



DEPARTMENT OF THE NAVY
BOARD OF INSPECTION AND SURVEY
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NORFOLK, VA 23521-3295

INSURVINST

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INSURV INSTRUCTION 4730.21F

From: President, Board of Inspection and Survey

Subj: AREA AIR DEFENSE (AD), AND SELF DEFENSE (SD) DETECT-TO-ENGAGE (DTE) DEMONSTRATIONS, AND LONG RANGE AIR SEARCH RADAR PERFORMANCE DEMONSTRATIONS

Ref: (a) FXP-2

Encl: (1) Specific Systems Used in Area AD/SD DTE Evaluations by Ship Class

1. Purpose. To establish PRESINSURV policy and standards for evaluating a ship's long range air search radar performance and the ability of installed SD systems and, if applicable, Area AD systems to detect, acquire, identify, track, assign and engage air targets. These capabilities are evaluated using long range air search radar performance, Self-Defense detect to engage demonstrations and, if applicable, Area AD detect to engage demonstrations. These demonstrations are designed to test equipment parameters and are not to be construed as tactical or training demonstrations.

2. Cancellation. INSURVINST 4730.21E.

3. Discussions. The DTE and long range air search radar performance demonstrations are evaluations of air warfare equipment in a clear environment using live aircraft services. All safety precautions in reference (a) will be adhered to during the conduct of the DTE. There will be NO live ordnance loaded or expended during the preparation for or conduct of the DTE. Air warfare equipment to be demonstrated includes:

a. Air search radars, including automatic detection and tracking capabilities.

b. Fire control radars.

c. Weapons direction equipment and combat direction system to weapons system interfaces.

- d. Missile launching systems.
- e. All installed automatic gun systems.

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4. Policy

a. Area AD DTE demonstrations will be conducted only in medium range and long range Standard Missile equipped ships.

b. SD DTE demonstrations will be conducted in all ships equipped with self-defense missile systems (NSSMS/RAM), gun systems, or CIWS.

c. All ships possessing a long range air search radar will conduct a maximum range detection demonstration in conjunction with UHF communications demo, TACAN and IFF demonstrations or Area AD/SD DTE.

5. Requirements. The ship is required to detect, track, and perform simulated engagements with all Area Air Defense and Self-Defense weapons systems. The most fully automated configuration designed into the combat system, consistent with demonstrating the ability to achieve maximum engagement ranges, will be used during the Area AAW and SD DTE demonstrations. (i.e. MK 92 FCS (TR AUTO), AEGIS (AUTO-SM for the initial salvo which will be for max range intercept), NSSMS (TAS TACTICAL, AUTO DETECT, AUTO TRACK, SEMI-AUTO ENGAGE/SEA SPARROW TEST/TRAINING, AUTO ENGAGE), and RAM (TAS TRAINING, AUTO DETECT, AUTO TRACK, AUTO ENGAGE/RAM CSOT/TRAINING, AUTO ENGAGE (SLQ-32 Interface enabled)) Exercise target aircraft providing services for Rolling Air Frame Missile (RAM) equipped ships must be configured with an external transmitter capable of stimulating the SLQ-32 and RAM systems.

a. Pre-fire checks on gun and missile systems must be satisfactorily completed prior to demonstrations.

b. Ensure the ID of the target aircraft will permit engagement at maximum range of the weapon system.

c. Radar ranges are based on Atmospheric Radar Environmental Prediction System (AREPS) data. AREPS predictions can be requested via email at cdo@nlmoc.navy.mil. Ships are requested by NLMOC to provide feedback in the form of actual ranges experienced versus predicted ranges to cdo@nlmoc.navy.smil.mil. Additional info may be found at <https://nlmoc.navy.mil/home.html>.

6. Long Range Air Search Radar Performance Procedures

a. Target aircraft will check in with the ship. Once positive control has been established, the AC will be vectored outbound at 30 k ft to beyond the 90 percent probability of

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detection (PD) range established per that day's AREPS, or if AREPS predictions are not available, to the maximum instrumented radar range. Once past the 90 percent PD range, the contact will be dropped from the system and then vectored inbound.

b. Air search radars (2D and 3D), including TAS, shall detect and track the target in their most automatic mode. The initial detection range will be recorded. If the auto detect results in a significant false target track load (in excess of system's maximum track load) due to ship's configuration or environmental conditions then semi-auto detect should be used.

