

Annex D – GLOSSARY

Airborne Testbeds – Ranging from small aircraft with pod-mounted components or systems to large aircraft designed for spread-bench installation and testing of EW and avionic systems. They permit the flight testing of EW components, sub-systems, systems, or functions of avionic suites in early development and modification, often before the availability of prototype or production hardware.

Amplitude Modulation (AM) – Modulation of the amplitude of a radio carrier wave in accordance with the strength of the audio or other signal. A radar angle tracking method using the time varying amplitude of the returning target signal to generate an error signal to correct the boresight position of the antenna.

Angle Of Arrival (AOA) – The direction of arrival of a signal normally referenced to the aircraft body coordinate system.

Antenna Gain – The dimensionless ratio of the intensity of an antenna in a given direction to the intensity that would be produced by a hypothetical ideal antenna that radiates equally in all directions (isotropically) and has no losses.

Anti-Radiation Missile (ARM) – An air-to-surface missile with an RF seeker designed to track and home on threat radar transmission.

Aperture – An EM opening through which energy can pass.

Beamwidth (half-power) – In a plane containing the direction of the maximum of a beam, the angle between the two directions in which the radiation intensity is one-half the maximum intensity of the beam.

Blanker – A device that manages RF suppression management in a platform. Also called a Central Suppression Unit.

Burn-through Range – The range at which a jamming technique is no longer effective. The point where the target skin return energy exceeds the jamming energy by a sufficiently large margin to negate the EA technique's effectiveness.

Chaff – A form of EA in which aircraft or other targets spread a cloud of small, thin pieces of aluminium, metallised glass fibre or plastic, which either appears as a cluster of secondary targets on radar screens or swamps the screen with multiple returns.

Closed-Loop – A system in which the output has an effect on the input quality in such a manner as to maintain the desired output.

Communications Intelligence (COMINT) – Technical information and intelligence derived from foreign communications by other than the intended recipients.

Continuous Wave (CW) – An EM transmission that is continuously operating, as opposed to pulsed operation.

Countermeasures – That form of military science that, by the employment of devices and/or techniques, has as its objective the impairment of the operational effectiveness of enemy activity.

Countermeasures Dispensing System (CMDS) – A system that dispenses expendable countermeasures, such as chaff and flares.

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Data Analysis Plan (DAP) – A document that details how the collected test data will be reduced, processed, analysed, and used to calculate the MOPs.

Data Reduction – The process of converting recorded data to engineering units and the data analysis process to produce a data set that can be evaluated.

Deceptive Jamming – An EA technique focused on deceiving an operator or the automatic detection and processing functions of a radar; also called false target jamming.

Digital RF Memory (DRFM) – Technology employed in RF countermeasures systems. DRFM-based techniques allow a jammer to produce very high quality false targets. They do this by sampling the incoming pulses and storing them. The stored pulses retain the nuances of the received pulses, such as phase coherency or intrapulse modulation. These stored pulses can then be modulated and retransmitted back toward the victim radar.

Directed Energy (DE) – An umbrella term covering technologies that produce a beam of concentrated EM energy or atomic or sub-atomic particles. A DE weapon is a system using DE primarily as a direct means to damage or destroy adversary equipment, facilities, and personnel. DE warfare is military action involving the use of DE weapons, devices, and countermeasures to either cause direct damage or destruction of adversary equipment, facilities, and personnel, or to determine, exploit, reduce, or prevent hostile use of the EM spectrum through damage, destruction, and disruption.

Dry – A test condition where the EA system is not operating, i.e., in standby mode or off.

Developmental Test & Evaluation (DT&E) – 1. Any testing used to assist in the development and maturation of products, product elements, or manufacturing or support processes. 2. Any engineering-type test used to verify status of technical progress, verify that design risks are minimised, substantiate achievement of contract technical performance, and certify readiness for initial Operational Testing (OT). Development tests generally require instrumentation and measurements and are accomplished by engineers, technicians, or soldier operator-maintainer test personnel in a controlled environment to facilitate failure analysis.

Dynamic Range – The input signal amplitude range that the receiver can process properly. The lower limit is the receiver sensitivity (MDS is commonly used). There is no universally accepted definition for the lower or the upper limit of the input signal level.

Effective Radiated Power (ERP) – The power transmitted by a system; the product of the transmitter power, transmission line losses, and antenna gain.

