Tampere University of Applied Sciences

EASA Approval Process for Aircraft Modifications

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BACHELOR'S THESIS
DECEMBER 2020

Mechanical Engineering
Aircraft Engineering

ABSTRACT

Tampereen ammattikorkeakoulu
Tampere University of Applied Sciences
Degree Programme in Mechanical Engineering
Aircraft Engineering

KURRI, TOMI
EASA Approval Process for Aircraft Modifications

Bachelor's thesis 32 pages, appendices 3 pages
December 2020

In 2020, a Finnish aircraft manufacturer Atol Avion Ltd started working on a modification project considering certain Cessna 150 aircraft models. These modifications had to be approved by the European Aviation Safety Agency, EASA.

The purpose of this thesis was to study the fundamental aircraft type certification authorities and processes, and in addition, to describe guidelines on how to proceed with the application process itself. The information would be used to advance the Atol Avion project. This thesis was conducted partly as a literature-based study and partly as a documentation of an engineering project.

The basics of aircraft type certification, along with respective terms, are explained in this thesis. EASA Part 21, an annex of European aviation law focusing on aircraft type certification, is heavily featured. Methods regarding how to comply with EASA regulations are also addressed.

The information gathered for this thesis was successfully used during the supplemental type certificate application of Atol Avion’s modification project. Therefore, it could also be used to help other small engineering organisations to achieve type certification for their aircraft or aircraft-related parts. The Cessna project of the company is used as an example throughout the thesis, naturally pushing its focus towards general aviation aircraft.

Key words: aircraft, modification, type, certification, part 21, cs-23, easa

CONTENTS

ABBREVIATIONS AND TERMS

TAMK	Tampere University of Applied Sciences
EASA	European Union Aviation Safety Agency
FAA	Federal Aviation Administration
Traficom	Finnish Transport and Communications Agency
CB	Certification Basis
CP	Certification Program
CS	Certification Specification
DOA	Design Organisation Approval
FAR	Federal Aviation Regulations
MDL	Master Document List
Part 21	Airworthiness and Environmental Certification
POA	Product Organisation Approval
STC	Supplemental Type Certificate
TC	Type Certificate

1 INTRODUCTION

Atol Avion Ltd had acquired a Supplemental Type Certificate (STC) issued for certain Cessna 150 models. This supplemental type certificate was issued for replacing the original engine and propeller of the aircraft in question. However, some of the original spare parts were no longer available. Furthermore, there was a need to conduct some additional modifications to the STC. These conditions created the requirement for a new EASA (European Union Aviation Safety Agency) type certification application.

In response to this need, Atol Avion reached out to Tampere University of Applied Sciences (TAMK), the leading Finnish polytechnic in Aircraft Engineering, which eventually led to the creation of this thesis. This thesis was created during the early stage of the company's STC approval process, with the purpose of serving as an application guide by providing information for organisations who seek EASA approval for their aircraft modifications.

The initial objective of this thesis was to get EASA certification and approval for some additional changes to a Cessna 150 Rotax modification kit offered by Atol Avion for its customers. However, due to time constrains and internal issues within the company, the objective was later changed to a more study-based investigation of the application process in general and preparation of the necessary documents in order to get the approval for the project in the future.

The information in this thesis might be subject to change in the future, since the EU legislation is regularly updated, and new laws are implemented. It is therefore recommended, that if used as a guidebook, one should always refer to the latest EU regulation for the most valid and up-to-date information. However, it is very unlikely for the whole application process to change dramatically without a prenotice from EASA.

2 ATOL AVION

2.1 Company

Atol Avion Ltd is an aircraft design and manufacturing company headquartered in Rovaniemi, Finland. The company was founded in 2012 and is specialised in amphibious LSA (Light Sport Aircraft) aircraft capable of operating in air and on water, as well as on ground and snow. Atol Avion has been granted a Product Design Approval (POA). The company has a design organisation, which has its headquarters in Espoo, Finland. (Atol Avion n.d.)

2.2 Products

2.2.1 Atol Aurora

The company's main product is the Atol Aurora two-seat amphibious aircraft (Picture 1). The company has a high expertise in wooden composite materials. The lightweight two-seater Aurora seaplane can easily be transported due to its folding wing design. At its cruise speed of 160km/h, it has a range of 800km. The aircraft requires very little daily maintenance. (Atol Avion n.d.)

PICTURE 1. Atol Aurora amphibious aircraft (Atol Avion)

2.2.2 Rotax Engine Kit for Cessna 150

Atol Avion also provides an engine and propeller upgrade kit for various Cessna 150 models (Picture 2). Cessna 150 is a two-seat general aviation airplane designed with several utilities in mind. It was introduced by Cessna Aircraft Company in 1959 and is widely used as a trainer aircraft and as a commuter aircraft.

PICTURE 2. Rotax-modified Cessna F150-K (Atol Avion)

Cessna 150 series is factory installed with a Continental O-200 engine. The Atol Avion STC replaces this engine by Rotax 912S. Rotax 912 is a series of engines designed specifically with general aviation applications in mind. It is among the most popular engines of its class, mainly due its long, 2000-hour overhaul interval (TBO, Time Before Overhaul). (Busch 2017.)

Rotax 912S is a 100 horsepower, FAR 33 certified version of the successful engine. It is a 4-stroke liquid/air-cooled 4-cylinder engine with dual carburettors. (Rotax 2016.)

3 PROJECT BACKGROUND

After acquiring the Rotax-Cessna supplemental type certificate (STC) for replacing the Cessna 150 original Continental engine with a Rotax 912S (Picture 3), Atol Avion had discovered that several modifications needed to be conducted in order to offer the best possible performance. Among these modifications were

- Installing a new propeller governor.
- Removing control cable splitter box.
- Improving the water cooler lineage.

Some of the parts in the original STC could no longer be purchased commercially, creating the need for new certified spare parts. In addition, conducting modifications to the control cable splitter box and the water cooler lineage could not be done without being first approved by EASA. It was presumed that EASA was likely approve these modifications as they were not substantial, but since Atol Avion did not hold a Design Organisation Approval (DOA), a certification programme had to be put together.

PICTURE 3. Rotax 912S installed on a Cessna 150 (Atol Avion)

4 LEGISLATION

This chapter introduces the officials and authorities involved in the aircraft type certification process.

4.1 EASA

European Union Aviation Safety Agency (EASA) is an agency of the European Union (EU) based in Cologne, Germany. EASA was founded in 2008 and it is the governing authority of European civilian aviation. The main purpose of the agency is to ensure civil aviation safety in the EU by regulating the design, production, maintenance and operation of aircraft and related products and personnel involved in the operation of aircraft. (Regulation 2018/1139.)

4.1.1 Basic Regulation (Hard Law)

EU Basic Regulation (2018/1139), also known as “Hard Law”, is the legal foundation for European aviation. Information presented in the Basic Regulation is legally binding and has been approved by the European Parliament and the Council and the EU Commission (Lumppio, 2016). Annexes to the Basic Regulation are commonly referred to as “Parts”. Each Part has its own defined area of focus, e.g. aircraft maintenance or airworthiness. The regulation structure is presented in Appendix 1.

