TECHNOLOGY CHALLENGES/AREAS OF INTEREST

To provide guidance to the S&T community, USTRANSCOM has established several technology areas of interest. These areas of interest identify specific technological capabilities that will enhance USTRANSCOM’s Unified Command Plan missions, IT strategies and roadmaps, fill JDDE capability gaps, and support realization of the USTRANSCOM Commander’s Priorities. The Command requires greater flexibility in adjusting the flow of integrated joint capabilities that support the dynamic plans of the Combatant Commands (CCMD). This includes responsive deployment and distribution planning and execution systems that accommodate capabilities-based force packaging and flexible deployment options. To receive USTRANSCOM funding consideration, initiatives must address a non-Title 10 responsibility, be consistent with available funding, and be executed in accordance with DoD Policies and Regulations.

Additional capability gap information can be viewed at http://www.transcom.mil/cmd/associated/rdte/ then click on References.
Global Access – Challenge

**Standardized Intermodal Containers and Pallets** - Systems that can be used by automated aircraft/ship loading/unloading systems, to include those designed to automatically scan standardized containers and pallets as they are on-loaded/off-loaded. Initiatives must be designed to increase cargo throughput by eliminating the requirement to handle cargo multiple times during shipping, reduce the requirement for multiple Materials Handling Equipment (MHE) systems, reduce need for additional ground personnel throughout the en route system, minimize the requirement to reposition MHE to support deployment/distribution, address pallet construction (current capabilities do not tie to shipments pallet break down, holding, frustration clearance, and costs), and improve the flexibility to be rapidly embarked on multiple expeditionary platforms.

**Rapid Distribution Technologies** - Concepts and technologies that improve the end-to-end flow of military unit equipment and cargo through ocean ports, aerial ports and intermodal inter-change points, to include autonomous capabilities and motion compensation interface platforms, for use with commercial cargo vessels to enhance cargo throughput of military unit equipment at sea.

**Delivery Technologies** - Seeking innovative solutions, to include autonomous technologies, that provide for the safe, accurate and timely delivery of joint forces and their sustainment within an Anti-Access/Area Denial (A2/AD) environment across a complex, distributed battlefield. This includes the re-supply of forces in austere conditions and in high threat areas are just two of the missions driving the need for more accurate and single-pass precision airdrop. This area applies to technologies to ensure survivability of aircraft and personnel on the ground while delivering cargo to a precise location within a high threat environment.

**Opportune Landing Site Identification** - All-weather airfield independence technology focusing on mobility aircraft determining the security of a landing site for arrival and throughput operations without use of a pre-coordinated survey or on-site, ground party analysis.

**Autonomous Aircraft Approach and Landing Guidance** - All-weather and lights-out taxi, take-off and landing capability for mobility aircraft operations from prepared and unprepared fields. Operations may require taxi, takeoff, and landing for aircraft under inclement weather conditions without assistance from navigation guidance systems that are commonly available at most U.S. airports.
Global Access (con’t)

**Force Protection** - Terrorism and asymmetric warfare pose an ever-present threat to our Nation’s strategic mobility assets and their embarked cargo, equipment and personnel. This broad area of interest supports proposals to counter these types of threats. Of particular interest is the application of technology to create virtual borders at the point of loading, decontamination of transportation assets, and enhance seaborne and air cargo container standards. Screen cargo for smuggled goods as well as explosive, chemical, and biological threats. Technology interests are in those systems with stand-off, hand-held, robotic and/or unmanned vehicle inspection/detection capabilities (both on land and in the water) as well as fixed detectors to allow for the identification of potential threats before endangering personnel and/or resources. Interests include technologies that, when applied, detect access attempts and can be monitored for intrusion.

**Aircraft Survivability** - USTRANSCOM seeks advanced capabilities to increase aircraft survivability and enhance aircrew situational awareness (SA). Affordable, open system technologies are needed to detect and counter the full range of surface-to-air and air-to-air threats, navigate in contested environments, fuse onboard and off-board data for aircrew SA, and counter directed energy threats to aircrew and sensors.