Effectiveness – The extent to which the goals of the system are attained, or the degree to which a system can be elected to achieve a set of specific mission requirements. Also, an output of a cost-effectiveness analysis.

Electromagnetic Wave – One of the waves that are propagated by simultaneous periodic variations of the electric and magnetic field intensity and that include radio waves, infrared, visible light, ultraviolet, X rays, and gamma radiation.

Electromagnetic Compatibility (EMC) – The ability of systems, equipment, and devices that utilise the EM spectrum to operate in their intended operational environments without suffering unacceptable degradation or causing unintentional degradation because of EM radiation or response. It involves the application of sound EM spectrum management; system, equipment, and device design configuration that ensures interference-free operation; and clear concepts and doctrines that maximise operational effectiveness.

Electromagnetic Hardening – Action taken to protect personnel, facilities, and/or equipment by filtering, attenuating, grounding, bonding, and/or shielding against undesirable effects of EM energy.

Electromagnetic Interference (EMI) – Any EM disturbance that interrupts, obstructs, or otherwise degrades or limits the effective performance of electronics and electrical equipment. It can be induced intentionally, as in some forms of electronic warfare, or unintentionally, as a result of spurious emissions and responses, intermodulation products, and the like.

Electromagnetic Pulse (EMP) – The EM radiation from a strong electronic pulse, most commonly caused by a nuclear explosion that may couple with electrical or electronic systems to produce damaging current and voltage surges.

Electromagnetic Spectrum – The range of frequencies of EM radiation from zero to infinity. It is divided into 26 alphabetically designated bands.

Electronic Attack (EA) – The use of EM energy, Directed Energy (DE), or anti-radiation weapons to attack personnel, facilities, or equipment with the intent of degrading, neutralising or destroying enemy combat capability and is considered a form of fires.

Electronic Protection (EP) – Actions taken to protect personnel, facilities, and equipment from any effects of friendly or enemy use of EM spectrum that degrade, neutralise, or destroy friendly combat capability.

Electronic Warfare (EW) – The use of EM or directed energy (DE) to control the EM spectrum or to attack the enemy.

Electronic Warfare Support (ES) – Actions taken by, or under direct control, of an operational commander to search for, intercept, identify and locate, or localise sources of intentional and unintentional radiated EM energy for the purpose of immediate threat recognition, targeting, planning, and conduct of future operations.

Electro-Optical (EO) – Of or relating to a branch of technology involving components, devices and systems which operate by modification of the optical properties of a material by an electric field.

Electronic Intelligence (ELINT) – Technical and geolocation intelligence derived from foreign non-communications EM radiations emanating from other than nuclear detonations or radioactive sources.

Emission Control (EMCON) – The selective and controlled use of EM, acoustic, or other emitters to optimise command and control capabilities while minimising, for operations security: a. detection, by enemy sensors; b. mutual interference among friendly systems; and/or c. enemy interference with the ability to execute a military deception plan.

Escort Jamming – A form of support jamming where the jamming aircraft flies along with the aircraft it is protecting.

False Alarm – A warning generated when no threat is present.

False Alarm Rate – The rate at which false alarms occur, normally expressed in false alarms per hour.

Flares – Expendable pyrotechnic defensive EA devices designed to capture the seeker of an IR-guided missile and seduce it away from the targeted aircraft.

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Frequency Selectivity – A measure of the ability of a receiver to distinguish between two signals of different frequencies.

Geolocation – The process of determining the position of a ground-based emitter.

Hardware In The Loop (HITL) – Indoor test facilities that provide a secure environment to test EW techniques and hardware against simulators of threat systems. Primary EW HITL facilities contain simulations of hostile weapon system hardware or the actual hostile weapon system hardware. They are used to determine threat system susceptibility and to evaluate the performance of EW systems and techniques.

High-Energy Laser (HEL) Weapon – A system that directs light energy at targets using the properties of coherent EM radiation. HEL systems are often categorised by the method of excitation, cooling, or the gain material. Some HELs are gas-dynamic lasers. These lasers are pumped by combustion or an energetic chemical reaction. Some lasers have a liquid gain medium or are liquid-cooled. SSLs have a crystalline or glass gain medium. SSLs have recently become viable contenders for HEL applications. All lasers can be formed into a tight beam because of the property of coherence, meaning that the phase relationship is preserved to the point that interference of the waves can occur.