4.1.2 Decisions (Soft Law)

Hard law sets out the basic rules that organisations within member states must follow. It does not, however, determine the means on how to comply with these rules. This area falls under so called “Soft Law”.

Soft Law is a set of agency rules created by EASA in order to assist in implementing EU regulations considering civilian aviation. Soft law is not legally binding, since the regulation is the sole legal foundation. (Lumppio 2016.) Soft law includes Certification Specifications (CS), Acceptable Means of Compliance (AMC) and Guidance Material (GM).

4.2 Federal Aviation Authority (FAA)

The Federal Aviation Authority (FAA) is the American counterpart of EASA. Created in 1958, it regulates and monitors aviation safety in the U.S. The FAA operates under the administration of United States Department of Transportation. (FAA 2020.) It is notable that before the creation of EASA in 2008, European aircraft were often obliged to follow FAA regulations to achieve type certification. This was likely due to the fact that few European national aviation authorities at the time had the capability to produce and maintain their own regulation.

4.2.1 FAR

Federal Aviation Regulations (FAR) are rules implemented by the Federal Aviation Agency. This regulation generally applies for aircraft intended for or made in the USA. Aircraft certified according to EASA rules are commonly granted a FAR approval and vice versa, so additional certification can be avoided.

4.3 TRAFICOM

The Finnish Transport and Safety Agency (Traficom) is the National Airworthiness Authority (NAA) of civilian aviation in Finland. It enjoys some jurisdiction over EASA but in most areas functions as the representative of EASA in Finland. For instance, Traficom oversees the implementation of EASA regulations for aircraft maintenance and production organisations in Finland (Traficom 2020).

Home built and ultralight aircraft are subject to EAS member state specific regulations and are thereby managed by Traficom (ICAO, 2019b).

5 AIRCRAFT TYPE CERTIFICATION

All aircraft and aircraft-related products, parts and appliances must be type certified. According to the EU Regulation 2018/1139,

> The design of a product shall be subject to certification and shall be issued with a type certificate. Changes to that design shall also be subject to certification and shall result in the issuance of a certificate of changes, including of supplemental type certificates. Repair designs shall be subject to certification and shall be issued with an approval. (EU 2018/1139, chapter 3, section 1, article 11.)

As can be seen from the list below, after almost any change done to a certified aircraft, an approval and a supplemental type certificate needs to be applied. First, we need to understand the definition of a modification.

A modification is defined as

- a change made to an aircraft, including its
    i. components
    ii. systems
    iii. engines
    iv. radios
    v. instruments
    vi. furnishings
    vii. flight manual
    viii. etc.

Changes can be either physical changes to the aircraft and its design or they can consist of documentation only. (ICAO, 2019b.)

5.1 Organisation Approvals

Aircraft design, manufacturing and maintenance are highly regulated procedures, and any type of organisation involved in any of these activities usually requires a corresponding EASA organisation approval. These approvals are the following:

TABLE 1. Organisation approvals. (Hoffren, 2019)

Organisation	Abbreviation	Defined in
Design Organisation Approval	DOA	Part 21 Subpart J
Production Organisation Approval	POA	Part 21 Subpart G
Maintenance Organisation Approval	MOA	Part M

Since the goal in this thesis was to get an approval for an aircraft modification, this thesis will focus in the role of Design Organisation (DO).

As it is determined in EASA Part 21 (Airworthiness and Environmental Certification), in order to demonstrate the capability to apply for type certification, a Design Organisation must;

a) Hold a Design Organisation Approval (DOA)
b) Use alternative means that must be agreed with EASA. (ADOA)
c) Provide a certification programme to EASA.

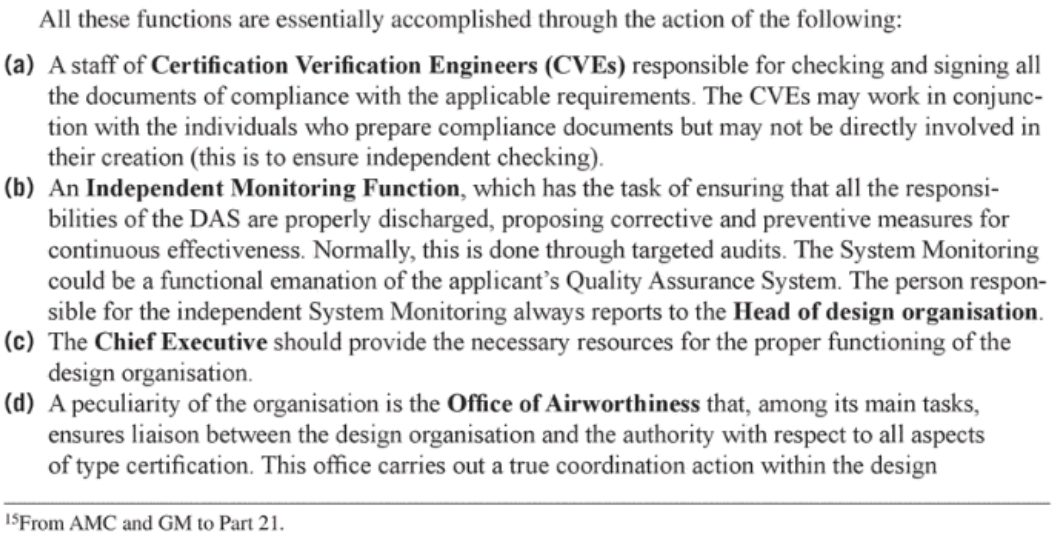
(EASA Part 21, 21.A.14)

As can be seen from the above, it is not necessary to hold a DOA in order to apply for an approval. It is therefore completely possible for smaller design organisations to conduct modifications and get an approval for them, as long as the process and the documentation are appropriate. This third option was the route that Atol Avion chose to follow, since although the company had a Production Organisation Approval (POA) and a Design Organisation, they did not have a Design Organisation Approval (DOA). However, it must be noted that there are some limitations to the usage of certification programme.

5.2 Design Assurance

The core purpose of a design organisation is to maintain design assurance, i.e. to make sure that aircraft design is conducted in a manner that ensures aviation safety. Every element of a design must be checked and verified by a person who is not the designer. This procedure is sometimes known as the “four eyes principle”, since every design document must be independently verified by a Certification Verification Engineer (CVE).

According to Florio, in order to be able to fulfil EASA requirements, the basic structure of a design organisation should usually contain the roles defined in figure 1.



All these functions are essentially accomplished through the action of the following:

(a) A staff of **Certification Verification Engineers (CVEs)** responsible for checking and signing all the documents of compliance with the applicable requirements. The CVEs may work in conjunction with the individuals who prepare compliance documents but may not be directly involved in their creation (this is to ensure independent checking).

(b) An **Independent Monitoring Function**, which has the task of ensuring that all the responsibilities of the DAS are properly discharged, proposing corrective and preventive measures for continuous effectiveness. Normally, this is done through targeted audits. The System Monitoring could be a functional emanation of the applicant's Quality Assurance System. The person responsible for the independent System Monitoring always reports to the **Head of design organisation**.

