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Report Summary			
Report No.	L200802825-2830	Material	Samples from Nimrod XV-249
Overall Status	N/A	Specification	N/A
Received From	RAF WADDINGTON EFDC	Senders Ref.	Nimrod IPT
Date Received	February 2008	QinetiQ Ref.	
Sample Description		System Information	
1 x Muff 2 x filter papers containing deposits collected from the aircraft Servodyne and Bay Door 3 x glass bottles of fluid from Nimrod RI XV-249.		2008002825 - Muff 2008002826 - Servodyne cylinder deposits on filter paper 2008002827 - Black deposit from bay door on filter paper 2008002828 - OX-87 from aircraft 2008002829 - OM-15 from aircraft 2008002830 - AVTUR F-34 from Aircraft	
Reason For Test			
Analysis requested in support of fire investigation.			
Comments			
<p><u>FTIR and GCMS Analysis</u></p> <p>A compound was found in sample 2008002825 "muff extract" which was tentatively identified as di-octyl sebacate. The source of this compound could be OX-7 engine oil. Analysis also indicated that the muff extract could possibly contain traces of OX-87, because trace levels of compounds which could be glycols of the type seen in OX-87 were found. However, it was not possible to confirm that OX-87 was present, because the levels of the compounds found were so low that it was not possible to conclusively identify them from their mass spectra.</p> <p>Areas of filter paper with visible deposit were cut from swab sample 2008002826 (Servodyne cylinder) and extracted with Tetrahydrofuran (THF). The THF extract was then reduced in volume and analysed by infra red and Gas Chromatography–Mass Selective Detection. The analysis indicated that the main components were most likely to be esters (probably oxidation products from the pyrolysis of organic materials). A trace amount of di-octyl sebacate was tentatively identified by Gas Chromatography in the extract (which possibly originated from OX-7 engine oil).</p> <p>Swab sample 2008002827 (black deposit from bay door) was extracted with THF. The THF extract was then reduced in volume and analysed by infra red and Gas Chromatography-Mass Selective Detection. The analysis indicated that the main components were most likely to be esters and carboxylic acids (probably oxidation products from the pyrolysis of organic materials). A trace amount of di-octyl sebacate was tentatively identified by Gas Chromatography in the extract (which possibly originated from OX-7 engine oil).</p> <p>In addition to the muff and swab samples three fluids were received from XV249 for confirmation of their identity (samples 2008002828 to 2008002830). The fluids were analysed by infra red and Gas Chromatography-Mass Selective Detection and compared to appropriate reference fluids. The results of the analyses were as follows. Sample 2008002828 (XV249 hydraulic oil) was consistent with an OX-87 reference, there was no evidence of contamination. Sample 2008002829 (XV249 OM-15) was consistent with a Nyco OM-15 reference. Sample 2008002830 (XV249 F-34) was consistent with an AVTUR reference, there was no evidence of contamination.</p> <p>In conclusion the samples of OX-87, OM-15 and AVTUR, appeared to be normal with no evidence of contamination. Samples taken from the muff, the servodyne cylinder and the bay door were not possible to positively identify. However, there was some evidence of OX-87 in the muff sample and some evidence of OX-7 in all three samples.</p>			

Thermal Analysis

Thermal gravimetric analysis and differential scanning calorimetry were carried out on sample 2008002828 and a modified version of 2008002828 (where the volatile material had been evaporated / burned off to form a gummy deposit). The results indicate that the OX-87 will show significant volatility above 130°C which would lead to significant evaporation probably leading to the a gummy deposit. The simulated gummy deposit (modified version of 2008002828) undergoes rapid thermal decomposition above 270°C – 300°C. There is no direct experimental confirmation that it ignited but there was a very rapid thermo/oxidative reaction which could have been auto ignition.

In conclusion, if OX-87 is heated above 130°C it will readily evaporate and form a gummy deposit. It is possible that this gummy deposit may auto ignite at a temperature above 270°C.

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