BACHELOR THESIS IN AERONAUTICAL ENGINEERING
15 CREDITS, BASIC LEVEL 300

Development and documentation of process and routines for Continuous Airworthiness Management Organisation

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Report code: MDH.IDT.FLYG.0249.2012.GN300.15HP.M
ABSTRACT
This report provides a description of a thesis work in aeronautical engineering that was carried out at Patria Helicopters AB during the period February to April 2012.

Patria have been responsible for the preservation of a Eurocopter EC135 since May of last year due to the fact that the previous owner went into receivership. A decision was made at the beginning of this year that the company would also take over the continuing airworthiness of the helicopter.

This created the need for a CAME to be written as part of the application process to become an approved CAMO organisation.

During the ten weeks at Patria the author has been working on the compilation of the exposition in accordance with Part M, Subpart G, M.A. 704 as well as all of the appendices that needed to be included with the application to Transportstyrelsen.

The task has meant familiarizing one’s self with the rules and regulations of EASA Part-M and how the various sub-parts relate to each other. In addition to this, the routines and processes that were already established at Patria have also been examined.

With the help of a compliance check list provided by Transportstyrelsen, “Anybodies CAME” and EASAs Part-M document, the different areas that needed to be addressed in the exposition were accomplished and thus describe the routines that are in place at Patria Helicopters AB which will ensure the continuing airworthiness of the aircraft managed by the company.

SAMMANFATTNING
Denna rapport ger en beskrivning av det examensarbete i flygteknik som utfördes hos Patria Helicopters AB under perioden februari till april 2012.

Patria har varit ansvariga för preserveringen av en Eurocopter EC135 sedan maj förra året tack vare att den tidigare ägaren gick i konkurs. I början av detta år så fattades ett beslut att företaget också skulle ta över den fortsatta luftvärdigheten för helikoptern och genom det så uppstod ett behov att sammanställa en CAME för ansökan om att bli en godkänd CAMO organisation.


Arbetet har inneburit att författaren har satt sig in i de regler och förordningar som står i EASAs Part-M dokument samt hur de olika delarna relaterar till varandra. Under arbetets gång så har också de arbetsrutiner och processer som redan vara etablerade hos Patria blivit granskade.

Tillsammans med en checklista som Transportstyrelsen tillhandahåller, ”Anybodies CAME” och EASAs Part-M dokument så har de olika delarna som ska ingå i handboken successivt bearbetats och som i sin tur beskriver hur Patria Helicopters AB kommer att arbeta för att garantera den fortsatta luftvärdigheten av deras helikoptrar.
Date: 23 April 2012

Carried out at: Patria Helicopters AB

Advisor at MDH: Tommy Nygren

Advisor at Patria Helicopters AB: Markku Eriksson

Examinator: Mirko Senkovski Karlsson
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<table>
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<tbody>
<tr>
<td>ACAME</td>
<td>“Anybodies CAME”</td>
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<tr>
<td>AD</td>
<td>Airworthiness Directive</td>
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<td>AFM</td>
<td>Aircraft Flight Manual</td>
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<td>AMM</td>
<td>Aircraft Maintenance Manual</td>
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<td>ARS</td>
<td>Airworthiness Review Staff</td>
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<td>ASB</td>
<td>Advisory Service Bulletin</td>
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<tr>
<td>CAA</td>
<td>Civil Aviation Authority (UK)</td>
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<td>CAM</td>
<td>Continuing Airworthiness Manager</td>
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<tr>
<td>CAME</td>
<td>Continuing Airworthiness Exposition</td>
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<td>CAMO</td>
<td>Continuing Airworthiness Management Organisation</td>
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<td>CMO</td>
<td>Contracted Maintenance Organisation</td>
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<td>CS</td>
<td>Certifying Staff</td>
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<td>EASA</td>
<td>European Aviation Safety Agency</td>
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<td>FR</td>
<td>Flygrapport</td>
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<tr>
<td>HEMS</td>
<td>Helicopter Emergency Medical Service</td>
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<tr>
<td>LVD</td>
<td>LuftVärdighetsDirektiv (Luftfartstyrelsen)</td>
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<tr>
<td>MMEL</td>
<td>Master Minimum Equipment List</td>
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<tr>
<td>MOE</td>
<td>Maintenance Organisation Exposition</td>
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<tr>
<td>PHAB</td>
<td>Patria Helicopters AB</td>
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<tr>
<td>SB</td>
<td>Service Bulletin</td>
</tr>
<tr>
<td>TS</td>
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Chapter 1
INTRODUCTION

