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MEMORANDUM FROM THE NUCLEAR SAFETY ADVISORY PANEL 2ND PROGRESS REPORT ON THE DEFECT REPAIRS TO HMS TIRELESS

Dear Chief Minister

As you are aware, on 14 November we met with representatives of the Ministry of Defence in London. At the meeting we discussed the following issues relating to HMS Tireless.

1 DEFECT DIAGNOSTICS/ANALYSIS

The Panel has stipulated that it requires to be satisfied that the MoD fully understands the cause of the defect before it proceeds to repair.

The Panel has considered two aspects of the diagnostics programme:

a) Progress and Timetable

In our 1st Progress Report we noted that by mid November the MoD should have established the cause of the defect and developed a practicable repair scheme-

However, the MoD has been unable to establish the defect cause with certainty and, hence, the development of the repair process has been delayed.

The intent is now to trepan (cut-out) a circular section of the main pipe, which includes the defective pintle area, and to return this to the UK for thorough examination. The trepanning equipment and operational methodology are both still under development at Rolls Royce Marine Power (RRMP) at Derby, but it is expected that the equipment will be transferred to Tireless for deployment on or about 24 November.

Thereafter, a full assessment of the trepanned section will occupy 3 or so weeks at which time MoD forecast that it will be in a position to establish the definitive cause of the defect. During this 'holdover' period no further work will be undertaken on board Tireless and the hole in the main pipework will be temporarily sealed.

Sketches A, B and C attached show the pressuriser-main pipe connection

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b) Risks during the Extended Diagnostics Period

The Panel has reviewed how the extended diagnostics period and nature of the physical intrusion into the main primary pipework will affect the safety of Tireless.

i) Extended Diagnostic Period

The diagnostics phase has now been extended by about one month over the original pintle scheme. The period over which the primary circuit is actually open is much shorter at about 3 days.

The Panel considers the increased risk associated with the extended time of the primary circuit being open continues to be acceptably low.

ii) Intrusion into the Primary Pipework

For the now abandoned pintle scheme, the intent was to maintain water coolant in the main pipe at half full level. This enabled the low pressure decay heat removal (LPDHR) system to continue in operation when required for cooling and as a means of primary circuit water quality treatment. During the estimated 3 day trepanning operation, the main pipe has to be dry so the LPDHR system cannot be used immediately.

The Panel has reviewed the risk implications of withdrawing the LPDHR for relatively short periods in terms of temperature rise of the coolant water and any adverse effect prompted by deterioration of the chemical quality of the water.

On temperature rise, the Panel is satisfied that loss of immediate availability of the LPDHR for a few days will not introduce any significant additional risk. Moreover, the Panel has been presented with further evidence that the decay heat is now so low that the fuel system is able to survive undamaged in an environment where all of the coolant water has been drained from the reactor pressure vessel (i.e. the worst case).

The Panel considers significant deterioration of the coolant water quality not to be a risk since satisfactory water quality is currently maintained by once weekly operation of the LPDHR system. Following its next scheduled meeting with the MoD of 21 December, the Panel should be in a position to report to the Government of Gibraltar its assessment of the MoD's diagnostic and proposed repair programmes. Because of the holiday period, the Panel's report will not be available until the 1st week of January 2001.

Accordingly, the Panel recommends that the Government of Gibraltar:

i) does not oppose MoD proceeding with the trepanning operation of 24 November and the subsequent temporary sealing of the holes in the main primary circuit pipework; but that it

ii) does not sanction any other primary circuit intrusion works (other than those necessitated by nuclear and ship's safety), maintaining this stance until the Panel has opportunity to report the outcome of its 21st December meeting early in the New Year.

the New Year.

The Panel has arrived at recommendation ii) because, at this time, it does not have sufficient information from the MoD to assess the risks of any other diagnostic or repair preparation activities that might be carried in the reactor compartment. This being so, should the MoD consider it necessary to undertake further primary circuit intrusion works the Government of Gibraltar might wish to:-

iii) insist that the MoD consult with all Panel members prior to any further works being undertaken past those of item i) aforesaid.

2 REPAIR SCHEME

The MoD is not yet able to give us a full description of the repair and its technical justification so the Panel must therefore defer its full assessment and reporting on this until at least after the 21 December meeting.

On the basis of the incomplete information at its disposal, the Panel has formed a number of reservations at this stage:

a) Commitment to the Sweepolet Type Insert

Essentially, the defect must be either welded up or removed in situ but this is complicated by the defect being in the immediate locality of the pressuriser and main circuit pipe junction.