(c) The **Chief Executive** should provide the necessary resources for the proper functioning of the design organisation.

(d) A peculiarity of the organisation is the **Office of Airworthiness** that, among its main tasks, ensures liaison between the design organisation and the authority with respect to all aspects of type certification. This office carries out a true coordination action within the design

[15]From AMC and GM to Part 21.

FIGURE 1. Design Organisation Roles (Florio, p.98. 2016)

This structure will allow a Design Assurance System (DAS) to function. The main function of a design assurance system is to control the design and to demonstrate compliance with the applicable certification standard and environmental requirements (Florio 2016, 98). DAS independently monitors the procedures conducted by the design organisation and therefore ensures its proper functioning (Lumppio 2016, 23).

6 TYPE CERTIFICATION PROCESS

EASA design organisation handbook describes the type certification process in the following flowchart (Figures 2 and 3).

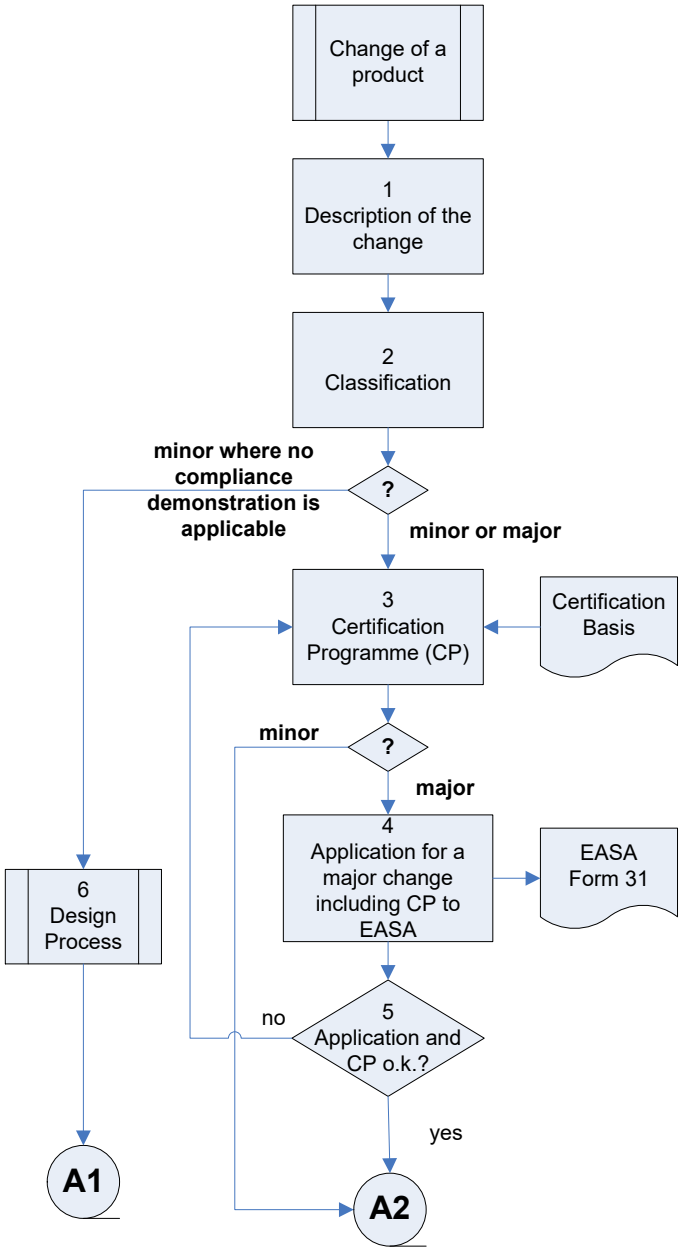


FIGURE 2. Classification and certification process (EASA Design Organisation Handbook, 2013)

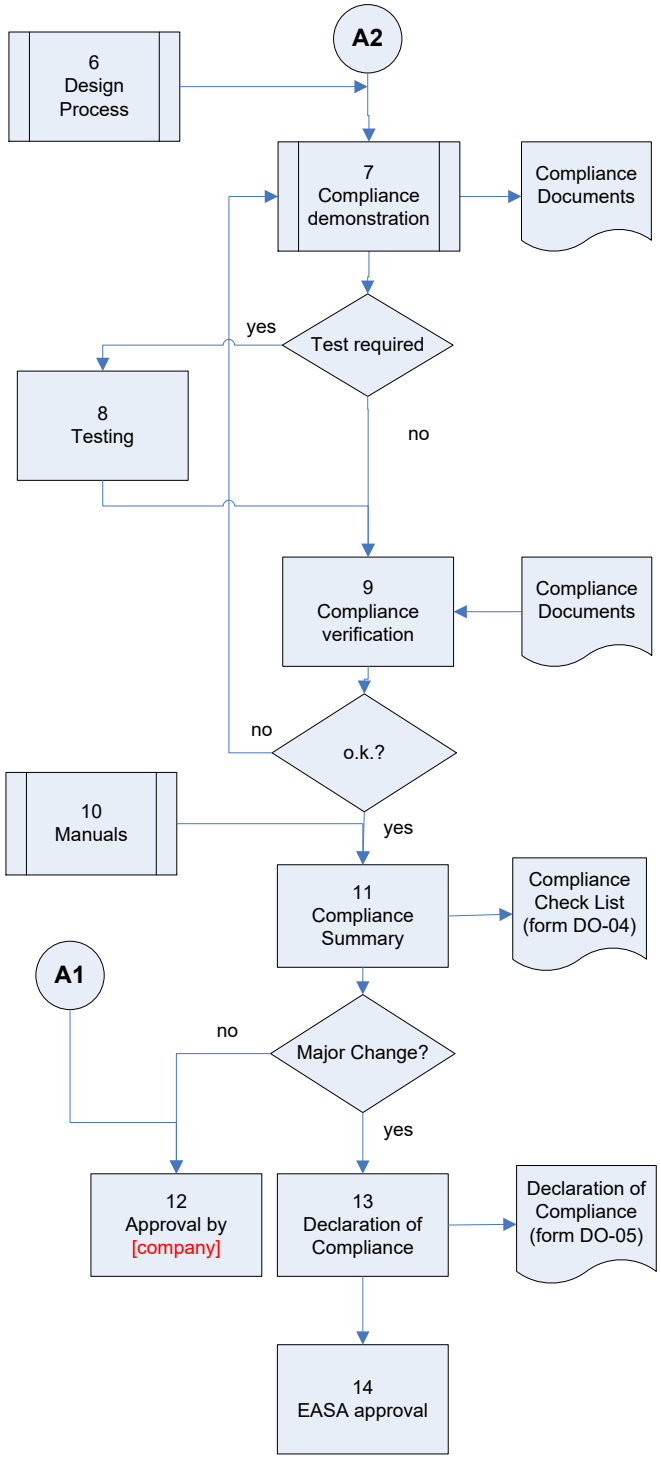


FIGURE 3. Classification and certification process (EASA Design Organisation Handbook, 2013)

As can be seen in these figures, the process begins with defining the modification or change to a product, then proceeding to classification and Certification Programme (CP). The classification is not always very straightforward, as explained later in chapter 7. The following chapters of this thesis will focus on different phases of the type certification approval process, especially on the change classification and compliance.

