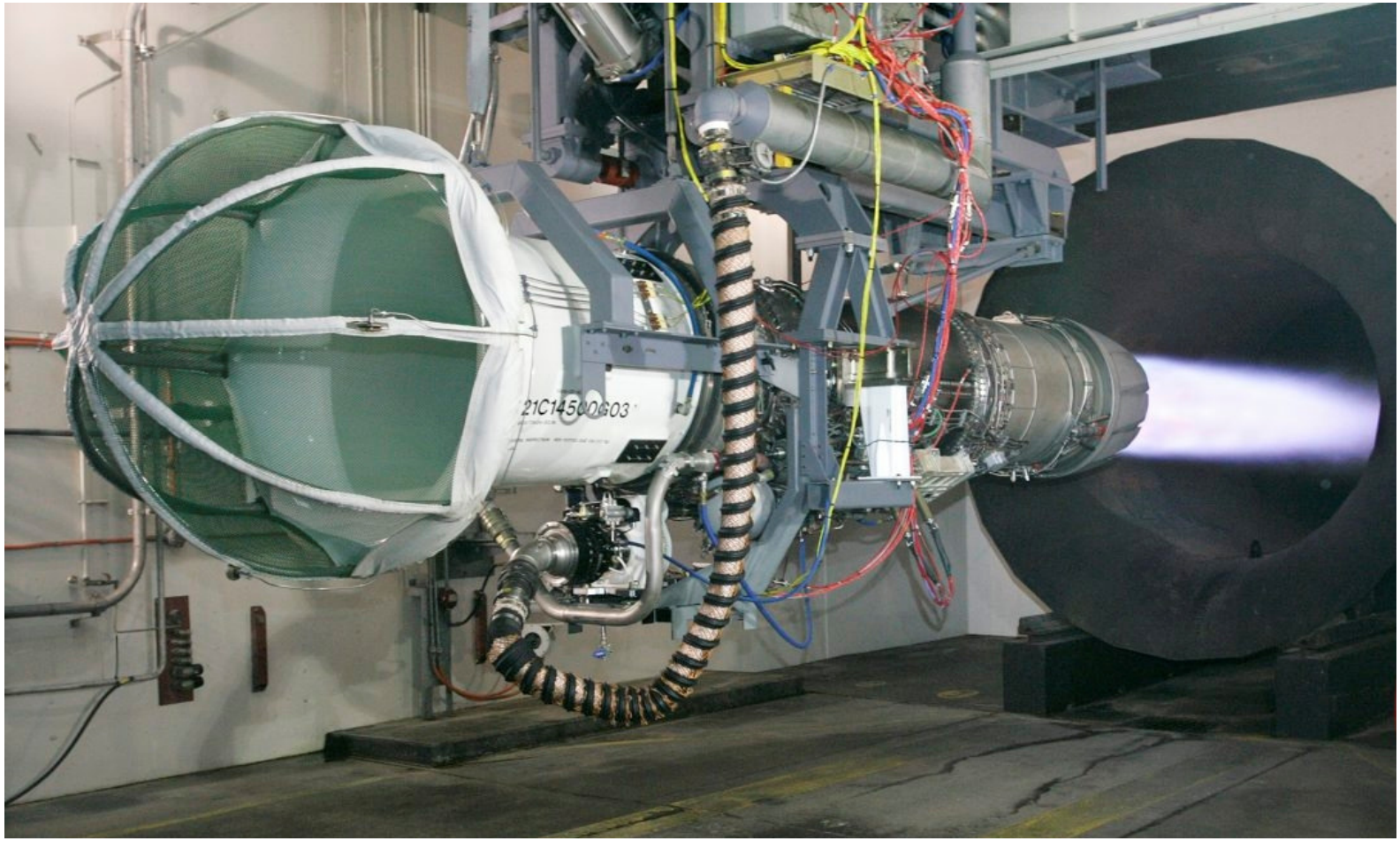
# SUPER HORNET – F414 Engine Condition Monitoring System



- Background
  - On 3 May 2007, the Australian Government signed a contract to acquire 24 F/A-18F's for the RAAF.
  - 10 Year operations. First Delivery 2010 (Planned Withdrawal Date 2020).



- Potential capability gap arising due to:
  - Retirement of F-111 (Dec 2010), and



– Delays in development of the F-35 Joint Strike Fighter (~2018 )



- Delivery of RAAF Super Hornets began March 2010
  - 14 arrived throughout 2010, and
  - Remaining 10 arriving in 2011.