For Tireless, the MoD intends to remove the complete junction (see Section 1a) for microscopic examination- However, this approach in itself commits the MoD to use of a (preformed saddle-like) swept branch connection, commonly referred to as a 'sweepolet'.

The Panel considers complete removal of the defect area and replacement with a single-piece, forged connection to be the best engineering solution, providing that the replacement component can be satisfactorily joined to the remaining section of the primary pipework.

b) Sweepolet Weld Scheme

The sweepolet type of pipe junction has not been used on Royal Navy submarine nuclear propulsion plants before, so the sweepolet component itself, the weld runs and the non destructive examination (NDE), all of which comprise the overall sweepolet repair scheme, will have to be validated from scratch.²

The sweepolet scheme is a considerable departure from past and present practice and the Panel will look to the MoD to fully justify the use of the sweepolet component in its structural function as well as requiring a practicable demonstration that the sweepolet technique, particularly the non-destructive examination to prove the quality of the weld, and qualification of the welders³ and fitters, is all fully quality assured.

c) Regulatory Acceptance of Sweepolet Scheme/Repair Timetable Revision

To progress the repair overall, the various

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To progress the repair overall, the various activities currently underway and those planned ahead all have to dovetail and be in place at specified times in the programme critical path.

As previously noted, RRMP is confident that defect analysis and much of the repair details will be available for MoD validation by the 3rd week of December, 2000. However, the Panel notes that there are still a number of uncertainties and unresolved issues relating to determining the cause of the defect, the final design detailing of the sweepolet, and development of practical aspects of the repair methodology, any of which could delay the validation process.

For validation the repair scheme will be passed to the MoD nuclear regulatory system that, essentially, comprises four distinctive tiers of 'examiners' and regulators, including final sanction by the Naval Nuclear Regulatory Panel (NNRP).⁴ The MoD have allocated 3 weeks for this regulatory process to complete so that repairs to Tireless could commence in or about the 2nd to 3rd week in January of the New Year. However, the Panel itself has acted very much in the same interrogatory role that it would expect the MoD's independent, second tier assessors (AEA Technology) to adopt when it interrogates the repair scheme. The Panel's experience has been that it has identified contingencies that have not been prepared for; it has revealed aspects of the preparation and diagnostics that have not been fully explored and/or developed; and examples have arisen where resources and equipment have not sequenced or dovetailed in the manner expected.

The Panel has also briefly considered other factors that have to be within the MoD's critical path for the completing the repairs to a specified date, but which may not be entirely under its control. For example, MoD intends to order the sweepolets at about the 3rd week of December, that is prior to the AEA assessment which itself might result in modification to the specification of the sweepolet geometry and/or material and, indeed, the sweepolet manufacturer may fall behind in delivery for this and other reasons.

For these reasons the Panel doubts whether the 3 week allocation for the important checking and regulatory tasks is sufficient and, indeed, that other 'external' and/or unforeseen factors could result in further slippage of the programme overall.

In advance of receipt of greater detail of the final repair scheme, the Panel recommends that the Government of Gibraltar:-

iv) not place any great reliance upon the MoD's commencement date for the repair scheme proper proper (2nd to 3rd week , January instead reserving judgment on this and the eventual sailing date for Tireless until the Panel has reported in the New Year following its scheduled meeting of 21 December.

4 RADIOACTIVE WASTE

The MoD reported the current stocks of radioactive waste held in temporary storage

CATEGORY	VOLUME-M ³	TOTAL	STATE
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CATEGORY	VOLUME-M ³	ACTIVITY	STATE
VLLW	4.2	1.18MBq	Solids, trash. etc
LLW	0.2	0.14MBq	Trash, insulation etc
Activated (LLW)	3.4	4.35 MBq	(radio) activated solids
Coolant	13.1	13,400 MBq	Primary Circuit Coolant Water

1 VLLW and LLW are standard definitions of specific activity for Very Low Level and Low Level radioactive Wastes.

2 Waste radionuclides are mainly β emitters and exceptionally α emitting.

3 M is Mega or $\times 1,000,000$ and Bq is Becquerel or one disintegration per sec.

The Panel noted to the MoD that the primary coolant water extracted from Tireless still remained on the quayside in the temporary storage PETs, whereas it had expected (in accord with MoD's own risk assessment) this water to have been transferred to the Active Waste Handling Facility before this time. MoD explained that there had been delays in the supply and validation of the radioactive waste drums, although this has now been resolved and transfer operations are to commence shortly.