7 EASA PART 21

EASA Part 21 is an annex to the European Commission regulation no. 748/2012 and as such it is a part of European law. Its main focus is in the certification of aircraft and aircraft-related products, parts and appliances, in addition it is also used for environmental (noise and emissions) certification. Part 21 defines design and production organisations and their requirements and the certification process. (ICAO 2019a.)

Part 21 is divided into two main sections, A and B, that are further divided into several subparts explained in the table below. In addition, each section contains advisory material, known as AMC (Accepted Means of Compliance) and GM (Guidance Material). (ICAO 2019a.)

TABLE 2. EASA Part 21 Subparts. (ICAO 2019a)

Subpart	Legend
A	General provisions
B	Type certificates
D	Changes to type certificates
E	Supplemental type certificates
F	Production without production organisation approval
G	Production organisation approval
H	Airworthiness certificates
I	Noise certificates
J	Design organisation approval
K	Parts and appliances
M	Repairs
O	European technical standard order authorisations
P	Permits to fly
Q	Identification of products, parts and appliances

Since Atol Avion was neither the holder of the original type certificate for the Cessna aircraft or the Rotax engine, and the situation in question was about applying for a new supplemental type certificate (STC), it was necessary to act according to Part 21 Subpart E.

7.1 Changes in Type Design

Whenever there occurs a need to change an already approved aircraft typed design, the change needs to be analysed and classified by EASA. Depending on several conditions, the change in type design can be either relatively simple or very complex process.

7.1.1 Minor and Major Changes

EASA can classify the requested change as a minor or a major change, depending on the technical content and scale of the applied change or modification. The classification is needed in order to determine the level of involvement of the authority in the application process (Florio 2016, 101). The general classification criteria are the following;

1. **Minor change**
    - No appreciable effect on the mass, balance, structural strength, reliability, operational characteristics, noise, fuel venting, exhaust emission, operational suitability or other characteristics affecting the airworthiness, environmental protection or operational suitability of the product.

2. **Major change**
    - All changes that cannot be classified as minor.

(EASA Part 21, 21.A.91)

A minor change can be applied by any “natural or legal person” while major changes must be applied by the Type Certificate holder. Therefore, when applying for a major change approval, all other applicants must apply for a Supplemental Type Certificate (STC). (Lumppio, 2016.)

Holding a Design Organisation Approval grants the applicant some privileges, e.g. DOA holders can approve minor changes without a certification programme and without a verification by EASA. t must also be noted that only DOA holding organisations are allowed to classify a change without EASA involvement (Florio 2016, 101). DOA holders also do not need send their means of compliance documents to EASA. They should, however, produce and store these documents in case of future need. (Lumppio, 2016).

While there is a remarkable difference in the approval process between these two change classifications, there is no effect in the initial application process. Since EASA as the governing authority will decide if the change qualifies as a minor change and the decision will be made only after the application has been sent. EASA's internal classification process is illustrated in Figure 4.

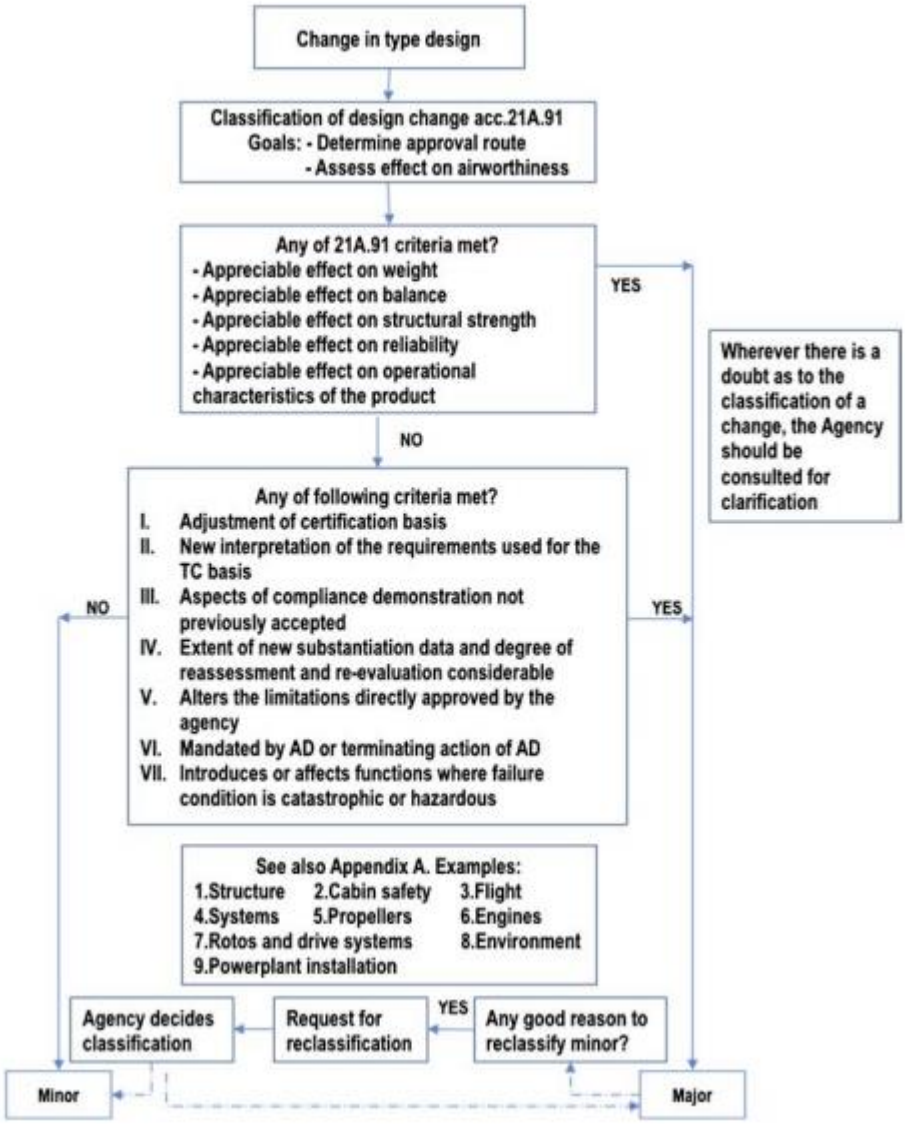


FIGURE 4. Classification of changes. (Florio, 2016, 102)

As can be seen in the Figure 4, it is, in most cases, quite straightforward to predetermine if it is likely for a modification to qualify as a minor change.

If a change is initially classified as a major change or if the classification cannot be done in the initial stage, a certification programme including the certification basis is needed. As stated in chapter 5, a certification programme is also needed if the applicant does not have a Design Organisation Approval (DOA).

7.2 Certification Programme

Certification Programme is a binding document between the applicant organisation and EASA. It determines how the applicant organisation will demonstrate the compliance of its modification project with the relevant Certification Specification (CS) and environmental requirements. It also establishes EASA's level of involvement in the certification process. (EASA 2013, Design Organisation Handbook.)

