

ANNEX E - PRE-PRODUCTION EVALUATION PROGRAMME AND PRODUCTION TEST SAMPLING

1. **PRE-PRODUCTION EVALUATION PROGRAMME** - This relates to Schedule of Requirements Item 1 only.
 - 1.1. The build and test of the pre-production Sonobuoys shall not commence until the satisfactory completion of the "A" model Critical Design Review (CDR) and all actions arising from it. The principal requirements to have been achieved at the "A" model CDR are, at a minimum, as follows:
 - 1.1.1. all "A" model development;
 - 1.1.2. the preparation of an "A" model design drawing package that reflects the "A" model design status; and,
 - 1.1.3. the completion of all "A" model trials (including deployment and performance trials performed in the sea where possible).
 - 1.1.4. The term "A" model applies to a fully functional representation of the Sonobuoy hardware intended for production. They are generally the "first-off" complete equipment resulting from development but may not necessarily be built from piece-parts made from production tooling, jigs and dies etc.
 - 1.2. The pre-production evaluation programme requires the build of a specified number of "B" model Sonobuoys and their test at the Sonobuoy Test Facility (STF), or any other authorised test facility. The number of Sonobuoys comprising each pre-production Lot and the accept/reject criteria to be achieved is defined in Para 1.3. The Sonobuoys will be tested for compliance with the specification against individual Sonobuoy Lot accept criteria as referenced in the table at Annex B under Range Criteria. For all failure modes, irrespective of whether the pre-production Lot is accepted or rejected, the Contractor shall identify the prime reason for the failure mode occurring and shall implement corrective action into the build of the next sequential Lot to be submitted for test. Submissions of the next sequential pre-production Lot for test shall not be permitted until the test of the preceding Lot has determined that the Acceptable Quality Level (AQL) Criteria has been met. The result of each stage, together with a summary of all failure modes and their cause shall be documented and submitted as part of the Certificate of Design (CofD) MOD Form CA(DPA)100A.
 - 1.2.1. The term "B" models applies to a fully functional Sonobuoy built using production-line techniques, methods and tests and all production tooling, jigs and dies etc. "B" models will be built to the chilled drawing standard intended for use in production. "B" models may be used to demonstrate minor design iterations prior to entering into full production; the final "B" model design, i.e. the final Lot, represents the build standard against which the Contractor will demonstrate compliance with the specification.
 - 1.3. The Contractor shall demonstrate to the satisfaction of the Authority's Project Manager that the Sonobuoys at all stages meet the quality requirements to BS 6001 in accordance with Clause 25 of the Contract Terms and Conditions.
 - 1.4. All samples will be expended in STF testing at [REDACTED] or any other authorised test location. The final development model Design Review shall take place after the successful completion of pre-production Lot test. The Lot sample quantity does not include Sonobuoys for any purpose other than the assessment of the performance stated.

2. **PRODUCTION TEST SAMPLING**

- 2.1. Sonobuoy drop test sampling, Lot acceptance and rework will be conducted in accordance with British Standard Specifications BS6001 Part 0 (1996) Sampling Procedures for Inspection by Attributes, Introduction to the BS6001 Attribute Sampling System, and BS6001 Part 1 (1991) Sampling Procedures for Inspection by Attributes and against individual Sonobuoy Lot accept criteria as referenced in the table at Annex B under Range Criteria.
- 2.2. Inspection will be to a single sampling scheme incorporating normal inspection and discontinuation of inspection where appropriate (see BS6001 Section 9). Single sampling plans for normal inspection shall be as per Table II-A. The inspection level shall be to General Inspection Level II for Lots 1-3 and Level I for Lot 4 onwards.
- 2.3. The individual Lot accept criteria do not in themselves guarantee that an individual Lot will achieve the AQL, but this is expected to be achieved from a series of Lots and must be achieved over the total Contract. A 2-tier monitoring of achieved performance will be applied:
 - 2.3.1. The first, defined by the moving process average measured from the percentage of failures relative to sample Sonobuoys dropped over 5 consecutive first-time submissions. This will be designated the Estimated Process Average (EPA).
 - 2.3.2. The second, designated the Average Outgoing Quality (AOQ) will be measured in an identical manner to the EPA but will be calculated from the last 5 Lots delivered to the Authority.
- 2.4. The AOQ will be the performance monitor used during the Contract (see Para 2.14). The percentage of failures will be calculated from every whole Sonobuoy failure notified by the Facilities Manager (FM) at the test facility at which the Sonobuoys are tested, irrespective of the number of individual defects raised against Sonobuoy. Where defects be classified major/minor/critical these will be categorised in accordance with the relevant range criteria; in this instance the most severe defect will be deemed to be the reason for failure. Where the Contractor is permitted to deliver early Lots to meet a relaxed quality level (e.g. reliability growth) these Lots will not count towards the calculation of the EPA or AOQ.
- 2.5. The random selection of samples for aircraft drop testing will be made by the Contractor. The Sonobuoys that are used for range sampling are consumed. The Contractor will be responsible for the transportation of the sample to the UK STF, or any other authorised test facility; the packaging of the sample Sonobuoys need only be sufficient to allow them protection during transit and storage before testing.
- 2.6. Inspection of samples will be in accordance with the requirement of BS6001 Section 9. For initial production normal inspection will be used; thereafter the switching procedures defined will be automatically implemented by the FM at the nominated STF. Unless a Lot is rejected before the full sample has been dropped, the accept criteria will be determined either when the full sample sizes has been tested or when an unequivocal decision with regard to the final outcome of testing is achievable. Where the AOQ indicates that the overall Contract AQL may not be achieved, the Authority's Project Manager and the Contractor will establish and implement a course of corrective action.
- 2.7. For all failure modes, irrespective of whether the sample is accepted or rejected, the Contractor shall identify each cause of failure where possible and apply corrective action into production. The nature of each failure mode shall be monitored. The Contractor shall advise the Authority's Project Manager of any instance where the actual cause of any single failure, i.e. the underlying cause for the defect observed at the nominated STF, begins to exhibit a repetitive nature. A repetition of a failure mode shall be deemed to be a 'pattern defect'; where this occurs the Authority's Project Manager and the Contractor shall establish a course of action which may