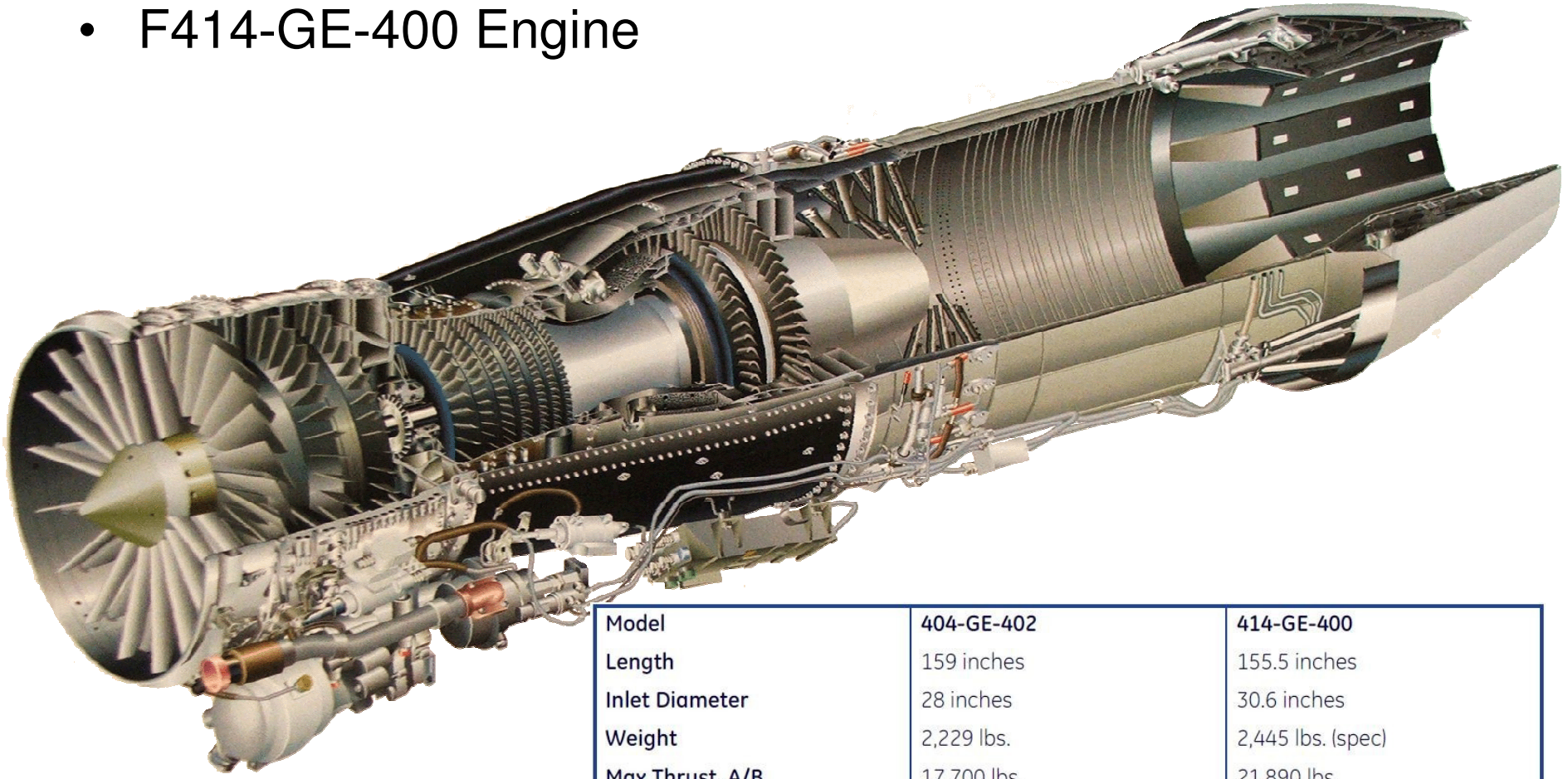



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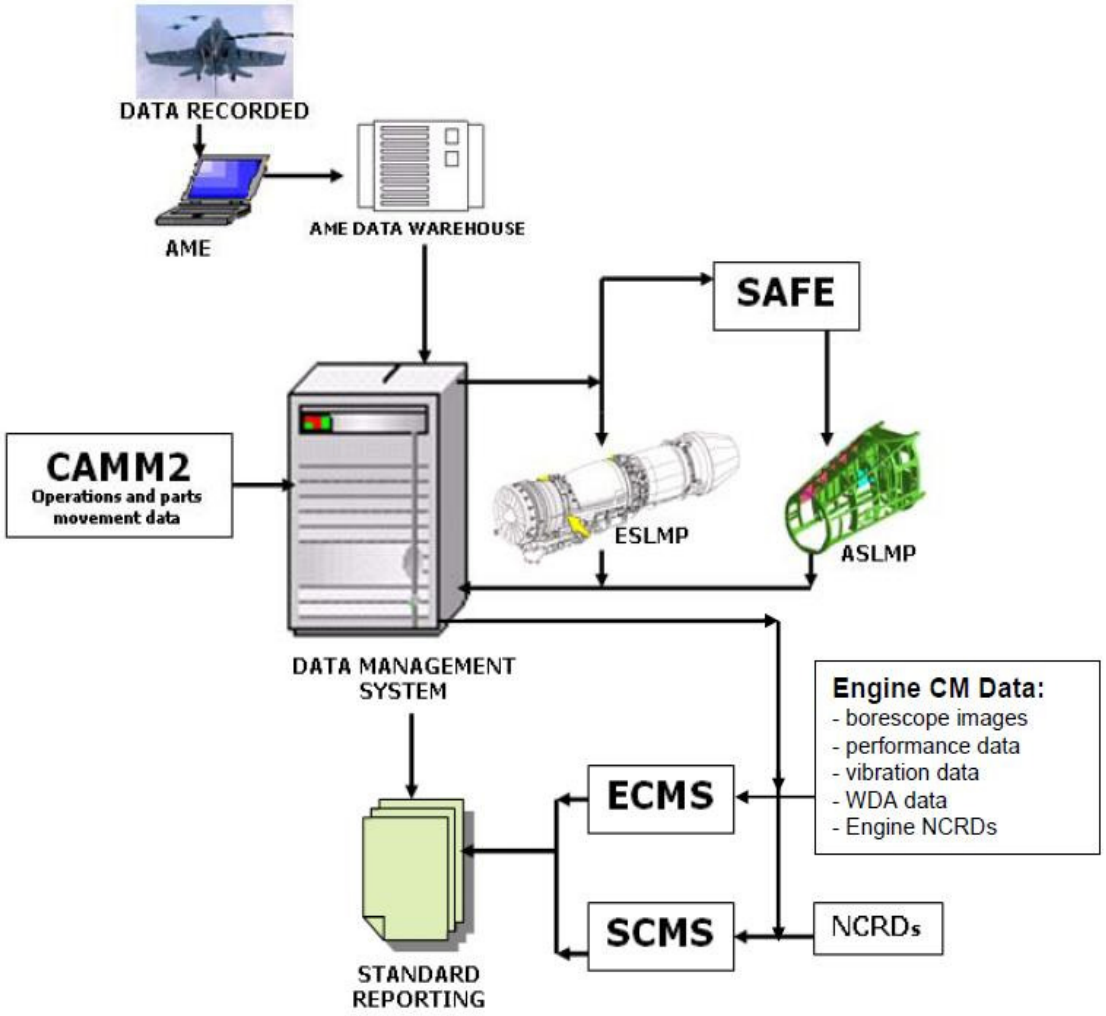


- F414-GE-400 Engine



| Model | 404-GE-402 | 414-GE-400 |
|---|---|---|
| Length | 159 inches | 155.5 inches |
| Inlet Diameter | 28 inches | 30.6 inches |
| Weight | 2,229 lbs. | 2,445 lbs. (spec) |
| Max Thrust. A/B | 17,700 lbs. | 21,890 lbs. |
| Max Thrust Dry | 11.875 lbs. | 14,770 lbs. |
| Thrust to Weight Ratio | 8:1 Class | 9:1 Class |
| Engine Compression Ratio | 25:1 | 30:1 |
| Airflow | 146 PPS | 170 PPS |
| Model | F404-GE-402 | F414-GE-400 |
| Type | Low Bypass Turbofan with A/B | Low Bypass Turbofan with A/B |
| Fan | Three stage axial flow | Three stage axial flow |
| Compressor | Seven stage axial flow | Seven stage axial flow |

- Aircraft Generated Data




## Installed Engine Condition Monitoring System

- LCF Counts
  - Full & Partial Cycles
  - Pressure Cycles
- Creep Counts
  - 3 x 214 Cells Matrix for LPT & HPT
- Thermal LCF Counts
  - HPT Blades
- Time (EOT, ABOT, IRPOT)

- Engine Condition Monitoring System (ECMS)

71. Engine CM data will include (but may not be limited to):

    a. Performance and vibration data from installed engine run;

    b. Performance and vibration data from uninstalled engine test runs;

    c. Level Maintenance videoscope images;

    d. Enhanced I Level Maintenance videoscope video footage;

    e. Wear Debris Analysis (WDA) images and related data;

    f. Defect Reports;