Overall, the Panel continues to be satisfied with the arrangements and safeguards relating to the handling and management of radioactive wastes and therefore proposes no recommendations in this area.

5 FURTHER INFORMATION AND FACILITY REQUIREMENTS OF THE PANEL

The Panel indicated to MoD that, because of the increasing complexity of the sweepolet repair scheme, it would be reviewing the necessity for its members to view, first hand, the development applications and welder qualification trials underway in the reactor compartment simulator at RRMP Derby.

The Panel also noted that MoD must provide greater assistance to the Panel by making available key design and analysis personnel at future meetings. The present arrangement whereby engineering and project managers are Gelded at meetings means, with respect to those personnel involved to date, that certain points of detail and engineering specialisms have to be deferred for answer at the next meeting - for its assessment of the sweepolet repair the Panel will wish to examine in greater detail matters relating to stress and crack growth analysis, non destructive examination and welding techniques.

Relating to the next stage of its assessment, the Panel recommends that the Government of Gibraltar:

v.) support the Panel's requirement to a.) directly view the sweepolet repair trials (should the need arise following the 21 December meeting) and b) to engage directly with MoD personnel and its consultants/subcontractors who are directly involved in the repair scheme preparations and its its practicable implementation.

6 REASSESSMENT OF THE RETURN TO THE UK OPTIONS

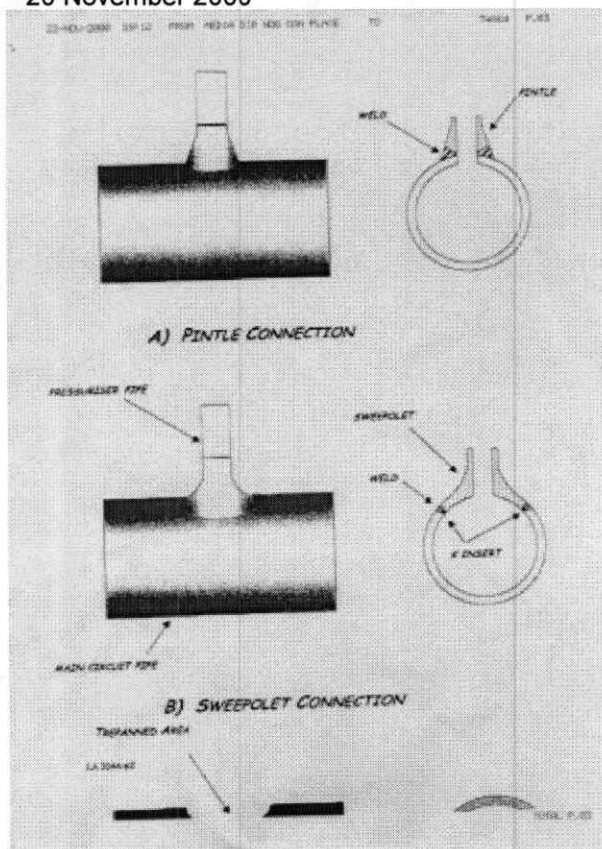
The Panel is awaiting further justification from MoD relating to its rejection of the use of a lift barge or a diesel-powered return to the UK Once in receipt of this, and if appropriate, the Panel will issue an interim opinion.

(signed)
P H Davidson

J H Large

C Milloy

20 November 2000



1 Sweepolet is a particular manufacturers trade name that is adopted throughout the text, although this particular manufacturer of swept branched connectors may not be eventually chosen for the repair

2 Sweepolet type saddles are commonly used in hydrocarbon and steam raising plants and there are examples of these saddles being used in civilian nuclear power plants, such as the PWR power station at Sizewell in the United Kingdom - RRMP should be able to access this UK sweepolet information and experience The sweepolet is welded to the main pipework by first tacking in a preformed bead or k insert which is then welded over - RRMP have considerable experience with the use of k inserts in the submarine primary circuit plant.

The Panel was particularly concerned with (as ventured by MoD at the meeting) the possible diminution of the welder's pass rate for the sweepolet installation. The Panel requested the reasons for this, together with fully detailed information describing the final weld NDT and the interpretation of its results, should be provided for the meeting of 21 December

The NNRP regulatory control applies to the platform (the submarine) and, separately, to the site (Gibraltar).

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