

SPECIFIC MARKET AREA FINDINGS

Summary: The project team reviewed the industry supply chain analyses, R&D, and academic information and assessed North Carolina's relative capacity in each market area using the following criteria:

- Industry growth expectations;
- Number of relevant companies in the state/location quotient (ratio of company concentration to that of the U.S.);
- North Carolina's research and education assets;
- Known niche specialties; and
- Long-term sustainability in North Carolina.

Mature Market Areas: C4ISR, Performance Materials, and RESET

Overall: Among the six market areas analyzed, the following three areas had the highest level of industry, academic and R&D strengths, thus promising economic development opportunities to support expansion and company recruitment.

Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR)

Definition: Systems, procedures, and techniques used to collect and disseminate information. This includes intelligence collection and dissemination networks, command and control networks, and systems that provide the common operational/tactical picture. C4ISR also includes information assurance products and services, as well as communications standards that support the secure exchange of information by C4ISR systems (digital, voice, and video data to appropriate levels of command).

Example technologies include hardware, such as radios, receivers, satellites, relays, routers, computers, and other information technology infrastructure. For Intelligence, Surveillance, and Reconnaissance ("ISR"), examples include the use of remote sensors (infrared, optical, radio frequency sensors) placed on platforms such as satellites and unmanned vehicles. For Command and Control, technologies require computing power and computer algorithms to fuse multiple sensor inputs and data streams into decision-support software to provide situational awareness. Other software algorithms and programs applied to C4ISR include those that ensure interoperability among disparate communications systems, encryption algorithms to ensure secure communications, signal detection and image processing methods, anti-jamming and low probability of signal intercept techniques, communications networking protocols, and inertial navigation. Threat warning systems and electronic countermeasures such as jamming techniques and decoys are also included in this technology area.

Skills and education critical to companies in this market area include computer, mechanical, electrical, programming and software engineering; information technology; mathematics; physics; statistics; and earth sciences.

Growth Potential: Expected funding for this technology area is strong—buying more surveillance hardware and software is less expensive than employing human surveillance and continues to be a priority for Secretary of Defense Robert Gates. The DoD plans to invest over \$28 billion through the

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Business and Industry Capacity: RTI identified at least 15 industries associated with C4ISR, and recommended three critical industries for initial supply chain analysis in North Carolina: Custom Computer Programming Services, Broadcasting and Wireless Communications Equipment, and Other Telecommunications. As of 2007, North Carolina had approximately 120,000 people working in these 15 industries, with Custom Computer Programming Services having the most well developed supply chain in the state among the other industries.

C4ISR has a strong level of involvement from existing industry in North Carolina, with more than 50 companies already engaged as defense prime contractors. General Dynamics Armament and Technical Products (GDATP), an operating unit of the General Dynamics Corporation, is headquartered in Charlotte and is a proven systems integrator of defense products for all branches of DoD. General Dynamics Advanced Information Systems has a presence in Greensboro, and develops systems integration, development, and operations support products for the military. Tactronics, located in Fayetteville, designs, develops and manufactures integrated PC-based mobility platforms for the U.S. Special Operation Forces, the U.S. Army and U.S. Navy.

North Carolina is also home to a number of small defense businesses engaged in C4ISR, including Raleigh-based Vadum Inc., which provides products to a DoD task force focused on counter-improvised explosive device technologies; and RLM Communications, based in Fayetteville, which provides communications support services—spanning research to lifecycle sustainment support—to U.S. Special Operations Command and many other DoD clients.

North Carolina has strong competitive advantages in niche industries that can be leveraged to support the growth of this market area as well as strong employment growth. Within the Research Triangle region, companies such as IBM, Cisco Systems, Sony Ericsson, Nortel Networks, and SAS have core capabilities in computing, networking, and communications. Among the core industries analyzed under C4ISR, North Carolina has particular strength in the manufacture of broadcasting and wireless communications equipment compared to the nation as a whole. The Partnership for Defense Innovation (PDI)—a leading statewide defense development organization—directly supports C4ISR modeling, simulation, design, prototyping, testing, integration and exploration of emerging technologies. In addition to its existing wireless laboratory, PDI has been funded to build a state of the art C4ISR Lab which will help support the Information and Intelligence Warfare Directorate.