    g. Enhanced I Level condition assessment reports; and

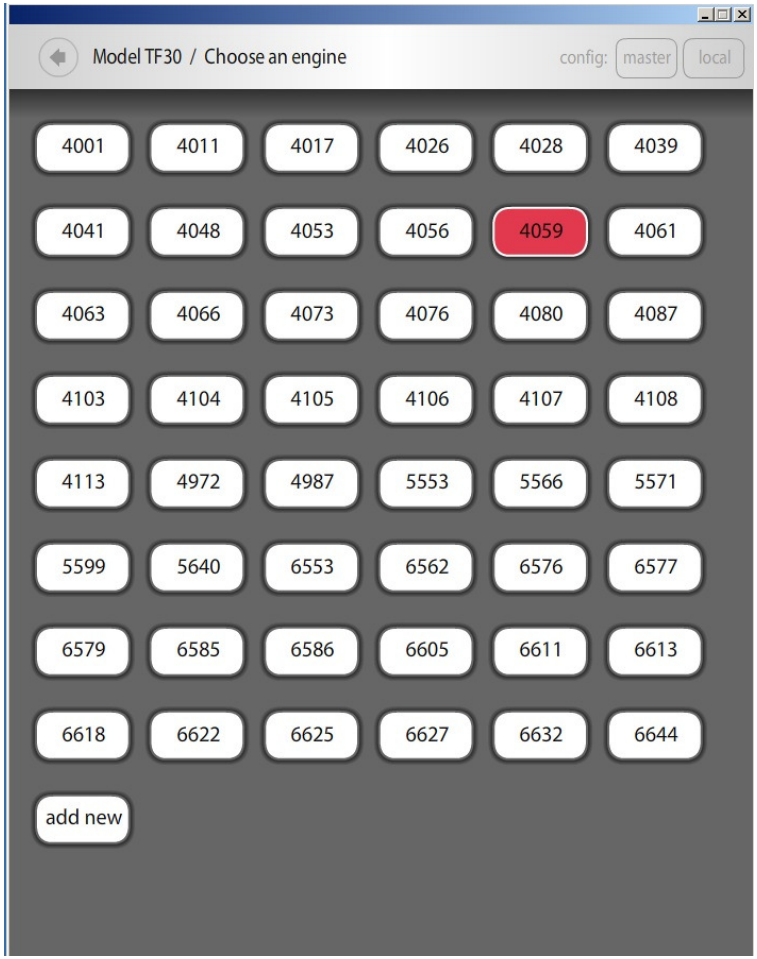
    h. Deviation and Waiver Dispositions.

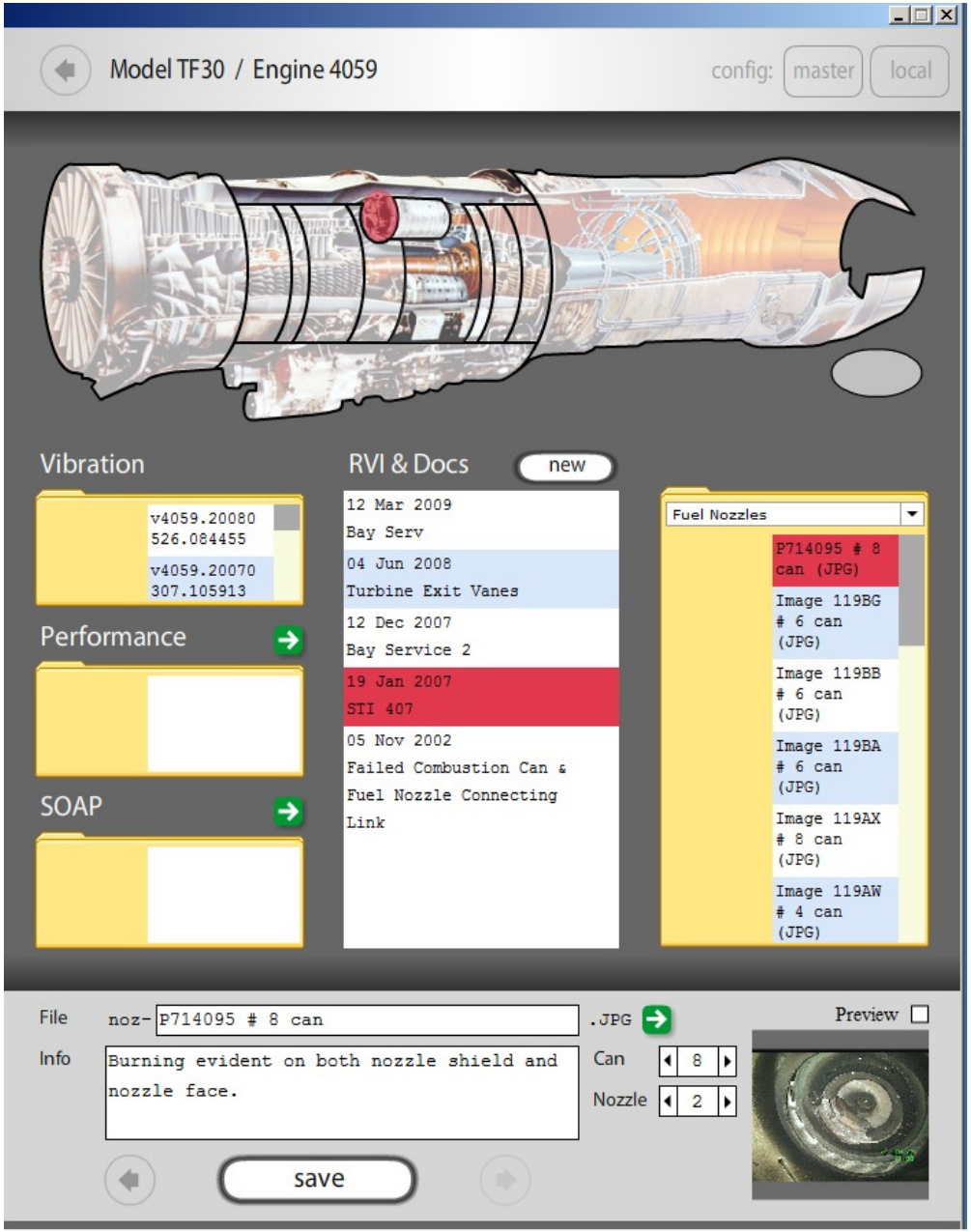
- Choosing a method to store & display ECMS data.