1.1 Background
From May 2011 Patria Helicopters AB (PHAB) has been responsible for the preservation of a Eurocopter EC135 P2, with registration OH-HCM. The primary use for the helicopter is for HEMS-operation.

The previous owner Copterline Oy went into receivership in February 2010. The receiver later leased the aircraft to the Austrian company Helicopter Air Transport GmbH which operated the aircraft during the period November 2010 to May 2011.

From then on it has been in preservation at PHAB’s facilities at Stockholm-Arlanda, with the engines being run every 3 months as per the aircraft maintenance manual.

At the beginning of this year it was decided that PHAB would take over the responsibility for the continuing airworthiness of OH-HCM and to further expand their services to act as a Continuing Airworthiness Management Organisation (CAMO) for other potential customers.

This created the need for a Continuing Airworthiness Management Exposition (CAME) to be written as part of the application process, where the organisation would describe how they would meet all of the requirements that are stipulated in EASA Part-M Subpart G, Regulation E.C No 2042/2003.

1.2 Objective
The objectives of this thesis work have been to

- Develop the Continuing Airworthiness Management Exposition, CAME in accordance to EASA Part-M regulation E.C No 2042/2003
- Develop other documents necessary to be included with the application to Transportstyrelsen (TS).
- Training/Information to the Accountable Manager, the Nominated Post Holders, and other staff at PHAB about the contents of the CAME

1.3 Problem formulation
To be able to qualify for the issue or continuation of an approval for the management of aircraft continuing airworthiness, PHAB has to show how they will meet and fulfil the requirements stated in EASA Part M Subpart G, Continuing Airworthiness Management Organisation.

This is accomplished by providing Transportstyrelsen with a Continuing Airworthiness Management Exposition, CAME.
The following information which PHAB has to provide to the competent authority is stated below:

1. A statement signed by the Accountable Manager to confirm that the organisation will work in accordance with Part-M and the exposition at all times.

2. The organisation’s scope of work.

3. The title(s) and name(s) of
   a. The person who has the corporate authority for ensuring that all continuing airworthiness management activities can be financed and carried out in accordance with Part-M.
   b. The person or group of persons that are nominated with the responsibility of ensuring that the organisation is always in compliance with Subpart G.
   c. Nominated Post holders (if applicable).
   d. The nominated persons who are authorized to extend the organisation’s airworthiness review certificates, subject to approval by the competent authority.

4. An organisation chart showing associated chains of responsibility between all of the persons referred to above.

5. A list of the airworthiness review staff, specifying, where applicable, the staff authorized to issue permits to fly in accordance with point M.A. 711(c) i.e. aircraft which are in a controlled environment and are managed by that M.A. Subpart G organisation.

6. A general description and location of the facilities.

7. Procedures specifying how the CAMO ensures compliance with Part M.

8. The CAME amendment procedures.

9. The list of approved aircraft maintenance programmes.
1.4 **Limitations**

The objectives of this thesis work have proven to be too ambitious for the ten weeks that was set aside. This has unfortunately forced the author to limit the scope of the thesis project.

The training/information to the Accountable Manager, the Nominated Post Holders and to the staff at PHAB has been omitted from this thesis work.

This does not mean that it will not be completed in the future. After the CAME has been accepted by Transportstyrelsen the document will be rewritten using a technique called Information Mapping, a method to write and structure information from large documents. This will help the potential reader to quickly and easily scan and retrieve the information that they are after.
Chapter 2
METHOD

2.1 Preparation
Transportstyrelsen provides through their website all the necessary information and documentation for the applicant. The material is found under “Nytt CAMO tillstånd”.