The state possesses existing niche strength in the Gaming/Simulation cluster in the Research Triangle region, which is supported by a variety of university and community college programs. There are more than 30 gaming companies that employ more than 1,000 people in the Research Triangle region, many of which support defense contracts. Examples of leading companies and organizations include Applied Research Associates, Emergent Games Technologies, Epic Games, RTI International's digital solutions group and Virtual Heroes.

From a workforce perspective, C4ISR likely has the largest need for personnel with security clearances among the six areas studied, which could be fed by transitioning military personnel from installations in North Carolina. Company interviews indicated that the state does not have a strong network of interconnected buyers and suppliers, and suggested networking events to build stronger in-state relationships within this market area.

Potential Crossover Area: Cyber security has become a high priority for DoD and DHS due to the increasing number and costly cyber-intrusions into their computer networks. As a result, the federal government is increasing its demand for training, technology and personnel in cyber security. This rapidly rising priority for DoD and DHS represents a crossover area for North Carolina computer encryption and cyber security companies that support the sizable banking industry in the state.

North Carolina has particular strength in the manufacture of broadcasting and wireless communications equipment compared to the nation as a whole.

Higher Education Capacity: C4ISR has among the greatest university R&D strength of the six areas studied. The UNC system has 54 undergraduate, graduate, and certificate programs in computer and information sciences, producing nearly 1,000 computer science graduates each year from 14 campuses across the state. Examples of post baccalaureate certificate programs include University of North Carolina-Greensboro's Information Assurance and Security Certificate Program and East Carolina's Geographic Information Science and Technology Certificate.

Leading research centers include the the Center for Rapid Product Realization at Western Carolina University and the Center for Human-Centric Command & Control Decision Making at North Carolina Agriculture and Technology State University ("NC A&T SU") which provides sensemaking support models to the U.S. Army for the creation of networks. NC A&T SU is also engaged in development work on sensors for the Air Force Research Laboratory and the Army Research Laboratory. The University of North Carolina-Charlotte's ("UNC-C") leading efforts in integrated modeling and simulation for the Defense Intelligence Agency has attracted significant attention from other DoD contractors; and its Visualization Center is already one of five Regional Visualization & Analytics Centers for DHS. It won the recent competition for a DHS National Center for Command, Control and Interoperability, which will build on the center's work for defense. UNC-C also hosts the Center for Optoelectronics and Optical Communications and has a Cooperative Research and Development Agreement with the Navy's Space and Naval Warfare Systems Center related to computer encryption.

Additional key examples include the Renaissance Computing Institute at University of North Carolina-Chapel Hill ("UNC-CH") and the Center for High Performance Simulation at North Carolina State University ("NCSU").

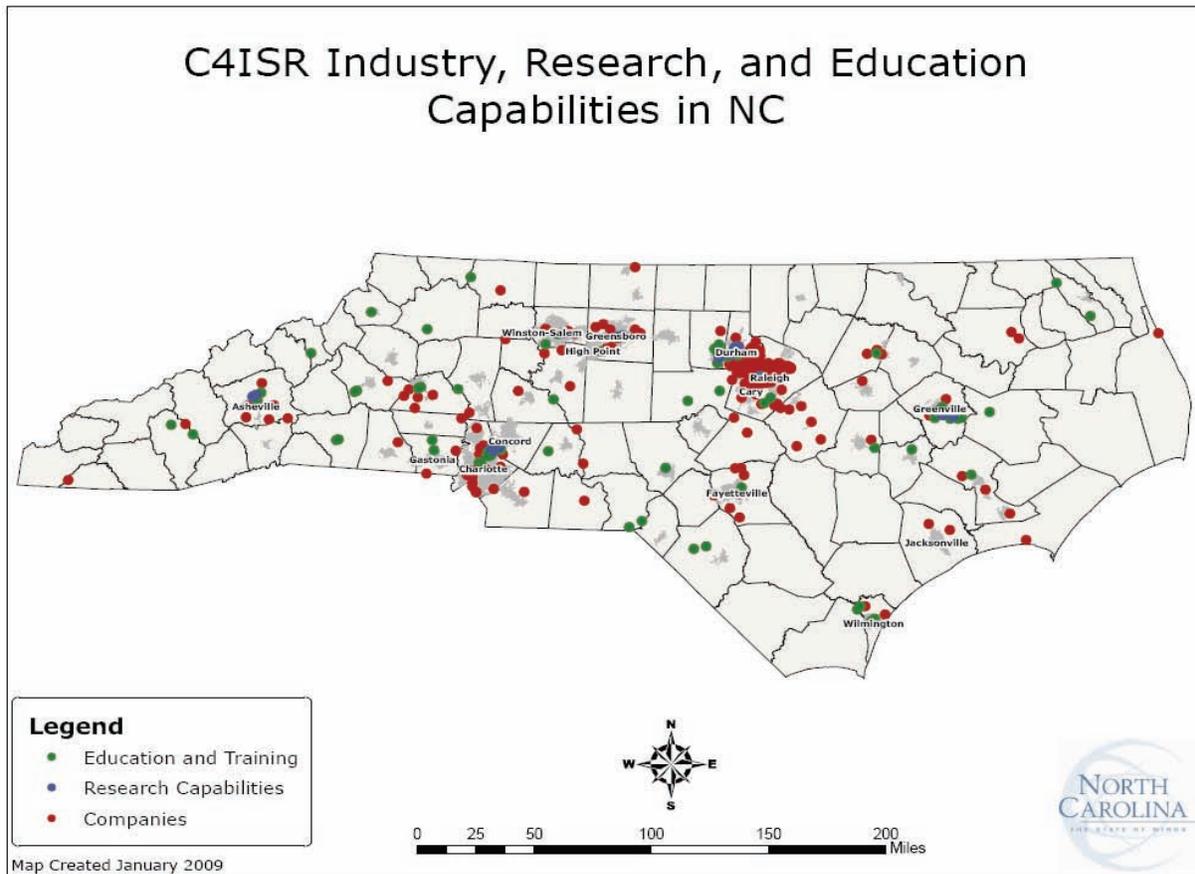
Within the community college system, there are over 25 campuses across the state that offer training in computer, electronics, and mechanical engineering technologies that can support the workforce needs of companies and industries under the C4ISR market area. Among these, Wake Technical Community College has a highly regarded degree program in Gaming/Simulation program development.