  - Diverse range of Data types (jpeg, mpeg, doc, xls, pdf, mdb etc)
  - Need to accommodate further data types as required.
  - Easy retrieval, display, trending & reporting of data.

- TAE had already faced a similar issue with TF30 (F111) ECM data

  - RVI, Vibration, Performance, Oil Condition (SOAP), WDA, Defect & Engine Condition Reports etc.
  - Needed a way to pull all this information together into one place.


Model TF30 / Choose an engine
config: master local
4001 4011 4017 4026 4028 4039
4041 4048 4053 4056 4059 4061
4063 4066 4073 4076 4080 4087
4103 4104 4105 4106 4107 4108
4113 4972 4987 5553 5566 5571
5599 5640 6553 6562 6576 6577
6579 6585 6586 6605 6611 6613
6618 6622 6625 6627 6632 6644
add new


Model TF30 / Engine 4059
config: master local
Vibration
v4059.20080 526.084455
v4059.20070 307.105913
Performance
SOAP
RVI & Docs
new
12 Mar 2009 Bay Serv
04 Jun 2008 Turbine Exit Vanes
12 Dec 2007 Bay Service 2
19 Jan 2007 STI 407
05 Nov 2002 Failed Combustion Can & Fuel Nozzle Connecting Link
Fuel Nozzles
P714095 # 8 can (JPG)
Image 119BG # 6 can (JPG)
Image 119BB # 6 can (JPG)
Image 119BA # 6 can (JPG)
Image 119AX # 8 can (JPG)
Image 119AW # 4 can (JPG)
File noz- P714095 # 8 can .JPG
Info Burning evident on both nozzle shield and nozzle face.
Can 8
Nozzle 2
Preview
save

- Discussions held with ASHSPO over F414 ECMS
  - TAE recommended development of a program similar to TF30 ECMS



1 & 6 Squadron

- 200 ENHR Boroscope
- Installed Eng Run
- Installed Vibration
- Defects
- IECMS data