High-Power Microwave (HPM) – HPM weapons are systems that emit RF energy at high peak power levels and are often categorised by the bandwidth-to-frequency ratio of their waveforms. These are typically very large ratios. They have been divided into narrowband, wideband, and ultra wideband. HPM devices have a smaller effective range than the EMP effects of a nuclear weapon. Narrowband devices tend to operate on specific electronic vulnerabilities in the target and therefore, require knowledge of enemy systems to be effective. Ultra-wideband devices tend to be simpler and cheaper, using powerful transient waveforms, and requiring less knowledge of the target. A few HPM weapons function by making use of psycho-sensory or neural phenomena, rather than just high power levels, to deter human actions or cause confusion among attacking troops.

Infrared (IR) – EM radiation with a wavelength between 0.7 and 300 micrometres.

Infrared Countermeasures (IRCM) – EA techniques directed against IR-guided weapons.

Installed Receiver Sensitivity – A measure of how the receiver transmission line including the antenna and amplifiers (if present) affects the receiver system's MDS. If the transmission line has positive gain, the system sensitivity will increase and if it has negative gain it will decrease.

Installed System Test Facility (ISTF) – Facilities that provide a secure capability to evaluate EW systems that are installed on, or integrated with, host platforms. These test facilities consist of anechoic chambers in which free-space radiation measurements are made during the simultaneous operation of EW systems and host platform avionics and munitions.

Isolation – The amount of signal loss between a transmitting antenna and a receiving antenna. Sufficient isolation between antennas prevents EMI.

Intermediate Level (I-Level) Maintenance – That level of maintenance/repair of items that do not have to go to depot level for major work and are incapable of maintenance/repair at the organizational level.

Jamming-to-Signal (J/S) – The ratio of the jamming signal strength J within the victim receiver's bandwidth to the desired signal strength S. To be effective, a jamming technique must insert sufficient jamming energy into the receiver's pass band to produce a desired effect on the victim system.

Kinematics – The study of the geometry of motion; relates displacement, velocity, acceleration and time, without reference to the cause of the motion.

Laser Warning System (LWS) – An ES system designed to detect the laser energy associated laser range finders or beam riding missiles and warn the aircrew.

Line Replaceable Unit (LRU) – An essential support item removed and replaced at field level to restore an end item to an operationally ready condition. (Also called Weapon Replacement Assembly (WRA) and Module Replaceable Unit.)

Low Observable (LO) – LO platforms are characterised by reduced signatures, most prevalently in the RCS and IR realms.

Man Portable Air Defence System (MANPADS) – Short-range normally infrared guided (heat-seeking) SAMs.

Measure Of Effectiveness (MOE) – Measure designed to correspond to accomplishment of mission objectives and achievement of desired results. MOEs may be further decomposed into Measures of Performance and Measures of Suitability.

Measure Of Performance (MOP) – Measure of a system's performance expressed as speed, payload, range, time on station, frequency, or other distinctly quantifiable performance features. Several MOPs and/or Measures of Suitability may be related to the achievement of a particular Measure of Effectiveness (MOE).

Measurement Facilities (MF) – Facilities that establish the character of an EW related system/sub-system or technology. They provide capabilities to explore and evaluate advanced technologies such as those involved with various sensors and multi-spectral signature reduction.

Military End User – The military organisation using the weapons systems in combat.

Minimum Discernable Signal (MDS) – The lowest power signal that can be discerned from the noise, i.e., the point where the signal power is equal to the noise power in the receiver.

Missile Warning System (MWS) – An ES system that warns aircrew of attacks by passive homing missiles (most commonly IR-guided) by detecting the IR and/or UV signature of a missile rocket motor plume.

Mission – The objective or task, together with the purpose, which clearly indicates the action to be taken.

Mission Data – The compilation of threat system parametric data, such as frequency ranges, PRI, scan rates, scan types, etc., along with threat system identifications and priority. Mission data sets are normally tailored to meet the requirements for a specific theatre of operations.

Mission Data File (MDF) – The file containing the mission data sets that is loaded into an EA or ES system; analogous to computer application.