According to Part 21, the certification programme contains (in general),

- Identification of the relevant personnel who make decisions affecting airworthiness, operational suitability and environmental protection, and who will interface with EASA, unless otherwise identified to EASA (e.g. within the DOA procedures).
- A project schedule including major milestones.
- Subcontracting arrangements for design, operational suitability, environmental protection and/or production as well as design organisation approval (DOA) responsibility sharing.

(EASA Part 21, AMC 21.A.15(b))

EASA offers several document templates at their website, among them a template for a certification programme.

7.3 Certification Basis

Certification Basis (CB) is the set of applicable certification rules for the specific aircraft type in question. According to Florio (Airworthiness, 2016), “as a general rule (exceptions are given), the certification of a type design change should comply with the requirements applicable at the date of the application for the change”.

For example, the certification basis could be determined to be CS-23 amendment 2, if the aircraft in question would fall under the EASA classification “Normal, Utility, Aerobatic and Commuter Aeroplanes” (CS-23) and would have been certified during amendment 2 being the latest version of CS-23.

If necessary, it is also possible to choose to comply with newer amendment or issue of the applicable regulation. (EASA 2016, Minor Change Certification Guidance Document.)

8 COMPLIANCE

The modifications made to an aircraft must comply with the corresponding legislature. To aid the organisation with the compliance process, EASA has created a set of documents known as Certification Specification (CS). CS describes different systems and sets out demands that must be followed in order to qualify for an EASA approval. CS is usually combined with information on Acceptable Means of Compliance (ACM). The applicable edition and issue of the specification depends on the type aircraft and the date of its type certificate approval. (See chapter 7.3, Certification Basis).

TABLE 3. Initial Airworthiness Certification Specifications (EASA, 2020)

Certification Specification	Category
CS-22	Sailplanes and Powered Sailplanes
CS-23	Normal, Utility, Aerobatic and Commuter Aeroplanes
CS-25	Large Aeroplanes
CS-27	Small Rotocraft
CS-29	Large Rotocraft
CS-LSA	LSA Light Sport Aeroplanes
CS-VLA	Very Light Aeroplanes
CS-VLR	Very Light Rotocraft

The CS chapters available extend beyond the main ones listed in the table above, there are chapters specifically made for e.g. engine and noise compliance. The latest CS-23 issue can always be downloaded from the EASA website.

As can be seen in Figure 5, certification specification can include specific requirements for certain aircraft parts, for example powerplant control knobs.

(b) Powerplant control knobs must conform to the general shapes (but not necessarily the exact sizes of specific proportions) in the following figures:

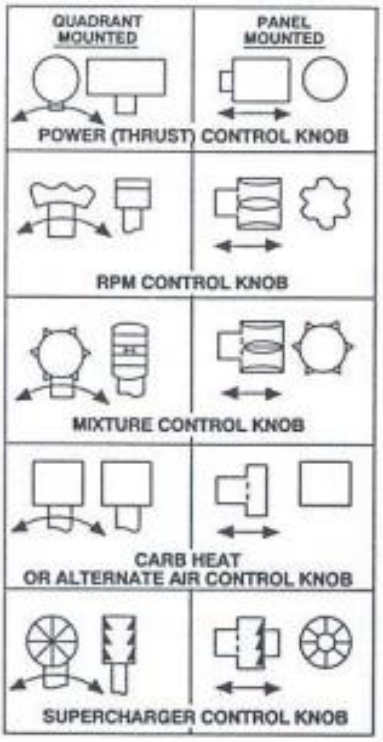


FIGURE 5. Accepted cockpit control knob shapes (EASA CS-23, 23.781)

8.1 Means of Compliance

As is described in the Part 21, there are several different “means of compliance”. This term refers to a method of proving that the project in question complies with specifications set out by EASA. The main purpose of these different methods and documents is therefore to demonstrate that the application does comply with the relevant EASA certification specification (CS).

These documents include, but are not limited to, recorded statements, test reports, analyses, design reviews, etc. EASA Part 21 includes the following table that can be referred to when trying to settle on the correct compliance method and relevant compliance documents.

Appendix A to AMC 21.A.15(b) Means of compliance codes

Type of Compliance	Means of Compliance	Associated Compliance Documents
Engineering evaluation	MC0 : (a) compliance statement (b) reference to design data (c) election of methods, factors, etc. (d) definitions	(a) Design data (b) Recorded statements
	MC1: design review	(c) Descriptions (d) Drawings
	MC2: calculation/ analysis	(e) Substantiation reports
	MC3: safety assessment	(f) Safety analysis
Tests	MC4: laboratory tests	(g) Test programmes (h) Test reports (i) Test interpretations
	MC5: ground tests on related product(s)	
	MC6: flight tests	
	MC8: simulation	
Inspection	MC7: design inspection/ audit	(j) Inspection or audit reports
Equipment qualification	MC9: equipment qualification	Note: Equipment qualification is a process that may include all previous means of compliance at equipment level.

FIGURE 6. Different means of compliance (EASA Part 21, AMC 21.A.15)

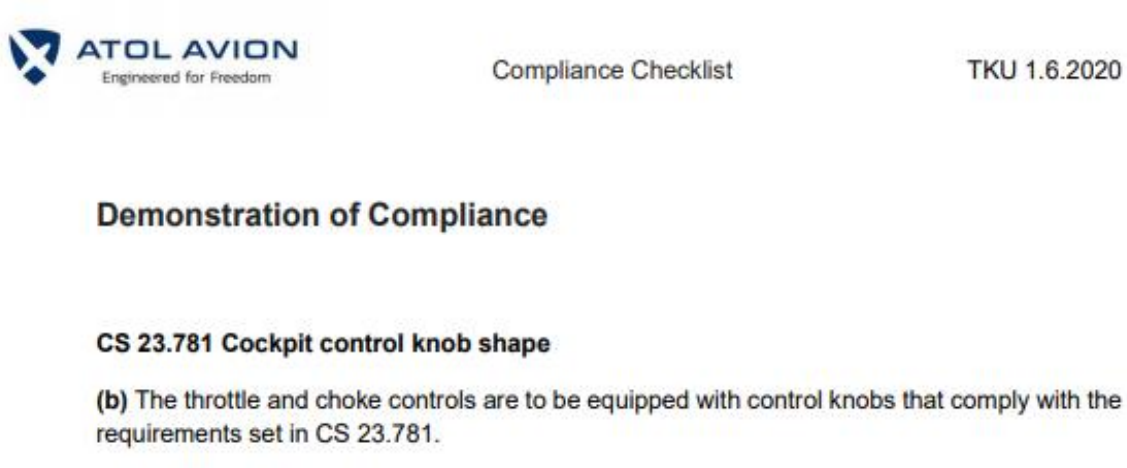
Several of these methods were successfully used during the compliance demonstration process of the Atol Avion Rotax-Cessna project. Notably, to further demonstrate the compliance and to analyse a new solution for the control cables, a risk analysis put together. A risk analysis (i.e. safety assessment) is among the approved compliance demonstration methods, as can be seen in the Figure 6.