For ease of reference during the thesis work the following documents were downloaded from the competent authority’s website.

- Step by step guide to apply for CAMO
- EASA Form 2, “Ansökan on nytt tillstånd/ändring av tillstånd”
- EASA Form 4, “Uppgifter om Ledningspersonal”
- Compliance Check List, CCL, for CAME

The main document Consolidated Part-M – Continuing Airworthiness Requirements is also provided by TS, but the version that EASA provided was preferred due to the fact that it was easier to read and it was quicker to find the relevant information that was needed.

The document can be found on EASAs Technical Publications website. The Consolidated Part-M also included the Acceptable Means of Compliance and further guidance material.

To help the author with the writing process of the CAME a copy of “Anybodies CAME” which the UK Civil Aviation Authority, CAA, provided was also downloaded.

2.2 Use of documents

2.2.1 Compliance Check List
During the writing process of the CAME the CCL was constantly referred to in order to comply with the stipulated regulations in Subpart G, M.A.704.

The document has two parts. The first part is a simple checklist which is intended to be used once the CAME has been written. The second part gives step by step instruction on how to write the exposition.

2.2.1.1 Checklist
The checklist has three columns with the headings, Subject, CAMO ref. and Remarks, Comments, OK or N/A, (see Figure 1 Compliance Check List).

- The checklist covers all of the subjects that should be included in a CAME. Some of the topics are specifically for organisations holding an AOC and as such all subjects might not be relevant to all organisations.

- CAME ref. is self explanatory and refers to which part in the exposition that needs to be revised.

- The last column is also self explanatory. Here space is given to write remarks or comments on the specific subject. It might be that the specific subject is not applicable to the organisation for which the CAME is written for.
Each completed part/chapter in the exposition was verified against the checklist to make sure that each subject had been adequately described.

The same procedure will also be done by the Continuing Airworthiness Manager (CAM) before the application is handed over to TS.

2.2.1.2 **Instructions**

The second part of the CCL gives a comprehensive guide on how to write the exposition, (see Figure 2). The instructions are based on the information from Appendix V to AMC M.A.704 and also further additions and clarifications have been made by Transportstyrelsen.

The document provides the following information to the author in his/her work with a CAME:

- The preferred headings and subheadings to use.
- It gives a description on the various topics and how they should be addressed for each subject.
- Which subpart in Part-M or AMC provides further information if additional clarification is needed.
2.2.2 “Anybodies CAME”

In conjunction with the CCL, “Anybodies CAME” was also used which is a specimen exposition, (see Figure 3). The document is provided by the UK CAA and can be found on their website.

As with the CCL, the specimen is also based upon the contents of Appendix V to AMC M.A.704.

The intention at the beginning of this project was to use as much as possible from ACAME to help in the writing process. But as the work progressed the exposition has been adapted and expanded to better reflect the processes that are in use at PHAB.

For some subjects there has been the need to add further headings or sub-headings for greater clarification in certain areas. This is especially true when it came to the description of how AD’s, SB’s were to be dealt with.

However, what ACAME facilitated in was with the creation of the appendices. Examples are given in the specimen exposition which can be used without any further editing.

During the work with PHAB’s exposition, ACAME has instead served as a source of information in addition to CCL and has also helped in the phrasing of certain paragraphs.
2.2.3 EASA Consolidated Part-M

This document has been the main reference during the whole process. EASA Part-M, (see Figure 4), is part of a greater document called Regulation (EC) no 2042/2003.

The document is divided into Subparts (chapters) where you will find all the rules and regulations which the organisation has to adhere to. Included in the document is also the Acceptable Means of Compliance, AMC, which provides you with comprehensive guidelines on how to accomplish the requirements stated in the subparts.

For each Part in the continuing airworthiness management exposition there is a corresponding Subpart in the EASA Part-M document which describes the rules and regulations that need to be followed.

Since the compliance check list references which Subpart to read in order to describe the relevant areas of interest, the work can progress without any greater problems.

