

The Nuclear Weapon Safety Committee (NWSC) derived three risk criteria<sup>(3)</sup> against which the risks to the public of a weapon accident are compared, to determine whether they are tolerable or not. These criteria are as follows:

- (a) Individual Fatality =  $1E-5$  p.a.
- (b) Societal Fatality =  $1E-3/N_1$  p.a.
- (c) Societal Contamination =  $1E-1/N_2$  p.a.

where  $N_1$  is the number of late cancer deaths and

$N_2$  are the number of people in an area contaminated to  $> 200\text{kBq.m}^{-2}$

The difference between a risk curve for the accident and an NWSC criterion gives the safety margin, known as the Compliance Factor. A Compliance Factor of unity signifies that the fatality and/or the contamination risk is equal to the NWSC criterion. A value greater than unity indicates that the risk is below the criterion and is tolerable (or acceptable, it may be argued, if it is greater than 100 below). The risk to the public is unacceptable if the Compliance Factor is smaller than unity.

To determine the risks to the public of a release of Pu from the SWS whilst an SSBN is on the shiplift, the model was run with the 'Total all hazards' values of frequency of Pu release in Table 1 together with the quantities of Pu and high explosive given in Section 3.

The radiological risks were calculated using the appropriate explosively generated Pu aerosol source fractions and particle size data, together with statistical meteorological and population census data relevant to Faslane, HM Naval Base Clyde.

## 5. RESULTS

The Compliance Factors obtained by running the model are shown in Table 2. They are all greater than unity and range in value from  $1.9E5$  for the CESO(N) optimistic estimate of Pu release frequency to  $2.1E0$  for the pessimistic estimate. Societal Contamination (SC) gives the smallest Compliance Factor and therefore represents the highest risk. The CESO(N) best estimate/TSC Panel 8 Compliance Factors are approximately one order of magnitude below the SC criterion, and the CESO(N) optimistic value is nearly two orders of magnitude below.

## 6. CONCLUSIONS

It may be concluded that, based on the data supplied by CESO(N) and the assumptions made in Section 3, the radiological risks to the public resulting from a release of Pu from the SWS whilst an SSBN is on the Shiplift are tolerable with respect to the NWSC criteria. The low values of the Compliance Factors (Societal Contamination) for the CESO(N) pessimistic case indicate that the risks

risks are close to the tolerability criterion level; there is, therefore, a strong argument for ensuring that the risks are As Low As Reasonably Practicable (ALARP).

These conclusions do not constitute AWE endorsement of the facility and procedures assessed.

## 1. REFERENCES

1. CESO(N), 'Accident Probability Assessment of Faslane Shiplift For Vanguard Class Submarines With Strategic Weapon System Embarked'. ES352/98/58. Issue 2 - August 2000.
2. Lampert RA and Vallis DG, 'The Application of Probabilistic Risk Assessment to Safety Studies of Nuclear Weapon Sites'. AWRE Report No 011/85.
3. ESTC Prescription No 2.

## Software and Data Used in the Assessment

AWE Probabilistic Risk Assessment (PRA) model, Version 1.3.  
(based on atmospheric dispersion code DIFFAL).

NRPB UK population census database - described in NRPB Report NRPB-M54

UK meteorological probability data -  
from the Environmental Consultancy Services (Air Pollution),  
Met Office 1985.

Plutonium particle size distribution -  
from AWE Report AWE SDTN 28/90 July 1990.

Dosimetry (Sv/Bq) - ICRP Publication 71.

Dose/Risk factor - ICRP 60 (1990).

NWSC criteria - described in ESTC Prescription Number 2.

## Quality Statement

The software is controlled in accordance with the AWE Quality System. The PRA program has specific controls which are detailed in Software Control Plan AWE/DWE31/95/21B107.