7. Area AD Detect-to-Engage Procedures

a. Target aircraft shall close the test ship starting at a position of 30 k ft MSL from the test ship at a range IAW paragraph 6.a.

b. The Combat Direction System (C&D/ACDS/SSDS/NTDS) will demonstrate its most automatic mode of track management and assignment to missile system. On Aegis ships, an Auto-SM doctrine statement will be built and exercised which will engage the target aircraft at maximum range. Fire Auth Bypass and CAW will be "off", MSS will be included in the firing train. On SM-2 ships, MR missiles only will be used from the sim inventory.

c. One missile fire control system director/illuminator/radar shall acquire, track, assign and simulate engagement of the target aircraft at maximum effective missile range. Following the initial simulated intercept all other remaining missile system components will be tested in like manner as the target aircraft continues inbound. (i.e., director/illuminator used to prosecute the first engagement will be downed and remaining directors/illuminators will be used for subsequent engagements.) Each director/illuminator/ launcher will be used to prosecute the target.

d. All missile launching systems shall successfully simulate missile launch during target engagement when ordered. Ship maneuvering to unmask batteries may be required. Salvo warning alarms will also be operated during the DTE sequence.

8. Self Defense Detect-to-Engage Procedures

a. Gun/ESSM/NSSMS/RAM/CIWS Phase: Upon completion of the Area AD DTE and/or Long Range Air Search Radar Performance demonstration, the aircraft shall continue inbound, descending to 300 ft MSL by 40 NM from the ship and close directly at the ship. The contact will be dropped from the system once the AC is at 300 ft and prior to commencing the SD DTE. After the

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initial SD DTE run the aircraft is only required to open to just beyond maximum engagement window for the systems tested (15 NM recommended). NSSMS ships will be configured in TAS TACTICAL, AUTO DETECT, AUTO TRACK, SEMI-AUTO ENGAGE/SEA SPARROW TEST/TRAINING, AUTO ENGAGE. For MK31 RAM ships, there will be no live rounds loaded in the launchers and the system will be configured in TAS TRAINING, AUTO DETECT, AUTO TRACK, AUTO ENGAGE/RAM CSOT/TRAINING, AUTO ENGAGE (SLQ-32 Interface enabled).

b. The Target Acquisition System (TAS) shall detect and track the target at a range sufficient to allow for a maximum effective missile range intercept. The TAS console operator shall manually engage the target to NSSMS at a range sufficient to allow for a maximum effective missile range intercept. The TAS computer program shall automatically engage the target to RAM at a range sufficient to allow for a maximum effective missile range intercept.

(1) The missile fire control system(s) shall acquire and track the target at a range sufficient to allow for a maximum missile range intercept.

(2) The missile launching system(s) shall train, elevate and simulate missile launch when ordered. RAM equipped ships will utilize a Canister Round Simulator (CRS)/Fleet Round Simulator (FRS), procured from NSWC PHD or the local ATG, to complete the firing simulation phase. CRS/FRS procurement is the responsibility of the ship being assessed. Where possible, two simulators will be loaded into each launcher. All live rounds must be downloaded prior to conduct of the DTE.

(3) The gun fire control system(s) shall acquire and track the target at a range sufficient to allow for gun engagement at maximum effective gun range. The gun shall train, elevate and simulate firing (including cycling the ammunition loading system) when ordered. FFG's will utilize the "Guns-In-Trail" function.

c. CIWS Phase: Only the first valid profile for each CIWS mount will be used in the overall characterization of the SD DTE demonstration. CIWS shall be configured as follows for the initial run:

- (1) Gun ARMED
- (2) HOLD FIRE Deselected
- (3) SECTOR HOLDBACK TOOL Removed

- (4) FIRING CIRCUIT Open (closed for SSDS ships)
- (5) System in HIGH POWER

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- (6) PASS Loaded
- (7) Magazine Loaded With Dummy Ammunition
- * (8) AUTO POWER Off (For AEGIS AUTO POWER On)
- * (9) RCP Control
- * (10) AD AUTO Selected

*Note: AEGIS CIWS mounts will be configured as RCP control/AIR READY with AUTO DESIG ENABLE selected and PHALANX DESIG TEST enabled (both mounts permitted) at the MSS console for one run, and in stand alone mode with AAW AUTO selected for a second run.

d. For ships with Multiple Weapons Coordination (MWC) capability, CIWS in RCP Control/AD AUTO with MWC selected will be demonstrated in an area of overlapping coverage for the initial run. Subsequent runs will be conducted to test remaining CIWS mounts with MWC deselected.

