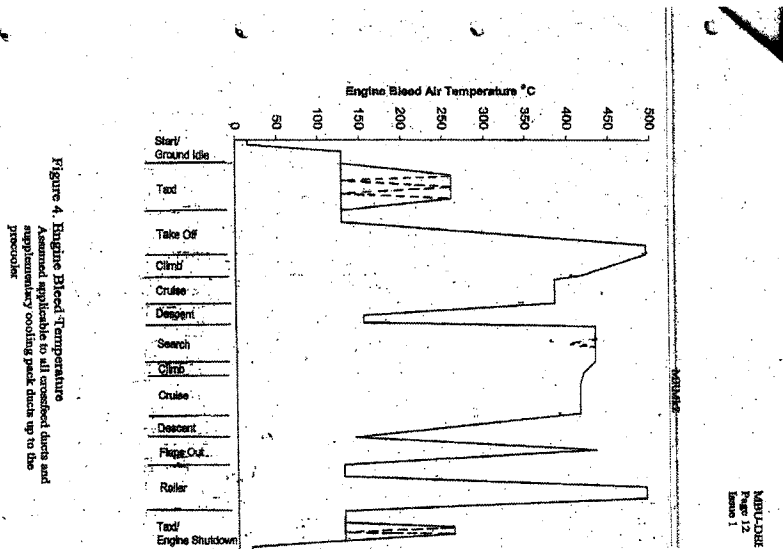


Re. Investigation of Nimrod XV 249 fire.

- 1) The Nimrod manual gives the expected temperatures of the engine bleed air passing through the Crossflow feed pipework. At cruise condition (80%Nh) the air temperature should be ~ 370°C.



The 'max dry' i.e. 98%Nh temperature agrees with the measurements made at Kinloss by the BOI team during the XV 230 investigation. Vis:

Extract from our report into the loss of XV230.....

A series of trials were performed at RAF Kinloss using temperature indicating lacquers to assess the likelihood of sustaining an auto-ignition event on the HP cross-feed bleed and SCP pipework **Error! Reference source not found.** The trials showed that exposed surfaces of the cross-feed/SCP pipe reached temperatures between 344°C and 399°C at 98% power. At the same operating condition, the external surface of the Refrasil™ insulation was found to be less than 302°C. However, preliminary tests at lower operating conditions indicated that the surface temperature of the insulation material was similar to the hot pipe surface when compressed onto the underlying pipework.

Much of the cross feed pipework is well insulated either by Refrasil jackets or by double or treble skinning in the case of the bellows. (note that the the bellows are constructed with

two layers of bellows and a central pipe and will not therefore reach anything like the air temperature).

The bellows that was heavily implicated in the XV320 fire was well insulated by a glass fibre cloth wrapped muff so that the bellows could approximately **attain hot air temperature** and was also able to allow ingress of fuel.

In general see article describing the hazards of lagging fires.

<http://www.foamglasinsulation.com/literature/combustibility.pdf>

In the present case, (XV249), the most obvious hot source is the pipework under the central insulating 'fairlead' block. **In view of the evidence above and since we seem to have exhausted other lines of enquiry I strongly recommend that we re-measure the pipe temperature under the fairlead block.** I would very much like to attend this trial please.

2) We have several outstanding actions from our last meeting at Waddington:

The timeline of events, observations and tests from the week before and up to discovering the fire.

Examination of the pipes and valves.

A description of the tests to measure the temperature of the cross-flow pipe i.e engine conditions, valve positions, location of thermocouples etc.

Data arising from examination of fairlead blocks including tests in ovens.

3) Information from QinetiQ is that the tarry/coke deposits remaining after OX87 is boiled to dryness auto-ignite at ~ 270°C. This is rather threatening because the deposits cannot just evaporate away. They must auto-ignite if the temperature suits.

~~XXXXXX~~ has found a mention of the auto-ignition temperature of kerosine being 210°C. Unfortunately there is not a reference to the test. I still think that this would be very difficult to achieve except by absorbing the fuel into absorbant material on the hot surface.

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3/2/2008

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