

Attachment 1 - PEO C4I Annual Science & Technology Requirements (2009)

RELEVANT MASTER PLAN REFERENCE MODEL TIER 0	S&T GAP TOPIC	ISSUES	SPECIFIC NEED/GAP (PMW)
COMMUNICATIONS	Robust, Reliable, Secure Communications and Networks	<ul style="list-style-type: none"> • Increasing vulnerability of satellite resources • Limited ability to reconfigure Comm paths to adapt to existing conditions • Limited topside real estate • Co-site electromagnetic interference 	<ul style="list-style-type: none"> • Persistent Communications at Speed and Depth (PMW 770) • Communications alternatives to space based satellites (PMW 170) • Efficient use of Space Communication Resources (PMW 170) • RF Interference Mitigation (PMW 170) • Throughput Improvement (PMW 170) • Protected SATCOM Capacity (PMW 170) • GPS Repeat Spoof Detection & Location (PMW 170) • Micro-Electro-Mechanical System (MEMS) Internal Measuring System (PMW 170) • Miniature Atomic Clock (PMW 170) • Miniature Optical Gyroscope (PMW 170) • Advanced Tactical Data Links (PMW 150) • Multi-Functional, Low RCS Antennas (PMW- 120)
	Pervasive and Persistent Sensor Networks	<ul style="list-style-type: none"> • Tactical Communications shortfalls limit cooperative sensing strategies • Position, Navigation & Timing (PNT) 	
NETWORKS	Robust, Reliable, Secure Communications and Networks	<ul style="list-style-type: none"> • Lack tools for actionable cyber situational awareness 	<ul style="list-style-type: none"> • Cyber Defense (PMW160) • Technology to support and maintain enterprise networking in differing levels of a degradation or in a degraded environment (PMW160) • Need Man on-the-loop (not in-the-loop) only when necessary. Provide distributed and dynamic tasking through the TST cycle for each SOI thread processed, posting what information is necessary to achieve the desired effects as soon as possible (PMW-120) • Need: Automation of remote tasking of IO assets, using Signal Collection Files (SCF) and Signal Description Files (SCF) as described by the SDF

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	Pervasive and Persistent Sensor Networks	<ul style="list-style-type: none"> • Manpower-intensive management and controls for sensor networks limit scope of ISR • Need for robust and survivable advanced tactical networks 	CONOPS (PMW-120). <ul style="list-style-type: none"> • Need Full Net-Ready Joint connectivity and interoperability among all sensors (passive/active) (PMW-120)
	Capability to Conduct Rapid Accurate Decision-Making across Range of Military Operations	<ul style="list-style-type: none"> • Applications suitable for Tactical Edge Networks 	
COMMON COMPUTING ENVIRONMENT	Robust, Reliable, Secure Communications and Networks	<ul style="list-style-type: none"> • Stove piped systems 	<ul style="list-style-type: none"> • High available and secure computing recourses to support near-real time to real-time requirements (PMW160) • Tactical Edge core services for disconnected, intermittent, and low bandwidth environments (PMW160)
	Pervasive and Persistent Sensor Networks	<ul style="list-style-type: none"> • Power requirements limit endurance 	

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	Diverse Sensing	<ul style="list-style-type: none"> Limited small package precision time-keeping and distribution in GPS-denied environment 	
COMMON SERVICES	Capability to Conduct Rapid Accurate Decision-Making across Range of Military Operations	<ul style="list-style-type: none"> High volume of data with low information content Feed forward fusion processes that are not mission aware Non real time fusion Automated tools perform poorly with uncertain, missing, and contradictory data 	<ul style="list-style-type: none"> Logistics to the COP (PMW 150) Collaboration and Geospatial Visualization (PMW 120) Need Advanced meteorological and oceanographic prediction systems to satisfy NAVO and FNMOC production needs with the capability of accurately forecasting the natural environment throughout the battlespace to support both strategic and tactical decisions (PMW 120) Need to sense relevant changes in the environment, process and analyze data, and provide timely and accurate information to the warfighter and the national intelligence community at the location of interest. (PMW-120) Operational COP (PMW 150) Automated Analysis services (PMW 150) Collaboration and Geospatial Visualization (PMW 150) Tactical Edge-enabled Applications and Intelligent Distributed Database (PMW750)
	Pervasive and Persistent Sensor Networks	<ul style="list-style-type: none"> Lack of mission aware definitions for anomalous data and behavior 	

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APPLICATION SERVICES	Pervasive and Persistent Sensor Networks	<ul style="list-style-type: none"> • Limited numbers of sensors in some domains (e.g., space) • Limited precision location • Manpower-intensive management and controls for sensor networks limit scope of ISR • Limited automated techniques for multi-objective planning of sensor networks • Lack of real time evaluation of sensing plan efficacy and continuous re-planning • Lack of mission focused definitions of normal and abnormal conditions • Lack of information metrics and strategies to control collection to improve information state • Lack of automated mission focused descriptions of commander's intent and derived mission metrics to support sensing strategy • Need for affordable, fuel efficient, modular, long endurance sensor platforms (both expendable & non-expendable) 	<ul style="list-style-type: none"> • End-to-End Mission Management (PMW 150) • Tactical Edge-enabled Applications and Intelligent Distributed Database (PMW750) • Cyber Defense (PMW160) • Optimal sampling techniques/technologies and persistent observation systems to support LBSF&I, NITES or METMF Programs and/or provide direct support to the METOC production Centers through the use of tactical sensor systems and platforms. Persistent sensing systems must perform within limits on latency based on the perishability of data/information.(PMW-120)
	Diverse Sensing	<ul style="list-style-type: none"> • Limited spatial-temporal scheduling to maintain persistent surveillance • Limited sensing for cyber networks and social-cultural phenomenon • Limited mission aware adaptation of individual and networked sensors to the environment and the target (e.g., resolution, waveforms, frequencies/spectral content) 	<ul style="list-style-type: none"> • End to End Mission Management (PMW 150)

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		<ul style="list-style-type: none"> • Lack of integrated sensing and processing to support higher operational tempo • Limited reliable, all weather, long range contact ID for ships, cargo and people • Significant manpower limitations in data fusion processes • Limited electronic protection (EP) techniques/capabilities that can be implemented in tactical sensor (e.g., radar, EO/IR, etc.) systems with minimal changes to the resident system • Lack of covert tags that can be monitored at range without raising suspicion rate 	
	<p>Sensor/Data Integration and Threat Assessment</p>	<ul style="list-style-type: none"> • Limited automated detection and recognition at the sensor • Manpower intensive fusion processes • Ad hoc tools to handle uncertain, imprecise, incomplete, and contradictory data, but largely human judgment • Massive amounts of data that consume bandwidth, require large storage, and manual analysis • Lack of automated, real time tools for association of data that can assess gaps in our knowledge and understanding of the battlespace 	<ul style="list-style-type: none"> • METOC Optimal Decision Aids (PMW-120) • Need Meta data fusion & analysis to gain intelligence, knowledge, wisdom, For example, services are needed to conduct SOI/SDF based end-to-end SIGINT Fusion Analysis (PMW 120) • Need Efficient and secure database systems and methods to efficiently populate these databases to insure availability of critical information where and when it is required by decision makers. (PMW-120) • Provide Actionable Intelligence to Tactical Units (HQMC) • Expose Enemy Networks, and Anticipate and Influence Their Behavior (HQMC) • Translate data to combat information at the point of collection (HQMC)