9. Long Range Air Search Radar Performance Evaluation

a. Satisfactory. The target was successfully detected and tracked by the air search radar(s) at a minimum of 90 percent of the maximum Atmospheric Radar Environmental Prediction System (AREPS) predicted range for a one square meter target at a 90 percent probability of detection. Detection and tracking was done in the radar's most automatic mode.

b. Degraded. The target was not successfully detected and tracked by the air search radar(s) at a minimum of 90 percent of the maximum AREPS predicted range for a one square meter target, at a 90 percent probability of detection, and/or the radar(s) could not be demonstrated in its most automatic mode.

c. Unsatisfactory. The target was not successfully detected and tracked by the radar(s) in any mode.

10. Area AD DTE Evaluation Enclosure (1) provides the specific systems considered in an Area AD demonstration evaluation.

a. Satisfactory. The target was engaged at or near the maximum range of the installed missile system, and the remaining illuminators/directors/launchers demonstrated the ability to successfully engage the target. The combination of events and equipment status resulted in an EOC score of .80 to 1.0.

b. Degraded. The target was successfully engaged with some, but not necessarily all, directors/illuminators/launchers, or the first simulated engagement occurred at a reduced range. The

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combination of events and equipment status resulted in an EOC score of .60 to .79.

c. Unsatisfactory. The combination of events and equipment status resulted in an EOC score of 0.0 to .59.

11. Self Defense DTE Evaluation Enclosure (1) provides the specific systems considered in a SD DTE demonstration evaluation.

a. Satisfactory. The target was successfully engaged by the installed SD systems. The combination of events and equipment status resulted in an EOC score of .80 to 1.0.

b. Degraded. The target was successfully engaged with some, but not all, of the installed SD systems. The combination of events and equipment status resulted in an EOC score of .60 to .79.

c. Unsatisfactory. The combination of events and equipment status resulted in an EOC score of 0.0 to .59.

12. Grading premises. Points awarded are the same for each equipment type, however cumulative point totals will vary based on ship class and configuration. Grading criteria is established as follows:

a. Search radar performance will be graded at 10% off for every 10% of reduced range based on AREPS 90% PD predictions or if AREPS is not available, 90% of the maximum instrumented range of the radar. Where multiple long range air search radars are installed, each will account for an equal percentage of the points awarded for the search radar portion of the score. For the SD portion only, TAS will count for an equal percentage of the points. (15 points possible).

b. ID/CDS performance will be graded on IFF performance (50%); CDS ability to properly display target video, IFF video, symbology, and the ability to move the target into the engagement queue (50%, or 25% if ESM is evaluated). NOTE: ESM will be evaluated if the DTE aircraft is fitted with an emitter POD. The AN/SLQ-32 and/or AN/WLR-1 will be evaluated for ability to properly ID the emitter, provide bearing line to CDS, and power adequate signal for RAM engagement (25%). (15 points possible).

c. Director merit will be graded with an equal percentage of total points for each installed director being able to support/prosecute an engagement. (25 points possible).

d. SM Engagement Performance Index will be graded as follows: 50% of the points available will be awarded for achieving maximum range intercept, with an equal percentage for each remaining intercept. (i.e. 25% for each remaining engagement for DDG, 17% for each remaining engagement for CG). For FFG's, max range intercept will account for 75% of total points and the 2nd engagement for the remaining 25%. (75 points possible).

e. NSSM Engagement Performance Index will be based on single shot max range intercept. (70 points possible).

f. ESSM (70 points) and RAM (30 points) will be scored based on 10% deducted for each 10% reduction in range.

g. Gun engagement will be scored as follows: for 5 inch guns 15+ rounds = 100%, 10-14 rounds = 75%, 5-9 rounds = 50%, 1-4 rounds = 25%; for 76MM guns 30+ rounds = 100%, 20-29 rounds = 75%, 10-19 rounds = 50%, and 1-9 rounds = 25%. (50 points possible).

h. CIWS engagement will be scored as follows: Initial detection = 50% of the score, with points deducted for reduced ranges at 20% intervals. The remaining 50% will be based on the ability to expend a minimum of 200 rounds. (50 points possible).

i. NSSM Director merit will be scored as follows: Each MK 78 Director/Illuminator counts for an equal percent of the points. (25 points possible).

