

Australian Government

**Department of Defence** Capability Acquisition and Sustainment Group

## Chinook Flight Test Instrumentation and Maintenance Management to Support Embarkation



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## Overview

- Embarkation Requirements
- Flight Test Instrumentation
- Marinisation Servicing
- Flight Trials
- Embarked Maintenance
- Future Work





- Landing Helicopter Dock
- Chinook required for heavy lift



## Requirements

- CH-47F is not designed to 'embark'
- Embarkation up to 45 days at a time
- Need to address:
  - Safe flight to and from the ship
  - Additional maintenance impacts in the marine environment
  - Ability to conduct maintenance whilst embarked
  - Long-term impacts on the aircraft

## Flight Test Requirements

- Flight test activities on-ship
- Instrumented aircraft
  - Aircraft performance and motion
  - Ship motion
  - Weather conditions (wind, sea-state)
- Controlled flight envelope
- Flight data used to determine operational limits

#### Flight Test Instrumentation System

- CHMU tasked to develop FTI solution
- Requirements included:
  - Data parameters and sample frequencies
  - Telemetry and communications
  - Imagery



Cameras

## Flight Test Engineer Station

- Custom Designed pallet installation
- Seat from proposed cabin seating upgrade
- Station console adapted from previous trial hardware



## **Sensor Mounting**

- Go-Pro Cameras mounted externally and in cockpit
- GPS Antenna mounted to aircraft window
- Additional ICS installed



## Data Acquisition

- Aprism HeliSHOLDS employs ACRA protocols
- Supports large range of data capture sensors
- MIL-STD-1553B snarfer/parser modules
- Live data feed monitored by FTE
- COTS processing hardware (Toughbook)



#### **Marinisation Maintenance**

- CH-47F is FMS from US Army
- US Army don't 'embark' aircraft
- Large number of variables:
  - New airframe construction
  - Embarkation duration
  - Location on ship
  - Sea state

#### **Marinisation Maintenance**

- New services developed by AASPO MRD section
- Built to be (overly) conservative
- Developed using existing maintenance tasks
- Washes conducted liberally
- Additional application of the existing corrosion
  preventative service
- Additional application of line maintenance corrosion inspections at the completion of embarked activities
- Contingency service developed to wash the aircraft without water (in the LHD hangar)

## **Marinisation Maintenance**

Service	Trigger	Frequency	Service Tasks	Impacts
Pre-Embarkation	Embarkation	Within 7 days	Corrosion Preventative Service	Commences 30 Day timer
Aircraft Wash	Aircraft On Deck	Daily	Wash	Commences 5 Day timer
Wash without water	Contingency	In lieu of aircraft wash	Manual cloth low-water wash	Claims Aircraft wash
5-Day Service	Aircraft washed and not hangared	5 days	Corrosion Preventative Service	Claims 30 Day service
30-Day Service	Days since last corrosion preventative	30 days	Aircraft wash and Corrosion Preventative Service	Resets 30 Day timer
Post-Embarkation	Return Ashore	Within 7 days	Corrosion preventative service and line maintenance corrosion inspections	Cancels all other marinisation services timers

## First of Class Flight Trials

- Flight test activity run by DoSA(FT) (AMAFTU)
- Controlled flight envelope
- Explores aircraft/ship motion limits
- Expands envelope based on flight data
- Outputs operational limits and procedures



## TLOR and FTAA/DoSA(FT)

- Technical limitations/risks communicated through Technical Letter of Release (TLOR) by DAR/HoDO
- Covered:
  - unknowns in startup/shutdown regime
  - limitations on parking spots
  - GSE/ship aviation facilities
  - Corrosion prevention/inspections
- Residual risk transferred to FTAA/DoSA(FT)
- TLOR was a significant body of work for the SPO

## Airflow Modelling



Images courtesy of DSTG Aerospace Division

## **Deck Handling Trials**

- 4 days in benign conditions
- Alongside at Garden Island (Sydney)
- Primarily a check of ship interfaces:
  - GSE
  - Elevators/hangar
  - Fuel/air/water
  - Blade removal
  - Lashing in all parking spots (8)





## Deck Handling Trials – Outcomes

- Blade removal possible
- Transit through hangar possible (170mm clearance)
- Working at heights
- Communications
- Aircraft washes using garden
  - hose.







## First of Class Flight Trials

- 7 week sailing with HMAS Adelaide
- Embarked team AMAFTU, AATES, CHMU, 5 Avn Regt, DSTG
- Sea states and temps
  Tasman to Arafura Seas



## First of Class Flight Trials – Outcomes

- Establishment of SHOLs
- Corrosion maintenance
  burdensome
- Maintenance confined to benign sea states
- Blade sail





#### Blade sail







Rotor head pitch shaft damage

Bottom of rotor head

Pitch shaft

Rectification maintenance – 1 week

# Future Work – Choules and Maintenance improvements

- FOCFT on HMAS CHOULES Feb 18
- Blade sail changes due to airflow
- Corrosion maintenance to be analysed
- Dynamic blade sail (DSTG) for LHD and LSD

## Airflow Modelling



Images courtesy of DSTG Aerospace Division

Acknowledgements





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