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24 Mar 22

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INTEGRATED MACHINERY ACCEPTANCE TRIALS (IMAT) OF EQUIPMENT AND SYSTEMS - NEW CONSTRUCTION SHIPS

1. **Introduction.** As *IN* has transgressed to Mission based deployments in a large navy construct, enhanced reliability and capability to operate the machinery with minimal defects and maximum availability, is an operational necessity. This has also necessitated revitalisation in maintenance and upkeep philosophy along with objective based inspections and materiel assessment of platforms, especially post refits. Posterity of such concepts relies on refining our acceptance processes for a naval platform during construction / major refits which are key milestones in its lifecycle. The entire process of acceptance also sets the momentum for combat effectiveness of the platform for subsequent Ops cycle. The functional and capability assessment of platforms is undertaken through inspection / trials of diverse Hull, Engineering and Electrical equipment and systems by various trial agencies independently.

2. **Gap Analysis.** A gap analysis of the present trials and acceptance methodology has revealed following shortcomings: -

(a) **Trial Status / Outcome.** The status of trials of machinery/ equipment and associated systems along with its outcome is not known comprehensively to all the stakeholders, who maybe EO/ LO/ EXO onboard a ship, concerned trial units in case multiple trial units are involved in trials, DGM (E/L/HULL) in a Yard, FEO/FLO/FNAO in Fleet, CEO/CLO/ CCONO in HQs and DME/ DEE/DNA at IHQMoD(N). This is primarily due to the fact that all stakeholders are always handling only their relevant part of the equipment and system. Hence, operational status of complete equipment and its associated systems remain ambiguous and not known to all stakeholders. For example,

in case of Diesel Alternator trials, multiple trial units viz. DTTT, ETMU and MTU are involved who render their reports to respective counterparts in Command, Fleet and Yard. However, the complete status is not known to any one agency at the same time.

(b) **Multiple Trials of Equipment.** WOTs offers multiple trials of the same equipment and systems to various trial units leading to repeated running of machinery especially critical evolutions wherein equipment undergoes excessive stresses/strains and WOT/ ship staff gets overburdened.

(c) **Comprehensive and Holistic Assessment of Equipment and Systems.** As part of acceptance trials, individual trial agencies undertake checks of part of their respective equipment whereas the equipment/ system as a whole (in entirety) is not assessed. For example, HVAC system trials are undertaken by HITU, whereas, the trials of AC and chilled water system are undertaken by MTU and ventilation blower motor trials are by ETMA. Sub-optimal performance of either of these components (AC Plant, blowers, instrumentation, chilled water pumps, etc.) has a cascading effect on the overall performance of the HVAC system irrespective of the fact that they may have been cleared by individual trial teams on an earlier date. The end aim of air conditioned spaces is not achieved as integrated trials are not undertaken.

(d) **Delay in Trials / Acceptance.** In certain cases, multi-disciplinary issues lead to undue delays due to multiple trial agencies undertaking inspections / trials independently.

3. **Integrated Machinery Acceptance Trials (IMAT).** To overcome the above shortcomings, the philosophy of 'Integrated Machinery Acceptance Trials (IMAT)' has been conceptualised and is being implemented by NATAA. The salient aspects of IMAT are as follows: -

(a) Integrated trials of complete equipment/system, which includes equipment foundation, SV mounts, control system, ancillaries, pipelines, valves, instrumentation, load hangars, etc. by integrated team from multiple trial agencies, as required. Each equipment / system will have Lead / Assisting Trial agency so as to ensure single point accountability and an Integral trial report is to be rendered covering all aspects of performance of the equipment / system.

(b) Shift from 'Parametric' centric trials to 'Performance' centric trials to ensure requisite performance of equipment/ system post routines and trials. This includes parametric checks of equipment by various trial units along with performance analysis of the overall equipment with involvement of Lead and Assisting Trial units.