12. Additional events. The following equipment shall be demonstrated in conjunction with these demonstrations, but will not be included in their overall evaluation.

- (a) TACAN
- (b) IFF (all radars)
- (c) Link 4A/11/16 (if aircraft capable)
- (d) UHF long range communications

13. The Commanding Officer of the unit remains completely responsible for the safe conduct of these demonstrations. At no time will the Commanding Officer's Weapons Safety Posture be compromised. Nothing is more important than safety of equipment and personnel.

/s/

C. A. KEMP

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SPECIFIC SYSTEMS USED IN AREA AD/SD DTE
EVALUATIONS BY SHIP CLASS

This enclosure defines systems considered in determining the Area AD/SD DTE demonstration evaluations, and the Equipment Operational Capability (EOC) score criteria.

FFG-7 Class

<u>System</u>	<u>Subsystem</u>	<u>Area AD DTE</u>	<u>SD DTE</u>
MK 92 FCS	STIR	Yes	No
	CAS (upper)	Yes	No
	CAS (lower)	Yes	No
Mk 13 GMLS		Yes	No
SPS-49 radar		Yes	No
76 mm gun		No	Yes
MK 15 PHALANX		No	Yes

DDG-51 Class

<u>System</u>	<u>Area AD DTE</u>	<u>SD DTE</u>
Mk 99 FCS	Yes	No
Mk 41 GMLS	Yes	No
SPY-1D	Yes	No
Mk 34 GFCS	No	Yes
MK 15 PHALANX	No	Yes
ESSM	No	Yes

CG-47 Class

<u>System</u>	<u>Area AD DTE</u>	<u>SD DTE</u>
Mk 99 FCS	Yes	No
Mk 26/41 GMLS	Yes	No
SPY-1A/B	Yes	No
Mk 86 GFCS	No	Yes
SPS-49	Yes	No
MK 15 PHALANX	No	Yes
ESSM	No	Yes

Enclosure (1)

FOR SHIPS ONLY HAVING SD SYSTEMS

<u>SYSTEM</u>	<u>SD DTE</u>
AN/SPS-40	Yes
AN/SPS-49	Yes
AN/SPS-48	Yes
SSDS/CDS/C&D/NTDS	Yes
MK 78 Dir/Illum	
MK 57 NSSMS	Yes
MK 15 PHALANX	Yes
MK 31/0 GMWS RAM	Yes
ESSM	Yes
AN/SPQ-9B	Yes
MK23 TAS	Yes
AIMS MK XII IFF SYSTEM	Yes

EQUIPMENT OPERATIONAL CAPABILITY (EOC) SCORING

The EOC score is split into 3 categories of Satisfactory (0.80 to 1.00), Degraded (0.60 to 0.79), and Unsatisfactory (0.00 to 0.59). Scores will be derived from system performance only, watch team performance will not be evaluated. The following table lists the various scoring elements for the specific Area AD DTE and Self Defense DTE:

POINT AWARDS

Elements	AD DTE	SD DTE	LHA/LPD/LSD/ AGF SD DTE w/RAM	LHA/LPD/LSD/ AGF SD DTE w/o RAM	DDG/CG SD DTE w/ESSM	DDG/CG SD DTE w/o ESSM
Search Radar	15	15	15	15	15	15
ID/CDS Perf.	15	15	15	15	15	15
Director Merit	25					
SM Eng. Perf. Index	75					
NSSMS Director		25				
NSSMS Eng. P/I		70				
CIWS Engagement		50	50	50	50	50
RAM Engagement		30	30			
ESSM Engagement		70			70	
Gun Engagement		50			50	50
Total Points Avail:	130	325	110	80	200	130

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Elements	AD DTE	SD DTE	DD SD DTE w/RAM	DD SD DTE w/o RAM	FFG SD DTE	CV(N)/LHD/ AOE SD DTE w/RAM	CV(N)/LHD/ AOE SD DTE w/o RAM
Search Radar	15	15	15	15	15	15	15
ID/CDS Perf.	15	15	15	15	15	15	15
Director Merit	25						
SM Eng. Perf. Index	75						
NSSMS Director		25	25	25		25	25
NSSMS Eng. P/I		70	70	70		70	70
CIWS Engagement		50	50	50	50	50	50
RAM Engagement		30	30			30	
ESSM Engagement		70					
Gun Engagement		50	50	50	50		
Total Points Avail:	130	325	255	225	130	205	175