**Sea Basing Technologies/Logistics Over-The-Shore** - Technologies and enablers to enhance the Joint Force Commander’s flexibility to deploy and employ from/through a joint sea base as well as deliver and sustain warfighting capabilities at the point of effect. Enhancements should minimize the need to build up a logistics stockpile ashore and permit the forward positioning of joint forces for immediate employment. This includes autonomous technologies that facilitate the trans-loading and/or transporting of supplies and equipment in a sea base operation within a degraded or austere access environment.

**Convoy Security** - The Theater Commander requires a variety of available lift asset options at his disposal to optimize distribution and best mitigate risks depending on Mission, Enemy, Terrain and Weather, Troops and Support Available, Time Available and Civil Considerations. There is limited ability to provide support for multiple, small, widely-dispersed detachments.

**Rapid Construction for Points of Debarkation** - The JDDE lacks the ability to rapidly assess, establish, and secure ports of debarkation in an A2/AD environment to make the Joint force more expeditionary.
Global Access (con’t)

**Mobility Aircraft** - This challenge addresses anti-access concerns, ergonomically designed crew stations to reduce aircrew workload, assured global line of sight/beyond line of sight secure airborne voice and data communications to enable dynamic mission re-tasking while enhancing aircrew situational awareness, and modular concepts that allow for multiple configurations/missions with same/like airframe. Additionally, aging airlift and aerial refueling fleet present a need for technologies that increase the reliability of aircraft systems and structures to include electronic control systems and more reliable avionics packages that will increase aircraft availability and airlift capacity.

**Advanced Mobility Aircraft** - Next generation mobility and air refueling aircraft to provide intra-theater maneuvers. This includes leveraging technologies used for hybrid and unmanned aircraft as well as next generation information, surveillance, and reconnaissance platforms. Advanced mobility aircraft capabilities will include future platforms that have more efficient airframes and engines, improved Command and Control (C2) and defensive systems capabilities, human integration and training, and have greater range, speed, payload, offload and access.

**Fuel Efficiency** - Mobility assets are the largest consumers of fuel within DoD. Seeking technologies that reduce the dependence and/or consumption of fossil fuels while maintaining or improving speed, flexibility, range, and responsiveness in contested environments.

**Interoperable, Multi-modal Patient Movement**
Future contingency operations will occur in contested environments, limiting USTRANSCOM’s ability to rely solely on aeromedical evacuation to move patients and creating a requirement to develop patient movement equipment and teams which can seamlessly transition to and from ground, sea and/or air platforms. These patient movement solutions should minimize the need for reconfiguration of the transportation asset and should be able to operate in cyber-compromised conditions.
C2/Cyber/Decision Support - Challenge

**Human System Interface (HSI)** - Poor HSI is a major contributor to data integrity problems in business systems supporting the Defense Transportation System. There is a need for intuitive HSI that reduces cognitive workload and lowers data entry errors for planners/port operators. Edit checks and suggested data correction alerts connected to DoD data dictionaries are needed to improve HSI input.

**Adaptive Planning and Execution** - The planning community requires trained personnel, well defined processes and the essential technology to ensure DoD’s ability to rapidly develop, assess, adapt and execute plans in a dynamic environment.

**Distribution Planning and Forecasting** - There is a lack of collaborative distribution planning, based on an understanding of aggregate customer requirements, for optimizing the JDDE. Require synchronized planning, forecasting and collaboration capabilities to ensure people, processes and assets are in place to execute planned operations.

**Supply Chain Sustainment Simulation Tools** - Joint simulation tools are poorly equipped to integrate sustainment flow modeling at the strategic and operational levels (wholesale and Service-level retail). Little capability exists to do unconstrained "what-if" supply scenarios without manual effort.

**Modeling** - Budget uncertainty and the evolving global mobility environment drive the need to modify our business processes, equipment and infrastructure. Currently USTRANSCOM is limited in its ability to weigh alternative courses of action and/or measure the effectiveness of the proposed changes. USTRANSCOM requires modeling & decision support tools to transform systems, programs and initiatives to ensure operational efficiency.