8.2 Compliance Checklist

Among the most relevant compliance documents required during the application process is a compliance checklist. According to EASA Part 21, a compliance checklist is determined as follows:

> a compliance checklist addressing each requirement, the proposed means of compliance (see Appendix A to AMC 21.A.15(b) below for the relevant codes), and the related compliance document(s).
> (EASA Part 21, AMC 21.A.15)

During the Atol Avion Rotax-Cessna project, it was essential to determine which CS-23 chapters taken in consideration in order to successfully get an approval for the modifications in question. This process was straightforward but required a lot of thorough assessment. The chapters were laid down into a compliance checklist. As discussed above, a compliance checklist includes a reference to the relevant CS chapters and proposed means of compliance, an example can be seen in the figure below. Note that this is not an original document used during the project, since the information it contains is considered confidential.


ATOL AVION
Engineered for Freedom

Compliance Checklist TKU 1.6.2020

Demonstration of Compliance

CS 23.781 Cockpit control knob shape

(b) The throttle and choke controls are to be equipped with control knobs that comply with the requirements set in CS 23.781.

FIGURE 7. Example of a Compliance Checklist.

9 APPLICATION AND DOCUMENTS

The application process begins with registration at the EASA Applicant Portal website, which can be found at https://portal.easa.europa.eu/ This is the preferred way for EASA to receive applications (EASA, 2020). The general online application process figure can be found in the appendices section of this thesis (Appendix 2). In order to successfully complete the type certification approval process, the applicant should prepare the following documents for EASA.

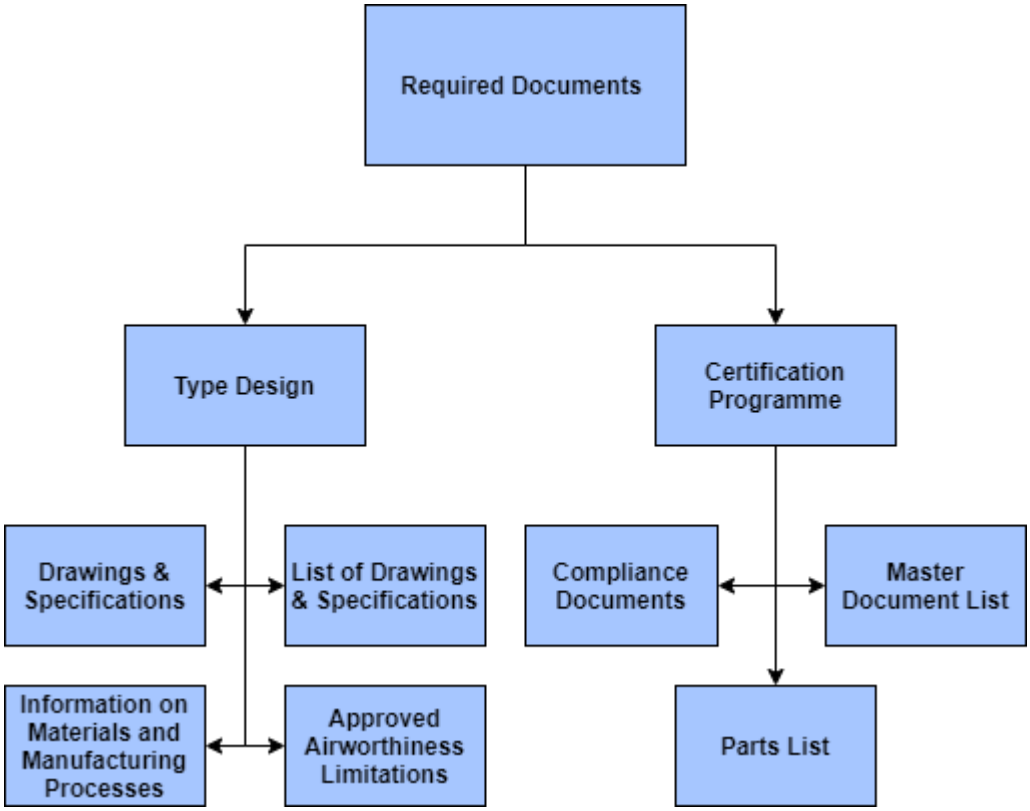


FIGURE 8. Documents required for the application.

In addition to the documents described in the Figure 8, environmental data should also be included as a part of the type design. (EASA Part 21, 21.A.31 and AMC 21.a.15(b))

EASA will charge a fee for every application. The charged amount depends on the type of aircraft and the change or modification in question. It is usually possible to get a price quote after sending the application to EASA.

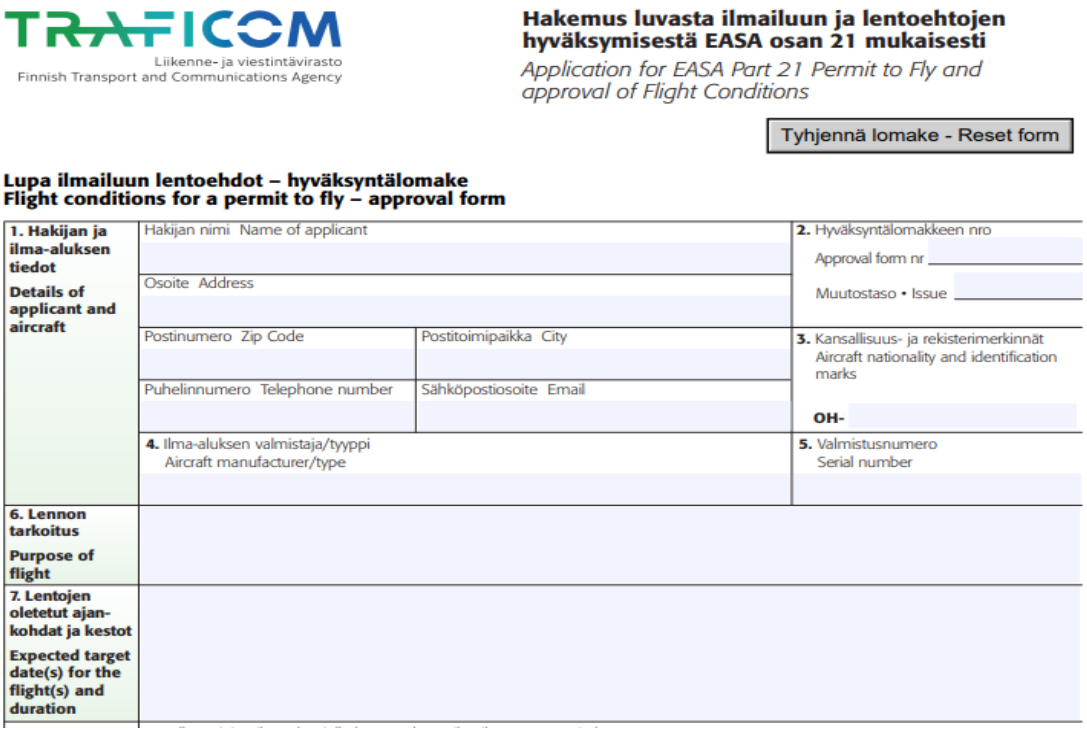
9.1 Test Flights and Conditions

In case the organisation has a need for conducting test flight(s), they can do so by applying for a so-called “permit to fly”. This permit is always needed when flying without a valid Certificate of Airworthiness. It must be noted that flight conditions for test flights must always be approved by the corresponding authority. The flight conditions are generally handled by the member state authority but in the following scenarios they must be applied directly from EASA.

