VFS MONTRÉAL-OTTAWA CHAPTER WEBINAR
CH146 GRIFFON LIMITED LIFE EXTENSION (GLLE)

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OVERVIEW OF THE ROYAL CANADIAN AIR FORCE (RCAF) GRIFFON HELICOPTER (BELL 412CF) MID LIFE UPGRADE PROGRAM. INCLUDING CANADIAN GOVERNMENT PROJECT STEPS AND RETROFIT MODEL, BELL’S PROPOSED SOLUTION (INCLUDING A NEW MISSION MANAGEMENT SYSTEM), DEVELOPMENT APPROACH, HANDLING OF AIRWORTHINESS CERTIFICATION AND NEW CYBERSECURITY REQUIREMENTS, AND USE OF DIGITAL THREAD
OPENING VIDEO
1 WING OPERATIONS

https://www.youtube.com/watch?v=PEmnes-EB1g
Supporting the Canadian CH-146 “GRIFFON” fleet

1992 - Initial Procurement
Bell Model 412CF

2011 - Integrated in-service support contract with Bell
Optimized Weapon System Support (OWSS)

2019 – Update to the A/C
Griffon Limited Life Extension (GLLE)
Griffon Origins – The CFUTTH Project

1992 Bell given contract by GoC to develop and manufacture 100 highly modified 412EP helicopters to replace their existing fleets of CH-118 Iroquois, CH-135 Twin Huey and CH-136 Kiowa

Was initially FAA certified as the Model 412CF

When delivered, were transferred under the Canadian Military Registry as CH146

9 412CF Outlaw for military training
83 CH146 Still fully active
2 CH146 Used as training aids
3 CH146 Storage
3 CH146 Destroyed

~ 535,138 hrs total fleet
~ 5637 hrs average
~ 7079 hours high time
(S/N 46467 1st GLLE Development A/C)
Introducing Major François Roy

• Engineer (Comp) from University of Chicoutimi
• Joined RCAF in 2006
• Pilot Wings in 2009
• Tac Hel with 430 Sqn
• Op tour in Kandahar, Afghanistan Jul 2010 to Mar 2011
• Griffon Pilot Instructor in 2014
• Air Requirements Office in 2018

Deputy Director of the GLLE Program in the RCAF Directorate of Air Requirement
Role of the “GRIFFON”

Operated by the Royal Canadian Air Force (RCAF) across 11 units in Canada

- Tactical Aviation
- Special Operations
- Search and Rescue
- Combat Support
Ensure the CH146 remains tactically and economically viable up to 2035 by replacing obsolete systems.

Meet new Communication, Navigation, Surveillance and new civil Air Traffic Management (CNS/ATM) requirements.

Maximize Off The Shelf solutions to minimize project risk.
# Project Overview

<table>
<thead>
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<th>3 Years</th>
<th>6 Years</th>
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<td>Conversion Kit Development</td>
<td>Development completion, ILS and Fleet Retrofit</td>
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**Objective**
- Conceptual Design
- Wiring Diagrams
- Electrical and Airframe Install drawings
- Production Engineering
- Prototype Install on two development A/C
- New Designation: **CH146C - Griffon Mk II**

Work performed by a dedicated BTCL organization via the in-service support (CH-146 OWSS) Contract for the GoC GLLE Project Office.

**Objective**
- Complete outstanding development,
- Test and Eval for certification and qualification
- Perform Integrated Logistic Support activities (LSA, Pubs, Training, …)
- Procure A/C modification embodiment parts and retrofit CH146 Fleet - **81 A/C**
- Establish initial sparing levels

New GLLE specific contract to be established with Contract Award on 1 Apr 2022 (Sole Source). Outsourcing Full rate Production to Canadian Industries
Two separate product improvement streams

Leveraging Bell commercial Model 412 improvements
plus Obsolescence mitigation initiatives specific to CH146 fleet
New instrument panel and pedestal... Analog to Digital
New Engine, Re-Wire, LRU Replacement, Airframe Mods

PT6T-9 TWIN PAC

LRU REPLACEMENT/RELOCATION

New FMM (not shown) Redesigned power turbine
Redesigned compressor turbine stage to improve cooling and tip clearance
Redesigned first stage for increased flow and pressure ratio

AIRFRAME MODIFICATIONS

COMPLETE RE-WIRE
Design Tools

Military and commercial equipment integration

Certification and Cybersecurity
Design Tools

1st option: Go back in time (~1994)
Design Tools
3rd option: Something in between…

- Cardboard mockups combined with 3D printed parts
- Partial 3D Mockup
  - Just enough to allow in context design of new parts, harness routing, and LRU positioning
- Digital Product Definition (3D) for new parts and new sub-assemblies. 2D dwgs for installation
Design Tools