Model – A representation of an actual or conceptual system that involves mathematics, logical expressions, or computer simulations that can be used to predict how the system might perform or survive under various conditions or in a range of hostile environments.

Modelling and Simulation (M&S) – Used to represent systems, host platforms, other friendly players, the combat environment, and threat systems. They can be used to help design and define EW systems and

testing with threat simulations and missile fly-out models. Due to the relatively low cost of exercising these models, this type of activity can be run many times to check ‘what ifs’ and explore the widest possible range of system parameters without concern for flight safety. These models may run interactively in real or simulated time and space domains, along with other factors of a combat environment, to support the entire T&E process.

Noise Jamming – An EA technique designed to prevent target detection by raising the noise level in a victim receiver to the point that the jamming energy exceeds the target energy.

Open Air Range (OAR) – Test facilities used to evaluate EW systems in background, clutter, noise and dynamic environments. Typically these resources are divided into sub-categories of test ranges and airborne testbeds. Open Air Range EW flight test ranges are instrumented and populated with high-fidelity manned or unmanned threat simulators. Additional emitter-only threat simulators are also used to provide the high signal density characterising typical operational EW environments.

Open-Loop – A system in which the output has no effect on the input signal.

Operational Flight Program (OFP) – The software performing the executive functions of a system; analogous to a computer’s operating system.

Operational Security (OPSEC) – Protection of military operations and activities resulting from identification and subsequent elimination or control of indicators susceptible to hostile operations.

Operational Test & Evaluation (OT&E) – The field test, under realistic conditions, of any item (or key component) of weapons, equipment, or munitions for the purpose of determining the effectiveness and suitability of the weapons, equipment, or munitions for use in combat by typical military users; and the evaluation of the results of such tests.

Probability of Kill (P_K) – The product of susceptibility and vulnerability.

Program Introduction Document (PID) – A document provided by a test customer to a test facility identifying technical and schedule requirements. See Statement of Capability (SOC).

Pulse Width (PW) – The duration in time of an EM pulse.

Pulse Repetition Frequency (PRF) – The number of pulses per second.

Pulse Repetition Interval (PRI) – The time duration between the beginning of successive pulses.

Pulse-Doppler Radar – A type of radar that uses a high PRF coherent waveform to detect and track targets in the frequency domain. The technique also permits look-down, shoot-down operations by airborne radars.

Radar Cross-Section (RCS) – Is a measure of how detectable a target is by a radar. A larger RCS indicates that an object is more easily detected.

Radar Warning Receiver (RWR) – A system that detects, identifies, locates, and determines the relative lethality of radar directed threat systems. It serves to warn aircrew of hostile radar activity and provides cueing information to other countermeasures systems such as chaff dispensers.

Radio Frequency (RF) – Is a rate of oscillation in the range of about 30 kHz to 300 GHz, which corresponds to the frequency of electrical signals normally used to produce and detect radio waves.

Regression Testing – Testing conducted following a hardware, software, or mission data change to determine if the changes have inadvertently affected other aspects of system performance.

Role – A function or part performed in a particular operation or process.

Rules Of Engagement (ROE) – Describe how the ground-based and airborne threat simulators will operate during the test mission. ROE detail what restrictions the test requirements place on the threat simulator operators, particularly addressing target acquisition and reacquisition procedures and the use of EP features.

Scenario – A specific description of the many parameters characterising an encounter between one or more aircraft and a hostile air defence system or elements of that system.

Self-Protection Jammer (SPJ) – An EA system that protects the host platform.

Sidelobes – The lobes of the far field antenna radiation pattern that are not the main beam.

Signals Intelligence (SIGINT) – A category of intelligence comprising either individually or in combination all communications intelligence, electronic intelligence, and foreign instrumentation signals intelligence, however transmitted or intelligence derived from communications, electronic, and foreign instrumentation signals.

Simulation – A simulation is a method for implementing a model. It is the process of conducting experiments with a model for the purpose of understanding the behaviour of the system modelled under selected conditions or of evaluating various strategies for the operation of the system within the limits imposed by developmental or operational criteria. Simulation may include the use of analogue or digital devices, laboratory models, or “testbed” sites. Simulations are usually programmed for solution on a computer; however, in the broadest sense, military exercises, and wargames are also simulations.

Simulator – A system that can represent relevant characteristics of an actual threat system.