**Joint Retail Inventory Interoperability** - DoD cannot optimize customer requirements as it does not provide inventory interoperability across all Services and theaters. Information and material exchange across the DoD is inhibited by disparity of systems and insufficient interfaces. Inventory status and shipment information cannot be optimized due to lack of connectivity between the various components in supply chain.

**Cross-Domain Information Exchange/Collaboration** - The Command requires a secure means to transition information across multiple classification domains to enable process improvements and reduce system requirements. This includes interaction/interoperability with military/civilian partners which has grown in importance and immediacy with the shift in focus toward home basing and homeland defense posturing. Closer interoperability between non-traditional actors is key to preparing and responding to threats in a truly global manner.

**Manipulation of Large Data Sets** - This area involves the ability for USTRANSCOM to manage “Big Data.” The Command requires the capability to explore, analyze and identify trends and correlations between elements of large data sets. This includes the ability to couple separate databases to create a set of data elements. Such manipulation includes a set of tools to assist analysts with identifying, visualizing and portraying data.
**Information Visualization** - The Warfighter requires a graphical view of logistics and transportation land, sea, air, and waterway operational information with drill-down capability into specific details. Users require a visual representation of information concerning inventory, movement, logistics and transportation information as well as easier and quicker understanding of rapidly changing information based on conveyance maintenance status, weather, intelligence, political/military considerations, etc.

**Distributed Global Mobility C2** - C2 is the heart of successful military endeavors. For global mobility, C2 must be seamless regardless of theater of operation and/or customer being supported. This includes technologies that allow distributed C2 with mobile platforms (whether on land, sea or in the air) as well as technologies that provide the capability to replicate large databases, in a synchronized fashion, across a globally distributed network. In addition, these enclaves must be capable of working “off-line,” then seamlessly rejoining the global network following combat or contingency degradation. Additionally, a capability that can plan, allocate and integrate logistics resources effectively and quickly on a global scale in support of the operational needs of the combatant commanders.

**Transportation Node Optimization** - Warfighters need a single integrated view of force movement and sustainment planning requirements to provide a continuous and optimal balancing of total demand and capacity from plan inception to mission completion.

**Information Science and Technology** - This area involves the maturing of technologies that support state-of-the-art capabilities for the Warfighter in the analysis, assimilation, and dissemination of real and simulated digitized battlespace information. Interests include, but are not limited to: intelligent software agents, course of action analysis, transportation planning and feasibility, embedded training, optimization and resource allocation solutions, collaborative technologies for distributed work environments, and data visualization.

**Knowledge Management Layer** - The operational and technical requirements of an effective near real-time global transportation network cannot be achieved through the application of legacy data-centric software design and development principles. Such a network calls for a degree of interoperability and a level of collaborative decision-support that are not available in any existing industry or government software environment of comparable scale. USTRANSCOM is looking to create an information-centric knowledge management layer on top of a data-centric Corporate Data Environment meta database layer.
Process Management and Business Rules - Joint process descriptions and business rules either do not exist or are unclear for many key deployment and distribution processes. A lack of well-defined, integrated process descriptions causes shipment delays, wastes resources, and undermines efforts to streamline the supply chain. The lack of business rules creates organizational and communication breakdown and precipitates a lack of control. Additionally individuals spend large amounts of time combing through mountains of data, often stored in silo enclaves, to assemble pertinent information for decision-makers.

Predictive Forecasting - The warfighter needs ability to more accurately forecast future logistics requirements. The JDDE lacks the capability to predict maintenance and logistics requirements to enhance operational needs and optimize the supply chain, both forward and reverse flow. Where predictive maintenance/logistics forecasting capabilities exist, they are not linked (machine-to-machine) to distribution and logistics support responses.