What you have to be cautious of while reading the regulations is that some of the paragraphs in the subparts don’t apply to the category “large aircraft” (multi-engined helicopters are classified as large) or vice versa. This can be quite difficult and confusing during the cross-referencing between the different chapters in the document.
2.3 Other documents

In addition to the above mentioned documents other sources have also had to be referred to for information when trying to describe how to comply with the regulations.

These have been documents from the manufacturer, authorities or internal documents. They have frequently been used as references for the different parts in the CAME. For example these have been used to describe for instance, MMEL categories, Pre-flight checks, quality audits or what the rules are for the leasing of aircraft.

All internal documents and the manufacturers manuals where available in the “library” at Patria, while the documents from authorities have been downloaded from their respective websites.

The following documents where used during the compilation of the CAME:

- JAR-OPS 3 Kommersiella flygtransporter (helicopter)
- JAR-FCL 2 Flight Crew Licensing (helicopter)
- AFM Aircraft Flight Manual
- AMM Aircraft Maintenance Manual
- MOE Maintenance Organisation Exposition
- AI 00-019 AD verifiering
- AI 00-029 Procedure for identify goals for increased flight safety
- AI 90-001 Follow up of LVD-AD-ASB-SB Status Record
- AI 90-002 Trigging of LVD-AD-ASB-SB spread
2.4 Interviews
During the ten weeks at PHAB there were of course a lot of questions that arose. Most of the questions were answered during normal conversations with the different employees at PHAB.

But other questions were of the nature that needed to be properly explained. For instance, what routines were in place for AD’s and SB’s or what documents were used for specific tasks such as for MEL-items, how were the pilots informed and so on.

For these types of queries meetings and interviews were arranged with the person/persons in charge.

The interviews were recorded with a mobile phone after permission by the person being interviewed.

The following people have been interviewed during the course of my thesis work:

- Markku Eriksson
- Peter Krig
- Caroline Petterson (an informal meeting together with Erik Samuelsson and Magnus Holmgren about SASIMS)
- Mikael Sahlgren

A copy of the questions put forward to the following people can be found in the appendix of this report.

Chapter 3
RESULTS
The result of this thesis project has been the completion of a Continuing Airworthiness Management Exposition, CAME, for Patria Helicopters AB, together with the necessary documentation needed for the application process.

These are presented in the Appendix of this report. Appendix 2 and Appendix 3.

Chapter 4
CONCLUSIONS
As a consequence of having worked on this thesis project a greater understanding of the process involved when an organisation is seeking the approval to become a CAMO has been instilled with the author.

It has also given an insight and understanding of the routines that are in place at PHAB as well as the relationship between the different departments.

But most importantly of all is the fact that a much better grasp of the rules and regulations that are stipulated in EASA Part–M and how the different sub-parts relate to each other has been achieved.
Chapter 5

FUTURE WORK

The application process will continue after this thesis report has been handed in due to the fact of its extensive nature.

A deadline has been set for the end of July for this process to be completed with the reservation for further clarifications requested by Transportstyrelsen.

The first task that needs to be completed is the description of the organisations Engineering Activity (Para 1.9) and Reliability Programmes (Para 1.10) but also the assembly of contracts and audits which have been carried out by authorized staff.

The work on Part 5 Appendices will therefore continue with the following documents being incorporated into the final document when all parties have completed their separate tasks:

- List of airworthiness review staff
- List of sub-contractors
- List of approved maintenance organizations
- Copy of contracts with approved maintenance organizations
- Airworthiness Review Report
- Airworthiness Review Certificate
- Auditing documents
- Completed Compliance Check
- Details of Aircraft Managed by the organisation

Chapter 6

ACKNOWLEDGEMENTS

I would like to thank all of the employees at Patria Helicopters AB for making me feel so welcome during these ten weeks and for taking the time to answer all of my questions that I’ve had when working on this thesis.