include the rejection of Lots and/or the cessation of sampling and sample testing until such time as an agreed solution or course of action for resolving the pattern defect is established.

- 2.8. A summary of all defects and their solutions shall be presented to the Authority's Project Manager at each QPM. In order to assist defect investigation, the Authority will make every effort to recover defective hardware expended during trials; this will be made available to the Contractor if he so desires. However, the Authority accepts no responsibility for material that is lost or damaged during recovery or while being held in its possession.
- 2.9. In cases where the nominated STF directs that a post-drop analysis is necessary to ascertain the trials result, a Contractor's representative will be expected to undertake this investigation with Authority staff in attendance. Where no Contractor's representative is available the OIC STF will seek agreement from the Contractor to allow him to undertake any investigation necessary to qualify the in-water test results. Any delay in declaring the test result that this causes will not be attributable to the Authority.
- 2.10. Subject to the reserved position with respect to pattern failures, a Lot will only be accepted for delivery after its sample has been subjected to the drop testing required and the accept requirement has been achieved. The Authority or its agents will endeavour to test all Lot samples within 25 Business Days of arrival at the nominated STF. Should the sample not be tested within the defined period Authority's Project Manager and the Contractor will agree a course of action. The notification that Lots are accepted for delivery will be made without prejudice to the requirements of the Contract, to the specification and to the responsibility vested in the Contractor as Design Organisation.
- 2.11. The nominated STF will determine by the number of defects arising from the trial and the accept/reject criteria which will be specified. The test results shall be communicated to the Contractor who shall present results along with a provisional Lot pass / fail decision for endorsement by the Authority's Project Manager; the Contractor shall discuss and resolve any reasonable dispute over the trials result with the nominated STF. Following discussion, matters of interpretation relating to the Contract and/or the specification that cannot be agreed with the nominated STF may be referred to the Authority's Project Manager for discussion and agreement.
- 2.12. At the discretion of the Authority's Project Manager a quantity of 2 Sonobuoys may be required at Authority expense for further evaluation; these will be taken from any successful production Lot. A diversion order will not be raised to cover this requirement.
- 2.13. The Contractor shall calculate and monitor the moving process average for both the EPA and AOQ. The latest values shall be advised to the Authority's Project Manager, the Contractor's Quality Manager and the OIC at the nominated STF at the time of the submission of each sample to the STF. Values for each successive EPA and AOQ measurement will be recorded; these shall be formerly presented to the Authority's Project Manager at each QPRM. The Quality Plan documentation shall reflect this requirement.
- 2.14. During the Contract delivery period the current value for the AOQ will be the figure used to monitor the product quality. The value of the achieved Contract AQL will be determined upon the completion of deliveries and will only be measured against nominated STF submissions that have met the accept criteria and have been accepted for delivery. The achieved Contract AQL percentage will be determined by the following calculation:

$$\text{Achieved Contract AQL\%} = \frac{\text{Total number of whole Sonobuoys failures from accepted Lots} \times 100}{\text{Total number of Sonobuoys tested from accepted Lots}}$$