AME Toughbook

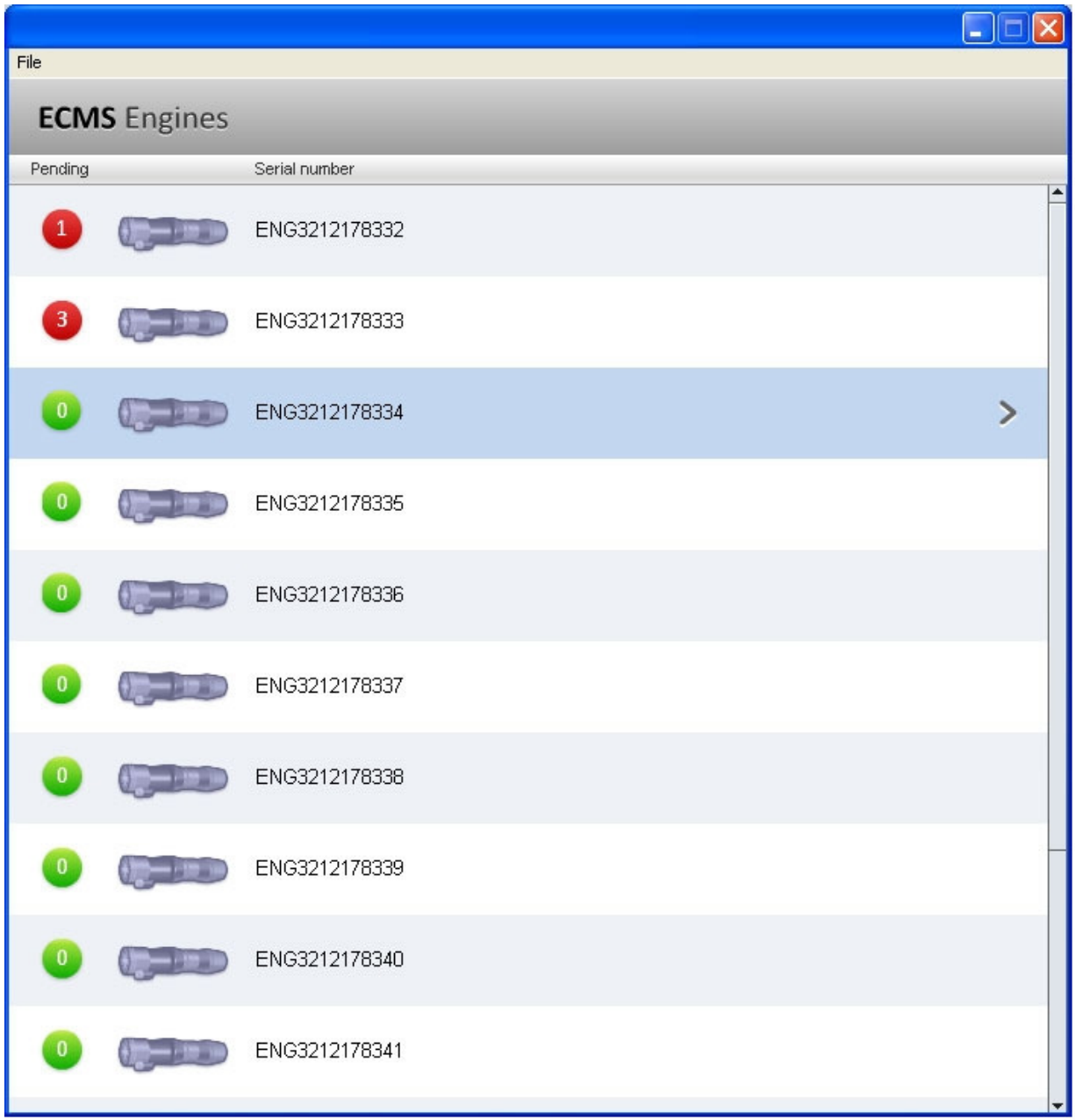


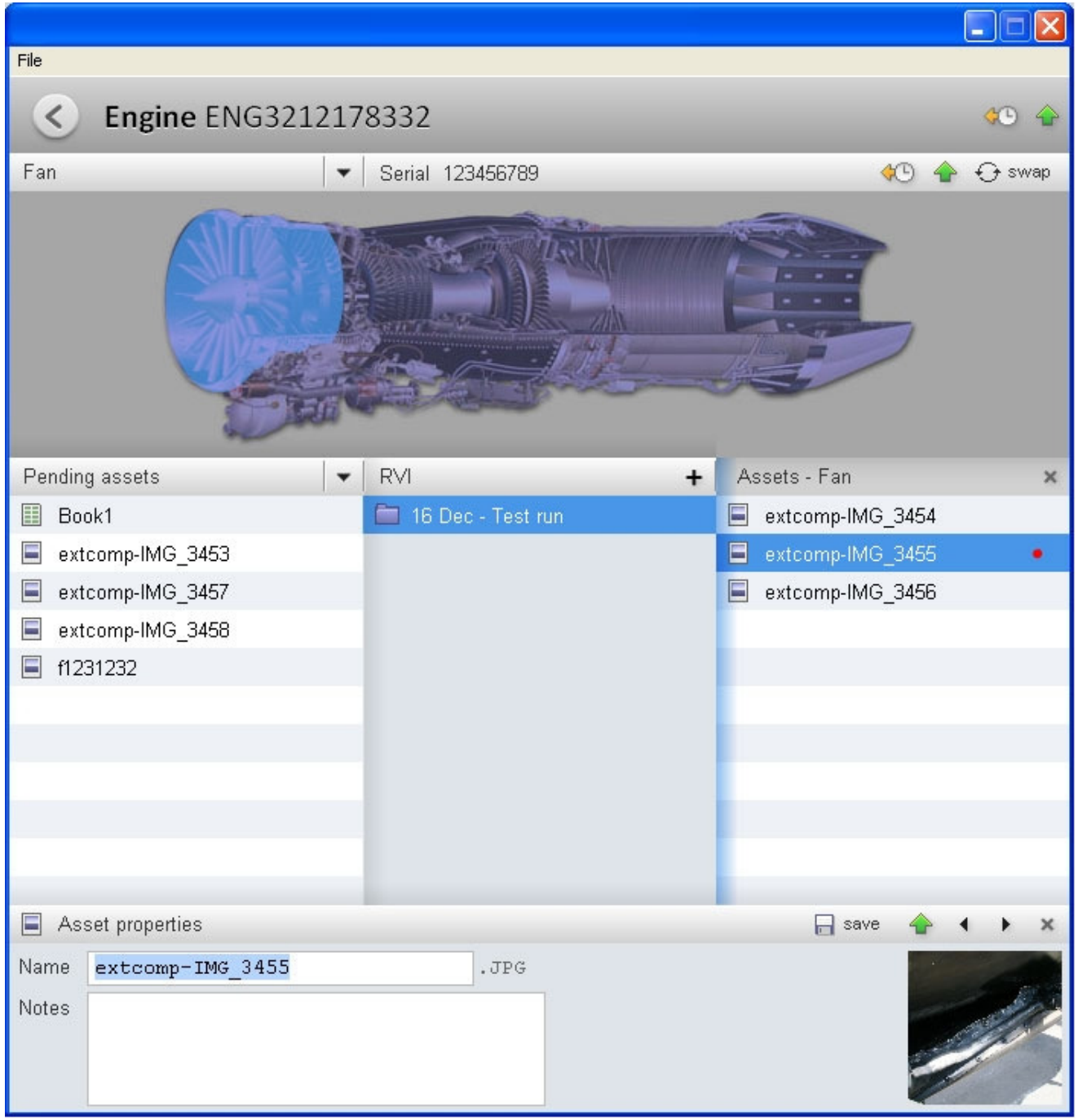
- I Level ENHR Boroscope
- Test Cell Eng Runs
- Test Cell Vibration Runs
- Defects / DIR's
- WDA
- Deviations
- Condition Reports