1. The aircraft does not conform to an approved design; or
2. An Airworthiness Limitation, a Certification Maintenance Requirement or an Airworthiness Directive has not been complied with; or
3. The intended flight(s) are outside the approved envelope

(Traficom, 2020.)

If the flight conditions are related to the safety of the design, they must be approved by EASA (EASA Part 21, Subpart P). There are no fees if the application is handled by the member state (Traficom, 2020). The application template can be (partially) seen in Figure 9. The complete template can be downloaded from Traficom website.



TRAFICOM
Liikenne- ja viestintävirasto
Finnish Transport and Communications Agency

Hakemus luvasta ilmailuun ja lentoehtojen hyväksymisestä EASA osan 21 mukaisesti
Application for EASA Part 21 Permit to Fly and approval of Flight Conditions

Tyhjennä lomake - Reset form

Lupa ilmailuun lentoehdot – hyväksyntälomake
Flight conditions for a permit to fly – approval form

1. Hakijan ja ilma-aluksen tiedot **Details of applicant and aircraft**	Hakijan nimi Name of applicant	**2.** Hyväksyntälomakkeen nro Approval form nr
	Osoite Address	Muutostaso • Issue
	Postinumero Zip Code / Postitoimipaikka City	**3.** Kansallisuus- ja rekisterimerkinnät Aircraft nationality and identification marks
	Puhelinnumero Telephone number / Sähköpostiosoite Email	**OH-**
	4. Ilma-aluksen valmistaja/tyyppi Aircraft manufacturer/type	**5.** Valmistusnumero Serial number
6. Lennon tarkoitus **Purpose of flight**		
7. Lentojen oletetut ajankohdat ja kestot **Expected target date(s) for the flight(s) and duration**		

FIGURE 9. Permit to Fly application template. (Traficom, 2020)

9.2 Application Approval

EASA will issue a type certificate to the applicant after the following conditions have been fulfilled.

a) The applicant has demonstrated its capability to apply for type certification. (See chapter 5.1)
b) The applicant has submitted a final statement of compliance.
c) It is shown that:
    1. the product to be certificated meets the applicable type certification basis and environmental protection requirements.
    2. any airworthiness provisions not complied with are compensated for by factors that provide an equivalent level.
    3. no feature or characteristic makes it unsafe for the uses for which certification is requested.
    4. the applicant has stated that it is prepared to comply with
d) The engine or propeller or both, if installed in the aircraft, have a type certificate issued according to relevant regulation.

(Florio 2016, 129.)

The application acceptance process at EASA can be found in Appendix 2.

10 CASE ATOL AVION

Atol Avion applied for the transfer of a supplemental type certificate. There are some cases in which a transfer of type certificate or supplemental type certificate is required. If, for example, acquired from another organisation, the rights to the STC are not transferred to the new owner until an application for transfer has been filled out by the organisation and approved by EASA. The application needs to be conducted by filling out EASA form number 38, “Application for transfer of certificate”. This application form was also used in transferring the Rotax-Cessna STC to Atol Avion.

Since the original Rotax-Cessna STC had been approved before EASA was created, it was certified according to American FAR 23. However, after consulting Traficom, the Finnish representative of EASA, it was clear that during the type certification process, it was necessary to comply with EASA CS-23.

Several documents were prepared for the Atol Avion certification programme. In order to demonstrate general compliance with relevant CS-23 chapters, a design review was put together. Furthermore, to analyse the safety of a new engineering solution, a risk analysis of the new control cables was put together. The Aircraft Flight Manual (AFM) was also updated to match with the corresponding changes.

A template of the Master Document List (MDL) used in the project can be found in Appendix 3. A Master Document List is a collection of information on all documents relevant to a type certification application.

Due to financial issues within Atol Avion, the Rotax-Cessna STC project was eventually put on hold. Should the project continue at a later date, the findings and principles presented in thesis could be used to finish the approval process.

11 DISCUSSION

The fact that the modification project that inspired the author to write this thesis was put on hold was a limiting factor when gathering type certification information and putting together all required chapters. However, the amount of work put towards the project was sufficient enough to ensure that the thesis could be completed.

There are definitely some areas that would have deserved more attention, especially the compliance documents and the latter part of the application process. It must be noted though, that most of the Rotax-Cessna documents considering these subjects are confidential and therefore cannot be published.

In general, it seems that areas of information that this thesis deals with are commonly not taught at university level and are instead mainly offered as specific courses for company employees. It is a shame that aircraft type certification, a highly demanding engineering task, does not get the attention it would deserve.

For the author of this thesis, who had previously only worked in military aviation, diving into the aircraft type certification field was a refreshing experience. However, no matter how different the aircraft he had worked with might be, the so-called “aeronautical engineering mentality”, i.e. the idea of accurate and thorough work, exists in both the civilian and military fields of aeronautical engineering.

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Picture 1. Atol Aurora. Image downloaded on 10.6.2020. https://atolavion.com/gallery/

Picture 2. Rotax-modified Cessna 150. Image downloaded on 10.6.2020. https://atolavion.com/gallery/

Picture 3. Rotax 912S installed on Cessna 150. Image downloaded on 10.6.2020. https://www.facebook.com/AtolAvionOy/photos/a.508259915980580/1701230153350211/