Special thanks to the following people at Patria,

- Markku Eriksson, Engineering Director, PHAB
- Christer Hallgren, Quality Director, PHAB
- Peter Krig, PHAB
- Mikael Sahlberg, Sales Manager, PHAB

- Tommy Nygren, advisor Mälardalens University
Chapter 7
REFERENCES

7.1 Books/Documents

1. AI 00-019. Patria helicopters AB. (2009). Instruction for coverage of AD from Aviation Authorities and ASB/SB from OEM. [Internal]

2. AI 90-001. Patria helicopters AB. (2004). Follow up on LVD/AD/ASB/SB spread in the company. [Internal]


7.2 Internet

   http://www.transportstyrelsen.se/sv/Luftfart/Luftvardighet/fortsattluftvardighet/Nytt-CAMO-tillstand/

   http://www.transportstyrelsen.se/sv/Regler/Regler-for-luftfart/Forfattningssamling/

   http://www.patria.fi/Patria_WWW_EN_Sisalto/Patria_WWW_EN/Group/index.html

   http://patriahelicopters.com/company/

Appendix 1  Questions put forward at meetings

Questions/remarks put forward during the meeting with Markku Eriksson 2012-02-24.

- **Tekniska loggböckerna:**
  - Vilken typ av loggböcker ska användas. Ska vi fortsätta att använda Copterlines?
  - Hur ska de användas?
  - Vem ansvarar för ändringar och godkännande till SCAA?
  - Loggning av timmar/cykler + SASIMS hur fungerar det?

- **Vilka ska vara nyckel personerna i organisationen?**
  - Är organisationsschemat som jag gjort rätt?

- **Hur ska vi formulera kapitlet “Contracted Maintenance”?**

- **Hur ska jag formulera MEL rutinerna?**

- **Vart kommer helikoptern operera, kan de hamna utanför EU?**
  - Vem är skyldig att informera CAM om flygmiljön?
  - Beräknat antal flygtimmar/år?

- **Kapitlet "Operating Requirements" behövs det tas med för vårt vidkommande?**
Questions/remarks put forward during the meeting with Peter Krig 2012-03-01.

- Aircraft Technical Log, "Flygrapporten"
  - Hur ser den ut?
  - Hur används den?
  - Vilken information ska fyllas in av piloten?
  - Hur ser systemet ut för loggning av timmar och cykler ut i helikoptern?
  - Kopior av Flygrapporten
    - Vem vänder man sig till för beställning av nya FR?
    - Är de standardiserade?
    - Kan man själv lägga till fält som är relevant till helikopterns syfte?

- Technical Instructions
  - Vad är det för något?
  - Vad är syftet?
  - Hur ser de ut?

- Technical Order
  - Vad är det för något?
  - Vad är syftet?
  - Hur ser de ut?

- MEL
  - Titta på polisens MEL-lista
  - Har man lagt till ytterligare punkter utöver MMEL?
  - Hur informeras piloten om eventuella fel upptäckta av tekniker?
  - Hur loggas felet?
  - Hur hanterar man fel som ingår i MEL, tidsbegränsningar osv.?
  - Kan tidsbegränsningar överskridas och vem får i så fall ta det beslutet?

- Checklist, Normal Operating Procedures
  - Kunna få titta på checklistorna
  - Finns det möjlighet att få en kopia?

- Övriga frågor
  - Pre-flight checks
    - Är det vanligt att CMO CS utför denna eller är det upp till kunden?
    - Vad har CS för utbildning?
    - Uppdatering av timmar/cyklar vid ledighet får inte överskrida 6 dagar vem har bestämt detta, myndighet eller CMO?
    - Weekly Technical Follow Up Meetings, är det Patria själva som har satt upp denna rutin eller är det den för att uppfylla Part-145?
    - Vägning av helikoptern, vid vilka tillfällen gör man detta?
Questions/remarks put forward during the meeting with Mikael Sahlgren 2012-03-15.

- Hur ser ägarstrukturen ut hos Patria Oyj?
  - Hur kommer PHAB in i den strukturen?

- Vilka företag samarbetar PHAB med?
  - Vilka helikoptertyper arbetar ni med?

- Vilka rättigheter har PHAB?
  - Vilka arbeten får ni utföra?

- Hur länge har ni samarbetat med Eurocopter?
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Appendix 3  
Appendices to CAME - PHAB

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