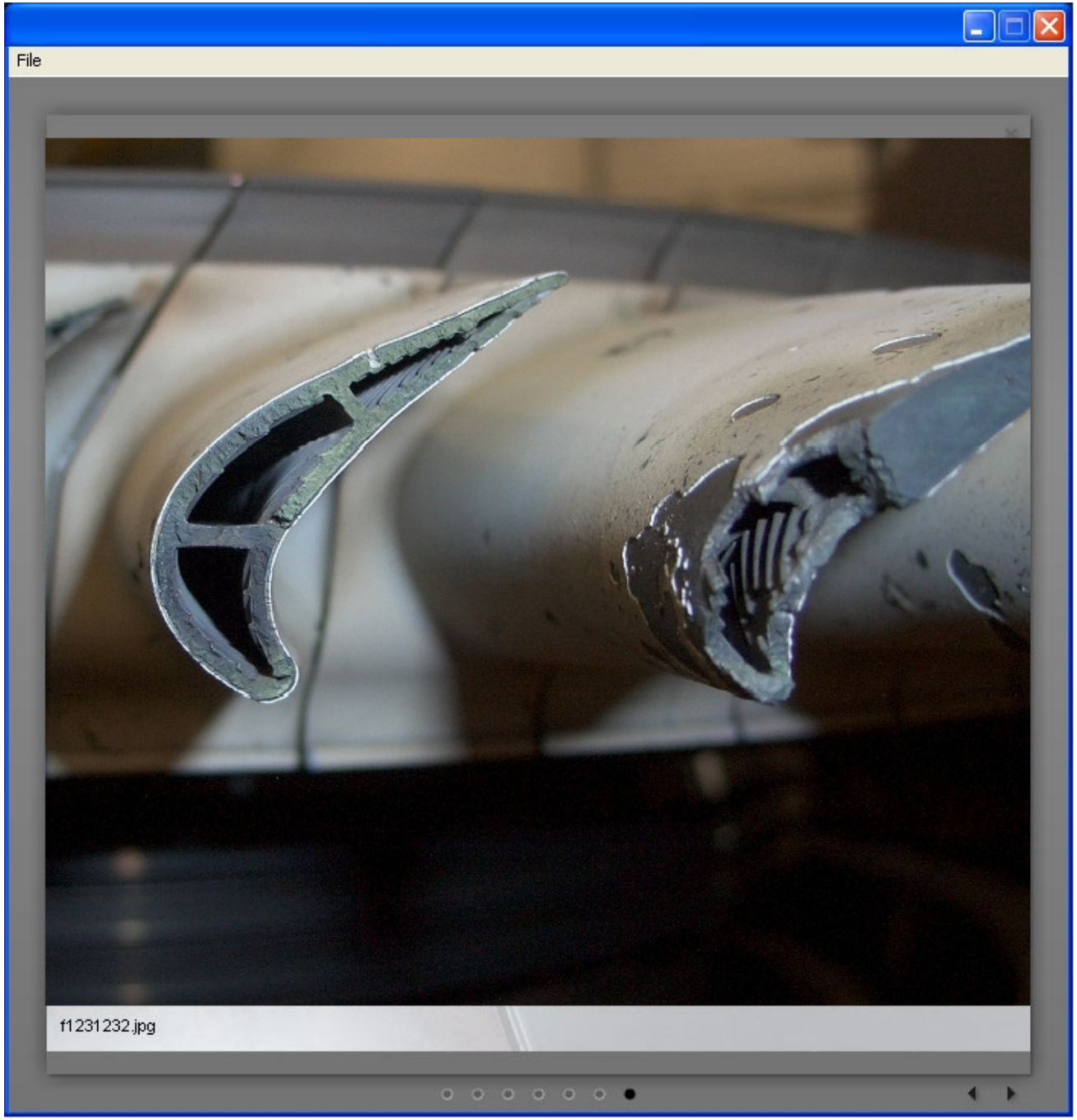


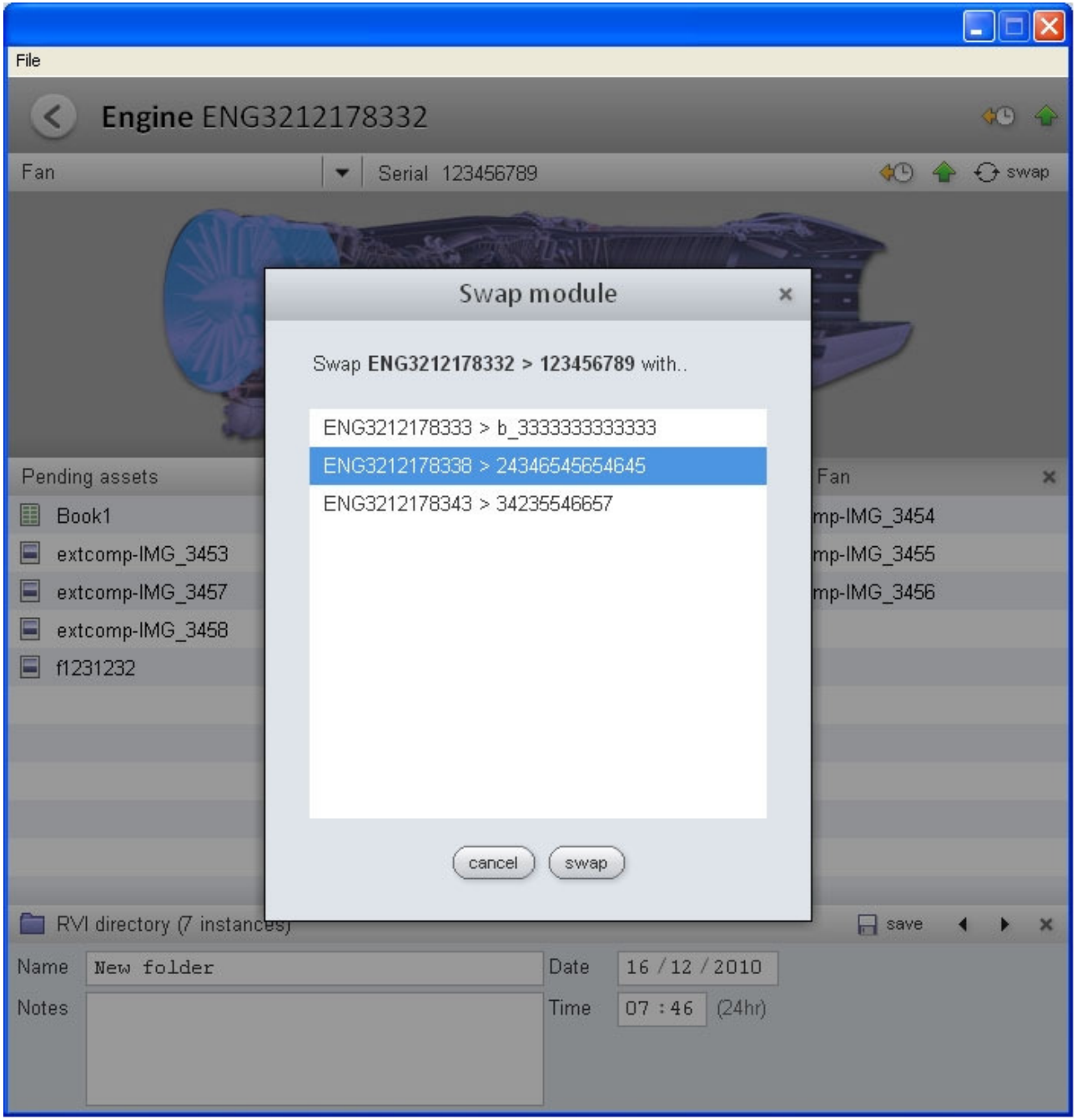


CM data stored on secure server


File
ECMS Engines
Pending
Serial number
1
ENG3212178332
3
ENG3212178333
0
ENG3212178334
0
ENG3212178335
0
ENG3212178336
0
ENG3212178337
0
ENG3212178338
0
ENG3212178339
0
ENG3212178340
0
ENG3212178341


File
Engine ENG3212178332
Fan
Serial 123456789
swap
Pending assets
RVI
Assets - Fan
Book1
extcomp-IMG_3453
extcomp-IMG_3457
extcomp-IMG_3458
f1231232
16 Dec - Test run
extcomp-IMG_3454
extcomp-IMG_3455
extcomp-IMG_3456
Asset properties
save
Name
extcomp-IMG_3455
.JPG
Notes


File
f1231232.jpg


File
Engine ENG3212178332
Fan
Serial 123456789
swap
Swap module
Swap ENG3212178332 > 123456789 with..
ENG3212178333 > b_3333333333333
ENG3212178338 > 24346545654645
ENG3212178343 > 34235546657
cancel
swap
Pending assets
Book1
extcomp-IMG_3453
extcomp-IMG_3457
extcomp-IMG_3458
f1231232
Fan
mp-IMG_3454
mp-IMG_3455
mp-IMG_3456
RVI directory (7 instances)
save
Name
New folder
Notes
Date
16 / 12 / 2010
Time
07 : 46
(24hr)