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RAE REPORT ON DEAN HILL INCIDENT

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GENERAL

Following the incident at Dean Hill over the weekend of 10/11 January 1987, Mr [redacted] and Mr [redacted] from SW Department joined the accident response team for their inspection of the hardware on Tuesday 13 January. Mr [redacted] represented the RDA for the container and ground handling equipment whilst Mr [redacted] represented the RDA for the fuzing and arming system of the weapons.

This report is confined to the inspections made to the vehicle which overturned; the incident to the second vehicle was judged to be so minor that no detailed inspection was necessary.

The experience gained during the rough handling trials, which were conducted in 1985/6, proved to be invaluable when inspecting and comparing the damage encountered. The conclusions presented later draw heavily on the results from these trials.

OBSERVATIONS

a. Vehicle, container restraints etc.

Two of the retaining pins that secure the crushable struts to the top of the vehicle had sheared. These struts are a comparatively recent modification to the vehicle which resulted from the accident scenario studies. Four struts are located on each side of the vehicle, the failed units were the forward two on the left (looking in from the back). The struts are designed to absorb energy when contracted; in this particular incident it is probable they were extended.

All 14 container tie-downs were inspected and found to be satisfactory.

Lateral movement of the containers in excess of 2.5 cms is prevented by side restraint brackets. Both containers had moved hard to the left and although damage caused to the container by these restraining members was slight it was more obvious on the front container. This damage is not considered to have any real significance.

b. Rear Container

Inspection of the interior of the container detected damage caused to a stringer by the saddle. This damage was quite distinct, with a greater degree of indentation to that sustained on either of the side impact tests conducted during the rough handling trials.

There was no damage to the protective covers on the fins of the store. (Damage was sustained during the side impact tests).

Following the successful removal of the store, inspection of the front anchorages, cradle, long and short bolts (tie rods) and saddle assembly showed no signs of additional damage.

There was no evidence of movement between the store and the saddle, but the store was some 3 mm to 4 mm from its central position in the cradle. This could have been the result of initial location or store movement; there was no evidence of rubbing marks to indicate movement.

The torque on the 4 long and short bolts (tie rods) was measured and was recorded at between 35 ft lbs and 47 ft lbs. This spread in the torque is very similar to that recorded on the side impact tests. The specified value when installing the store is 55 ft lbs.

c. Front Container

Initial inspection of the interior of the container showed no damage caused by the saddle, although it is debatable whether some purely cosmetic damage to the protective finish of the stringer resulted from this cause.

No damage was sustained by the protectors on the fins of the store or any of the restraining furniture.

There was no movement between the saddle and the store but again the store was some 3 mm to 4 mm from its central position in the cradle with no evidence of movement.

Torque on tie rods were measured between 55 ft lbs and 39 ft lbs.

d. Stores

Inspection of the store showed no damage as a result of the incident.

Electrical safety tests conducted on the stores were satisfactory.

DISCUSSION

In attempting to assess the environment experienced by the stores as a result of the incident, the data from the side impact tests conducted during the series of rough handling trials provide a valuable basis for comparison. However there were significant differences between the incident and the trial:-

1. The incident involved 76 DK02 containers and 600 lb stores; the trials were conducted on a 76 DK04 container and a 950 lb store.
2. The incident occurred with the container in a vehicle and hence the dynamic effect of the shock on the relative motion of the container and store was likely to be different from the trial.
3. The damage that resulted when the saddle impacted the container stringer would have been a function of the static clearances; these can vary considerably due to tolerance build-up.

Examination of the general results from the rough handling trials (Appendix A reproduces the relevant page from the report) shows that for side impacts the g levels measured at the CG of the store were comparatively low. This is due to the resilience of the cradle and saddle assembly in this direction.

It is considered that the circumstances of the incident and the evidence collected, both strongly indicate that the rear container was subjected to higher g levels than the front container.

The damage to the container stringer on the rear container, which is clearly the most definitive evidence, leads to the conclusion that the g levels could well have been greater than the 20g measured on the rough handling trials. However because of the difference and uncertainty in making the comparison, the actual level experienced is unlikely to be established with a high degree of confidence. Nevertheless, based on all the evidence, it is judged that levels in excess of 30g were unlikely. Detailed examination of the containers and its furniture may provide evidence for a more accurate assessment.

CONCLUSIONS

From the available evidence it is considered that the environments experienced by the store, as a result of the incident, were within those defined in WE148, relevant to the store remaining safe and serviceable.


Further the damage sustained by the rear container and the circumstances of the incident provides high confidence that the store did not experience levels in excess of the max value of 52g measured on the rough handling trials. Following these trials the fuzing and arming system was functioned and was confirmed to be both safe and serviceable (NB: the store was subjected to a total of 16 impact tests).

It is therefore concluded that, following the incident, there is very high confidence that the store has remained safe and serviceable. Nevertheless it is considered to be prudent to refurbish the stores, if this can be arranged without embarrassment to the Services and Production Authority.

RECOMMENDATIONS

This incident and the one previously experienced at Bruggen has clearly demonstrated the value to SW Dept, and hopefully to the accident organisation in general, of having store and container representatives from RAE involved in the recovery exercise. It is therefore recommended that in future, these SW Dept representatives should be included as formal members of the accident response team and hence be associated with the regular practise exercises etc.

Arrangements have been made to return the containers and crushable struts involved in the incident to RAE. It is recommended that the hardware be carefully examined by the team responsible for the recent series of rough handling trials and then be subjected to detailed inspection procedures by QA(Nuc).


Supt SW2