Spectral – Of or relating to the EM frequency characteristics of a signal.

Stand-In Jamming – A form of support jamming normally performed by Unmanned Aerospace Vehicles (UAV) operating within the engagement range of hostile air defence systems.

Stand-Off Jamming (SOJ) – A form of support jamming normally performed by manned aircraft operating outside the engagement range of hostile air defence systems.

Statement Of Capability (SOC) – A test facility’s response to a customer’s PID, documenting the cost, availability, and technical considerations or limitations.

Stimulator – A low fidelity piece of test equipment that can induce a desired response in a SUT without necessarily simulating the behaviour of an actual threat system.

Suitability – The degree to which a system can be placed and sustained satisfactorily in field use with consideration being given to availability, compatibility, transportability, interoperability, reliability, wartime usage rates, maintainability, safety, human factors, habitability, manpower, logistics supportability, natural environmental effects and impacts, documentation, and training requirements.

Support Jamming – Jamming conducted by one platform to protect another.

Susceptibility – The probability that an aircraft will be hit by a damage causing mechanism.

Synthetic Environment – Interrelated simulations that represent activities at a high level of realism from simulations of theaters of war to factories and manufacturing processes. These environments may be created within a single computer or a vast distributed network connected by local and wide area networks and augmented by super-realistic special effects and accurate behavioural models. They allow visualization of and immersion into the environment being simulated.

System Integration Laboratories (SIL) – Facilities designed to test the performance and compatibility of components, sub-systems and systems when they are integrated with other systems or functions. They are used to evaluate individual hardware and software interactions and, at times, involve the entire weapon system avionics suite. A variety of computer simulations and test equipment are used to generate scenarios and environments to test for functional performance, reliability, and safety. SILs are generally weapon system specific and are found in both contractor and Government facilities.

System Under Test (SUT) – The test article. This can be a component, equipment, sub-system, system or whole platform with installed systems.

Technology Readiness Level (TRL) – One level on a scale of one to nine, e.g., “TRL 3,” signifying technology readiness pioneered by the National Aeronautics and Space Administration (NASA), adapted by the Air Force Research Laboratory (AFRL), and adopted by the Department of Defense as a method of estimating technology maturity during the acquisition process. The lower the level of the technology at the time it is included in a product development program, the higher the risk that it will cause problems in subsequent product development.

TEMPEST – Originally a codeword (hence capitalisation), since declassified. It is not an acronym. It refers to investigations and studies of compromising emissions. These are defined as unintentional intelligence-bearing signals which, if intercepted and analyzed, may disclose the information transmitted, received, handled, or otherwise processed by any information-processing equipment. NATO requirements defined in SDIP-27.

Temporal – Of or relating to the time domain.

Test and Evaluation (T&E) – Process by which a system or components are exercised and results analysed to provide performance related information. The information has many uses including risk identification and risk mitigation and empirical data to validate models and simulations. T&E enables an assessment of the attainment of technical performance, specifications, and system maturity to determine whether systems are operationally effective, suitable and survivable for intended use, and/or lethal.

Test Conductor – The individual responsible for the test point-by-test point execution of a test mission.

Test Director – The individual with overall responsibility for executing a test mission.

Time, Space, Position Information (TSPI) – Location data referenced to a coordinate system as a function of time.

Towed Decoy – A defensive EA system towed behind the host aircraft with the intent of providing a more seductive target to a threat system and one that creates an angle tracking error in the threat sensor system.

Type I Error – Rejecting null hypothesis when it is true.

Type II Error – Failing to reject a null hypothesis when it is false.

Ultraviolet (UV) – EM radiation with a wavelength shorter than that of visible light, but longer than X-rays, in the range 10 nm to 400 nm.

Unmanned Aerospace Vehicles (UAV) – An aerospace vehicle that is either remotely piloted or operates autonomously.

Unmanned Aerospace Systems (UAS) – UAS, which also means Unmanned Autonomous Systems, include UAVs and UCAVs (Unmanned Combat Air Vehicles).

Vulnerability – The conditional probability that an aircraft will be killed when struck by a damage causing mechanism.

Wet – A test condition where an EA SUT is operating in a transmitting mode.

Wild Weasel – An aircraft equipped with specialised receivers designed to detect, identify, and locate the source of hostile radar transmissions and ARMs to engage them.