3rd Option: Something in Between, Partial Digital Thread

- Enterprise Digital Mock-Up (EDMU)
- Lightweight Reps for Repurposing 3D
- Analytical and Parametric Models
- Iterative Design & Virtual Validation
- Source Data 3D CAD
- Dynamic Metrology
- Fab/Inspect
- Product Visualization
- Assembly Planning
- Pubs
- Tail Number Config
- Aftermarket/Sustainment
- Supply Chain
- Assembly
- Detail Part Fab
- Concept Development
- Product Design
- Requirements Model
Certification - The Aeronautics Act

An Act of Parliament
- Achieve an Acceptable level of Aviation Safety
- Identifies the ‘Authorities’ for ‘regulation and supervision’ of aeronautics in Canada:
  - Minister of Transport
  - Minister of National Defence
Path to Full Operational Capability

Airworthiness Approval

- Type Certification
  - Certification Basis
  - Certification Plan
  - Compliance Program
  - Flight Manual
  - Type Record

- Aeronautical Product
  - Certificate of Conformance
  - Certificate of Airworthiness
  - Certificate of Registration
  - Aircraft Registration
  - Aircraft Markings

- In-Service Support
  - Maintenance Support Program Approval
  - Engineering Support Program Approval
  - Logistics Support Program Approval
GLLE Certification Strategy

GLLE Modification is a combination of installations that have already been FAA certified on the 412 in combination with new unique changes MAJOR and COMPLEX.

Type Design Examination (TDE) process can be applied where previous approval is considered “acceptable” and proposed installation is “applicable”.

412CF Certification Basis essentially retained
Challenge - Griffon vs Commercial Operating Environment

412EPI Civil Operating Environment

CH146 Operating Environment (SOI)

412EPI Civil Unique Operating Conditions (e.g. Single Pilot, CAT A)

Common Operating Conditions (e.g. IFR, Dual Pilot)

CH146 Unique Operating Conditions (e.g. SAR, formation flying, gunfire)

Cyber
Aircraft Cybersecurity = Cybersecurity applicable to systems critical to safe flight and landing

Cyber Mission Assurance = Cybersecurity applicable to systems critical to mission accomplishment

= Safe Flight and Landing

= Complete Mission

Special Condition issued by TAA. Similar to FAA, EASA and TCCA SCs. Recommends that guidance in RTCA DO-326A, DO-356 and DO-355 be followed

Risk Based Cyber Mission Assurance Process (RCMAP) developed by Defence Research and Development Canada (DRDC)
Cybersecurity and System Safety Parallels

Approach for Aircraft Cybersecurity and Cyber Mission Assurance are similar to System Safety, with some important differences:

- System safety is not concerned with completing a mission
- System safety is not concerned with loss of confidentiality
- “Probability” of a cyber attack is qualitative
Mission Management Capability Gap

• 1 of 3 Tac Aviation Pillars… Intelligence, Surveillance and Reconnaissance (ISR)
• Tech Advancement in late 2000’s allowed introduction of more modern equipment
• INGRESS project fielded initial EO/IR Sensor and Moving Map capability in 2009 in record time to support Afghanistan and Vancouver Olympics
• Standalone kit with very limited integration
  - Limited compatibility with Msn Planning software
  - Not connected to aircraft GPS
  - High workload in the cockpit (Video)

“GLLE will replace the INGRESS kit with an integrated Mission Management System that will reduce pilot workload, enhance situational awareness and increase availability of system by making the MMS basic ship configuration.”
EO/IR System & Mission Management System

Mission Management System

- GPS Position from A/C System
- Moving Map Available on all Aircrafts
- MX-15 interface as part of MMS (Hand CTRL stays)
- Customized User Interface
- Touch Screen Control and Pedestal Mounted Controller for LH & RH Pilot Control
- Single data Load for both MMS and FMCDU (FMS)
- MMS to FMCDU (FMS) bidirectional connection
What does this all mean to the RCAF Operator

For the **RCAF**, the GLLE project will allow to extend the life of the Griffon until at least the mid-2030s in a configuration that is operational relevant and interoperable with NATO allies.

For the aircraft **Technicians**, the GLLE modified aircraft will be easier to maintain, increasing the fleet availability rate.

For the **Aircrew – Pilots, Flight Engineers and Mission Specialists**, the CH146C Griffon Mk II will be:

- Safer to Fly
- Operationally more Capable
- Compliant with Civilian and Military Air Regulations
Build a high degree of Trust
Leverage on existing tools
Focus on efficiency
Eliminate surprises
Have the best team

Relationship Charter in the GoC Contract

“Parties commit to acting at all times in a manner that is consistent with the following principles: do no harm, no secrets, no surprises and no blame”