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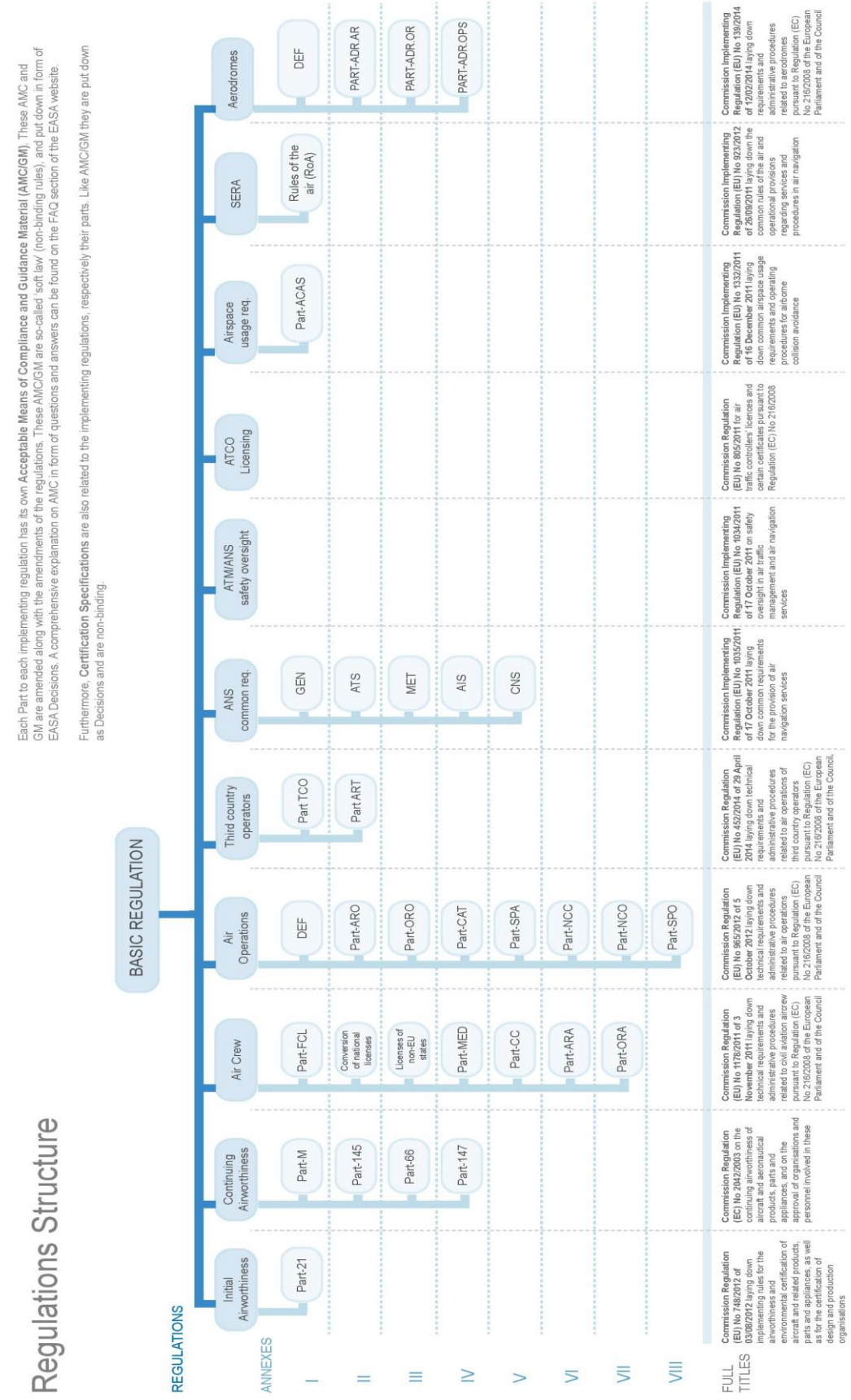
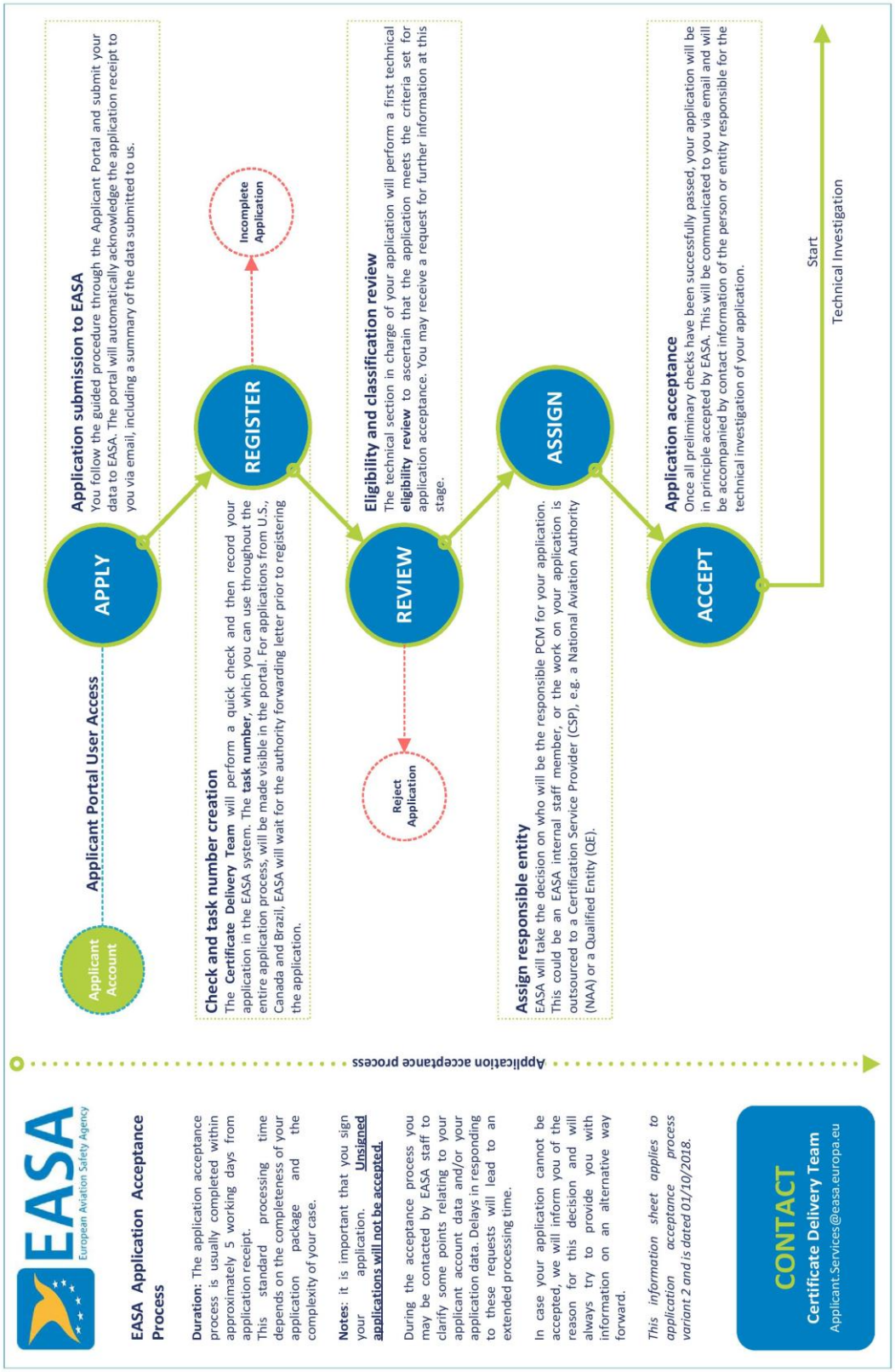
Appendix 2. EASA. 2018. Application Acceptance Process. Downloaded on 10.6.2020. https://www.easa.europa.eu/sites/default/files/dfu/Information%20Sheet%20on%20the%20Application%20Acceptance%20Process_Minors.pdf

APPENDICES

Appendix 1. EASA Regulations Structure.



Appendix 2. EASA Application Acceptance Process.



Appendix 3. Master Document List Template.

ATOL AVION Engineered for Freedom	**Master Document List**	Document number
		Revision
		Date
Reference	Project reference	Page 3 of 3

Document No.	Date	Revision	Title	Signatories
1234567890	1.1.2020	1	Example document	Example Person

PREPARED BY

NAME

Title

APPROVED BY

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Title