer PKI. See RFC 6960 for detailed syntax. The following table lists the fields that are expected by the OCSP Responder.

Field	**Value**
Version	V1 (0)
Requester Name	DN of the requestor (required)
Request List	List of Certificates as specified in RFC 6960
Request Extension	**Value**
None	None
Request Entry Extension	**Value**
None	None

10.5 OCSP Response Format

See RFC 6960 for detailed syntax. The following table lists which fields are populated by the OCSP Responder.

Field	**Value**
Response Status	As specified in RFC 6960
Response Type	id-pkix-ocsp-basic {1.3.6.1.5.5.7.48.1.1}
Version	V1 (0)
Responder ID	Octet String (same as subject key identifier in Responder Certificate)
Produced At	Generalized Time
List of Responses	Each response will contain Certificate id; Certificate status[10], thisUpdate, nextUpdate[11],
Responder Signature	sha256WithRSAEncryption {1.2.840.113549.1.1.11}
Certificates	Applicable OCSP Responder Certificates

[10] If the certificate is revoked, the OCSP Responder shall provide revocation time and revocation reason from CRL entry and CRL entry extension.

[11] The OCSP Responder shall use thisUpdate and nextUpdate from CA CRL.

Field	**Value**
Response Extension	**Value**
Nonce	c=no; Value in the nonce field of request (required, if present in request)
Response Entry Extension	**Value**
None	None

10.6 PKCS 10 Request Format

The following table contains the format for PKCS 10 requests.

Field	**Value**
Version	V1 (0)
Subject Distinguished Name	Unique X.500 CA DN as specified in Section 7.1.4 of this CP.
Subject Public Key Information	2048 bit modulus, rsaEncryption {1.2.840.113549.1.1.1}
Subject's Signature	sha256WithRSAEncryption {1.2.840.113549.1.1.11}
Extension (encoded in extension request attribute)	**Value**
Subject Key Identifier	c=no; Octet String
Key Usage	c=yes; optional; keyCertSign, cRLSign, digitalSignature, contentCommitment
Basic Constraints	c=yes; optional; cA=True; path length constraint (absent or 0 as appropriate)
Name Constraints	c=yes; optional; permitted subtrees for DN, RFC 822, and DNS name forms

10.7 Permitted Extended Key Usage Values

Certificate Type	**Required EKU**	**Optional EKU**	**Prohibited EKU**
CA[12]	None	None	All

[12] CA Certificate includes: self-signed Root Certificate, Cross-Certificates, intermediate and subordinate CA Certificates, and self-issued key rollover Certificates.

Certificate Type	Required EKU	Optional EKU	Prohibited EKU
OCSP Responder	id-kp-OCSPSigning {1.3.6.1.5.5.7.3.9}	None	All Others
SCVP Server	id-kp-scvpServer {1.3.6.1.5.5.7.3.15}	None	All Others
Subscriber, Role: Authentication	id-kp-clientAuth {1.3.6.1.5.5.7.3.2}; smartCardLogon {1.3.6.1.4.1.311.20.2.2}; id-pkinit-KPClientAuth {1.3.6.1.5.2.3.4}[13]	Any EKU that is consistent with Key Usage	anyExtendedKeyUsage {2.5.29.37.0}; and Any EKU that is not consistent with Key Usage
Subscriber, Role: Signature	id-kp-emailProtection {1.3.6.1.5.5.7.3.4}; MSFT Document Signing {1.3.6.1.4.1.311.10.3.12}; Adobe Certified Document Signing {1.2.840.113583.1.1.5}	Any EKU that is consistent with Key Usage	anyExtendedKeyUsage {2.5.29.37.0}; and Any EKU that is not consistent with Key Usage
DAD Signature	id-kp-emailProtection {1.3.6.1.5.5.7.3.4}; MSFT Document Signing {1.3.6.1.4.1.311.10.3.12}; Adobe Certified Document Signing {1.2.840.113583.1.1.5}	None	All Others
Subscriber, Role: Encryption[14]	id-kp-emailProtection {1.3.6.1.5.5.7.3.4};	Any EKU that is consistent with Key Usage, e.g., Encrypting File System {1.3.6.1.4.1.311.10.3.4}	anyExtendedKeyUsage {2.5.29.37.0}; and Any EKU that is not consistent with Key Usage
Non-Aircraft Software Code Signing	id-kp-codesigning {1.3.6.1.5.5.7.3.3}	Life-time Signing {1.3.6.1.4.1.311.10.3.13}[15]	All Others

[13] smartCardLogon and id-pkinit-KPClientAuth required only if the private key is in hardware.

[14] This Certificate is defined as the one that has only the key encipherment or key agreement bit set and optionally data encipherment bit set.

[15] It is recommended that this EKU be included so that Microsoft platforms will not verify signed code using an expired Certificate.

Certificate Type	Required EKU	Optional EKU	Prohibited EKU
LSAP Code Signing	id-kp-BALSAPCodeSigning {1.3.6.1.4.1.43804.3.6.3.1}	None	All Others
Device Authentication, Web Server	id-kp-serverAuth {1.3.6.1.5.5.7.3.1} id-kp-clientAuth {1.3.6.1.5.5.7.3.2}	None	All Others
Device Signature used for sending automated emails	id-kp-emailProtection {1.3.6.1.5.5.7.3.4}	None	All Others
Device Signature used for Message Signing (Web Service, Type X, etc.), other than air-ground communications	id-messageSigning {1.3.6.1.4.1.11243.20.1.1}	None	All Others
Device Signature used for Assertion Signing (e.g. SAML Assertions by Identity Providers and Attribute Authorities)	id-assertionSigning {1.3.6.1.4.1.11243.20.1.6}	None	All Others
Device Encryption used for Message Encryption (Web Service, Type X, etc.), other than airground communications	id-messageEncryption {1.3.6.1.4.1.11243.20.1.2}	None	All Others
Device Encryption used for Database Encryption	id-databaseEncryption {1.3.6.1.4.1.11243.20.1.3}	None	All Others
Device Encryption used for Archive Encryption	id-archiveEncryption {1.3.6.1.4.1.11243.20.1.4}	None	All Others
Device Encryption used for Assertion Protection	id-assertionProtection {1.3.6.1.4.1.11243.20.1.12 }	None	All Others
Domain Controller	id-kp-serverAuth {1.3.6.1.5.5.7.3.1}; id-kp-clientAuth {1.3.6.1.5.5.7.3.2}; id-pkinit-KPKdc {1.3.6.1.5.2.3.5}; smartCardLogon {1.3.6.1.4.1.311.20.2.2}	None	All Others

Certificate Type	Required EKU	Optional EKU	Prohibited EKU
Time Stamp Authority	id-kp-timestamping {1.3.6.1.5.5.7.3.8}	None	All Others
Web Client	id-kp-clientAuth {1.3.6.1.5.5.7.3.2}	None	All Others
Workstation	id-kp-clientAuth {1.3.6.1.5.5.7.3.2}; iKEIntermediate {1.3.6.1.5.5.8.2.2}; id-kp-ipsecIKE {1.3.6.1.5.5.7.3.17}	None	All Others