TP400-D6 Turboprop
A European Collaboration Programme

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Why a Turboprop …?

1. Advantage in fuel efficiency for a given payload/range target

1. Particular operational capabilities
   1. Steep Descent
   1. Ground Manoeuvrability

1. Thrust responsiveness during low-level flight missions
   1. Airdrop missions
   1. Field Performance
The Engine Team
Europrop International GmbH

- Project Management Organisation for the TP400-D6 programme
- Registered in Munich, Germany
- Operational Office in Madrid, Spain
- Approx. 60 employees
- Shareholding
  - Snecma 28%
  - Rolls-Royce 28%
  - MTU 28%
  - ITP 16%
- 750 engines on firm order
Heritage of European Co-operation

**Tyne** for C-160 Transall
RR / Snecma / MTU / Techspace Aero

**EJ200** for Eurofighter
RR / MTU / ITP / AVIO

**Adour** for Jaguar
RR / Turbomeca

**RB199** for Tornado
RR / MTU / Avio

**MTR390** for Tiger
MTU / Turbomeca / RR

**Olympus** for Concorde
RR / Snecma

**Larzac** for Alphajet
Sneca / MTU / Turbomeca / KHD

**RTM322** for NH90
RR / Turbomeca

We are doing this not for the first time… but still it is “more commercial now”
TP400-D6 Partner Company Workshare

Performance
Whole Engine Model
Air/Oil System
Intermediate Casing
HP Compressor
Internal G/B
LP Shaft
Hot Strut
Sensors & Probes

Flying Test Bed
Vulnerability Assessment

Type Certificate Holder
Validation / Certification
Project Management
Integration Management
Installation Management
Interface Control
Prop G/B Management
Configuration Control

Installation
Control System
Development Tests
HP Turbine
Combustor
Acc G/B

Development Tests
Test Equipment
Front Structure
Exhaust Case
LP Turbine
Dressings

Production Assembly
Control System
Development Tests
IP Compressor
IP Shaft
IP Turbine

09/2006
Rolls-Royce Defence Aerospace
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TP400-D6 – Engine master programme

54 Months

28 Months

Engine run
(30.08.05)

Eng/Prop run
(30.12.05)

Engine Certification
(handed)
(30.10.07)

Engine Certification
(baseline)
(30.03.08)

FTB
(30.12.06)

First Flight A400M
(30.11.07)

Completion of Qualification test
(30.01.09)

PDR
(May 04)

CDR
(Dec 04)

□□□□

- Fixed Price contract against frozen specification
- First engine run achieved 28 October 2005
- First Engine & Propeller run achieved 28 February 2006
- Flying Test Bed engine scheduled for early 2007
- First flight of TP400-D6 powered A400M scheduled for end November 2007

A military development programme with civil schedule timescales
TP400-D6 Overview
TP400-D6 – Technical features

1. 10,500+ shp
2. 3-shaft engine architecture
3. Overall pressure ratio 25:1
4. 5 Stage IP compressor
5. 6 Stage HP compressor
6. Single stage unshrouded HP turbine
7. Single stage shrouded IP turbine
8. 3 Stage free Power (LP) turbine
9. Chin air intake
10. Offset power gearbox (9.9 ratio)

The most powerful modern turboprop in the western world!
TP400-D6 knowledge transfer examples

RTM322
- IPS design tools

T56 and AE2100
- In-service experience
- Gearbox experience
- Mount arrangement

Trent
- 3 shaft architecture
- Transmissions work

Civil / Military R&T
- Aero methods from Civil R&T programmes
- Corporate Compressor Systems
TP400-D6 Validation Programme
TP400-D6 Certification basis

1. Certification against Civil Basis amended by Military Requirements
2. Qualification against Airbus Military Specifications

- Mission Endurance Test (IMI)
- Engine Smoke Visibility
- Engine Sand & Dust Resistance
- Engine Corrosion Resistance
- EMC / EMD
- Radiation
- Lightening (direct / indirect)
- Reversing Capability

“Fuel Venting”
“Freezing Fog”
“Complex Digital Devices”

CS-E

Military

Civil

Basis
TP400-D6 Validation programme

1 3 Sea Level Test Beds
   1 Rain/Hail and Sand/Dust ingestion
   1 LP telemetry
   1 150hr type and cyclic endurance test
   1 Thermal paint
   1 Overspeed, Overtemperature, etc...

1 1 Altitude Test Bed
   1 Performance and handling
   1 Windmill / relight
   1 Air/Oil/Fuel System verification
   1 HP / IP telemetry

1 2 Outdoor Test Beds
   1 150hr type tests and cyclic endurance
   1 Bird ingestion
   1 Dyno-prop control and propeller integration
   1 Crosswind and noise
TP400-D6 First engine run – 28th October 2005

MTU Sea Level Testbed (Ludwigsfelde, near Berlin)

Engine reached 10,700 shp within 4 weeks of testing
First Engine & Propeller Test – 28th February 2005

Snecma Outdoor Testbed (Istres, near Marseille)
Engine tested with propeller unfeathered & feathered (up to 15 degrees)
Achieved full power
TP400-D6 Flying Test Bed

1. The FTB is a C-130 Hercules
   1. The aircraft is XV108 “Snoopy”, the former meteorological research flight aircraft.

1. The programme is being led by AMSL

1. EPI have to provide an instrumented engine, technical support and a financial contribution.
A400M Flying Test Bed – Technical Concept

Flying Test Bed prime contractor is Marshall Aerospace, Cambridge

1. C130 Hercules Airframe
2. TP400-D6 installed at no.1 inboard
3. 100 Flight Test hours over 15 months
4. 700 Parameters to be recorded
Summary
TP400-D6 – Summary

1. TP400 is a major step forward for European Defence collaborations
   1. Partnership builds on long experience
   1. Commercial practices applied to a military programme

2. The TP400 design is a low-risk technical solution tailored to the A400M
   1. Optimised ‘Rolls-Royce’ three-shaft architecture
   1. Designed for 11,000shp and capable of driving 8 bladed 17ft propeller
   1. Component design based on demonstrated technology
   1. Robust core with low cycle temperatures
   1. Sufficient growth potential

Europrop International combines the best of Europe’s engine manufacturers’ resources and expertise
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For more news & information
http://www.europrop.aero