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Snapshot: C4ISR Industry Cluster Analysis

Core Industry	Employment (2007)	Employment Growth (since 1992)	Avg. Annual Wage (2007)	Value Added LQ (2006)	Employment LQ (2007)
Custom Computer Programming Services	17,363	253%	\$84,032	0.71	0.97
Broadcasting and Wireless Communications Equipment Manufacturing	3,737	54%	\$98,644	2.09	1.84
Other Telecommunications	29,191	37%	\$63,128	0.59	1.26

Note: For this and following charts, Location Quotients ("Value Added LQ" and "Employment LQ" above) are ratios that compare the concentration of a resource or activity, such as employment, in a defined area to that of a larger area or base. Location quotients are used to compare North Carolina's employment and value added (output) by industry to that of the nation. A location quotient of 1.0 suggests that the concentration of state employment (or value added) for a given industry in North Carolina is equal to the concentration experienced by the United States as a whole. An Employment Location Quotient greater than 1.25 indicates a core industry strength.



Note: Companies mapped using the following NAICS codes and are indicative of capacity in these industries: **334220:** Broadcasting and Wireless Communications Equipment Manufacturing; **517910:** Other Telecommunications; and **541511:** Custom Computer Programming Services

Performance Materials

Definition: The DoD's goal for performance materials is to create lighter and stronger materials that are used in a wide variety of applications, including defense vehicles, electronic systems, protective gear, and uniforms. Example materials include composites, such as aramid, ultra-high molecular weight polyethylene, and S-2 glass-fiber reinforced polymers; thermoset fiber-reinforced composites for products ranging from body armor to armaments; nanomaterials using carbon nanotubes or nanoparticles for fuel cell catalysts; and multi-functional materials, such as fabrics combined with electronics for heating/cooling of protective clothing as well as "smart" uniforms that can relay data to a centralized network on the battlefield (a strong emerging area with high potential value globally). Metamaterials is a renewed field of interest as well, using plasma and electromagnetic fields to bend light to assist in stealth operations.

Critical skills and education required by companies in this market area include chemical engineering, materials science, chemistry, physics, and polymer processing technicians.

Growth Potential: According to DoD, Defense Supply Center Philadelphia purchased approximately \$2.2 billion in clothing alone during FY 2008. This amount is expected to grow to \$2.8 billion during FY 2009, and increase as the Army and Marine Corps add to their end-strength. According to Vector Strategy, advanced composites and ceramic materials for military ground vehicle armor could represent a \$3 billion opportunity between 2010 and 2015 (inclusive) as these non-metal