(c) Conduct of integrated trials of the equipment/ systems by all trial agencies, inspection of all components, functional checks of instrumentation and trials of all controls features so as to achieve the desired performance of each system. Also, IMAT will ensure single point accountability of the lead trial unit for integrated trials / inspections of each system.

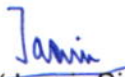
- (d) Evaluation of legacy, complex and recurring issues during acceptance trials of the ship for setting performance datum.

5. **Implementation of IMAT.** IMAT has been implemented by all trial units under NATAA for ships entering/ completing NR / MR. A generic list of equipment and systems indicating 'Lead' and 'Assisting' trial units for various equipment and systems is placed at **Enclosure** for reference. Similar approach of 'Lead' and 'Assisting' trial units will be undertaken by various trial units at every station whilst undertaking equipment and system acceptance trials of new construction ships as per the charter of duties laid down in NOs/ extant directives in respective Command/ Stations. The responsibility of making the consolidated report of a particular equipment/ system shall lie with the 'Lead' trial unit. Further, any discrepancies/ disagreements towards establishment of the 'Lead' and 'Assisting' units may be referred to NATAA on case-to-case basis for resolution.

6. **Improvements Envisaged with Implementation of IMAT Methodology.** Following improvements are envisaged with implementation of IMAT:-

- (a) Clear and unambiguous status of complete equipment and systems will be available for taking informed decisions by WOT, Shipyard, Admin Authority and ship staff.
- (b) Concurrent trials by multiple trial teams will lead to lesser number of trials. Further, carrying out concurrent trials will ensure ironing out of technical issues amongst trial teams.
- (c) Lead trials team shall function as single point of contact for WOTs, ship staff, NATAA, Admin Authority and IHQ MoD(N) to comprehend the overall status of an equipment and systems.

7. **Conclusion.** In light of the above, it is requested that Integrated Machinery Acceptance Trials (IMAT) procedures be implemented for conduct of trials of equipment and systems onboard new construction ships with immediate effect. Clarifications, if any, may be sought from NATAA office at Mumbai.


(Jasvir Singh)
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Addl Director
for Director General

Enclosure: - As above

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Internal: - SO/ACOM(IT&S) SO/ACOM(D&R) SO/DG NATAA

INTEGRATED MACHINERY ACCEPTANCE TRIALS MATRIX - GENERIC

<u>SNO</u>	<u>MAIN EQUIPMENT / SYSTEM</u>	<u>SUB-SYSTEM</u>	<u>LEAD TRIAL UNIT</u>	<u>ASSISTING TRIAL UNIT 1</u>	<u>ASSISTING TRIAL UNIT 2</u>
1	GAS TURBINE PROPULSION MACHINERY & ASSOCIATED SYSTEMS AND GAS TURBINE GENERATORS (GTG)	MGTA, CONTROLS & SHAFTING	GTTT	MTU	-
		MPP AUXILIARIES		ETMA	MTU
		GTG			-
2	DIESEL PROPULSION MACHINERY & ASSOCIATED SYSTEMS AND DIESEL ALTERNATORS (DA)	DIESEL PROPULSION ENGINES	DTTT	ETMA	MTU
		DA			
		EMERGENCY DA			
3	ENGINEERING EQUIPMENT AUXILIARY	A/C & REF PLANTS	MTU	ETMA	-
		HPAC & DD COMPRESSOR			
		OILY WATER SEPERATORS			
		STEERING GEAR & STABILISER SYSTEM			
		RO PLANTS			
		ALL AUXILIARY PUMPS & CENTRIFUGES			
4	SHIPS ENGINEERING SYSTEMS	-	MTU	-	-
5	ELECTRICAL EQUIPMENT AND SYSTEMS	-	ETMA	-	-
6	HULL & DECK MACHINERY	-	HITU	-	-
7	MAJOR FIRE FIGHTING SYSTEMS IN MACHINERY SPACES	-	IAW EXTANT ORDERS		