Risk Assessment - There is a lack of available real-time risk assessment information for commanders and deploying units to rapidly determine acceptable levels of risk while en route to final destinations or to an intermediate staging locations.
End-to-End (E2E) Asset Visibility - Stakeholders throughout the deployment and distribution process require the ability to determine shipment status (where has it been, where is it now, and what condition is it in) through system access at the beginning of a movement through the various nodes to the final destination/point of need. The availability of this information contributes to inform decision making, confidence in the supply chain, and improve overall performance of the logistics processes. Although much asset visibility data resides in USTRANSCOM's Integrated Data Environment/Global Transportation Network Convergence (IGC) system, challenges remain in the effectiveness and efficiency of data capture, visibility of assets in-theater, and ability to create an enterprise view of the data. USTRANSCOM is interested in partnering with other organizations to provide solutions to overcome challenges including integration of asset visibility data into appropriate business processes and system(s).

Automatic Identification Technology (AIT) - AIT and automated information systems (AIS) are two of the basic building blocks in DoD’s effort to provide timely asset visibility in the logistics pipeline, whether in-storage, in-transit, in-process or in-theater. Specifically, AIT is used by a business AIS to capture the identity of materiel or packaging at each layer of consolidation to improve logistics processes. AIT also contributes to the track-and-trace capability within the Department’s supply and distribution operations. USTRANSCOM is interested in partnering with other organizations in AIT solutions that improve logistics processes in a resource-constraint budget environment.

Cloud Computing - Explore, demonstrate and prototype a modern cloud computing environment which supports migration of multiple applications from current DoD environments. Goal is to show the utility of a vendor agnostic cloud computing environment which demonstrates the value of open architectures, modern tools and services while adhering to appropriate DoD Computer Network Defense Service Provider (CNDSP) security methodologies. Prototype environment must demonstration and support these key areas of interest: business intelligence, analytics, rapid prototyping, performance dashboards, continuous development and testing, and containerization.
Survivable Communications - The JDDE needs technical solutions that address survivable and secure communications and networks, information infrastructure protection, and survivable systems engineering. The objectives of the research are to provide secure, survivable, and assured communications over both wired and wireless networks to include highly mobile networks.

Data - Explore ideas and prototype tools for advanced data management concepts, including schema integration and data warehousing, in a standardized data environment. Allow transparent access to multiple heterogeneous databases, data mining, and knowledge discovery in large distributed databases. Organize unstructured/multi-structured data and documents into easily searchable queries to enhance data analysis.

Electronic Data Interchange - Today USTRANSCOM and its components use electronic data interchange (EDI) to communicate with its industry partners. EDI continues to evolve/mature to meet requirements. The move towards a service-oriented architecture provides additional opportunities for EDI that did not exist previously. There is a need to assess the current state of how EDI is being used and then evaluate where there may be opportunities for future enhancement.

Secure Collaboration with Commercial Partners - USTRANSCOM has interest in exploring concepts which minimize risk to passenger and cargo movement data on commercial scheduled or chartered plane, ship, truck, bus, barge, and rail services leaving the Defense Information Systems Network (DISN) and shared with commercial partners. Capability must allow for assured, secure and trusted communications protected with Federal Information Processing Standard (FIPS) 140-2 compliant cryptography. Solutions must require minimal management/infrastructure overhead, be able to integrate into existing DoD and commercial information systems, and leverage government-owned/operated capabilities to the maximum extent possible. Goal is to securely collaborate and share information with commercial partners while ensuring confidentiality, integrity, and availability of U.S. transportation data residing outside of the DISN.

Cyber Security - USTRANSCOM and its components must be able to defend its information, detect and mitigate cyber threats against mobility platforms, networks, and C2 systems to continue uninterrupted operations. This requires a platform independent capability to secure deployment/distribution information resident in or traversing low assurance info networks/environments. This includes predictive analysis techniques/tools to dynamically assess future threats, attack vectors, and attacker intent and anticipate actions before they happen (i.e., the capability to defeat an attack before it happens, instead of having to react to it as it occurs). Capability must allow for assured, secure and trusted communications protected with Federal Information Processing Standard (FIPS) 140-2 compliant cryptography. Solutions must require minimal management/infrastructure overhead, be able to integrate into existing DoD and commercial information systems, and leverage government-owned/operated capabilities to the maximum extent possible. Capability must enhance government collaboration in its ability to predict, detect, analyze, assimilate, mitigate, and deter cyber threats.