Unmanned Systems

Definition: Unmanned Systems are vehicles (air, land, sea) that utilize C4ISR technologies, replacing on-site human presence in their operations. Unmanned Systems include four main components:

- Platform: Aerostructure, chassis, or hull, which is the vehicle that carries the command and control electronics, sensors, and weapons for the unmanned system. This includes ground vehicles, such as small wheeled off-road vehicles or large tanks; aircraft, including small hand-launched devices, vertical-launched systems, such as helicopters, and traditional aircraft systems; and water-based platforms, such as underwater vessels and surface ships.
- Control: The electronics, communications, and computer systems required for navigation, guidance, and control of the vehicle. This includes communications systems required for tele-operation, robotic mechanical mechanisms, sensors for motion and proximity detection for mobility, and intelligent systems algorithms and programs for autonomous operation and human-robot interaction.
- Propulsion: The engines or fuel cells needed to move the system.
- Payloads: The equipment that the unmanned system carries in order to fulfill its mission. Examples include remote sensors for reconnaissance, communications links, and weapons. Unmanned rescue systems carry humans as payloads out of hazardous situations.

For purposes of this analysis, the Unmanned Systems technology area focuses on the first two components, since propulsion is covered under Fuel and Power, and payloads are covered under C4ISR.

Critical skills and education required by companies engaged in this market include aerospace, electrical, mechanical (vehicle and robotics), and marine engineering; automotive and mechanical technicians; computer science; computer programming; and information technology.

Growth Potential: In 2000, the U.S. military had fewer than 50 unmanned aircraft in its inventory; as of May 2008, the number surpassed 6,000 (GAO, November 2008). From 1999 to 2009, U.S. military unmanned aircraft procurement grew from $500 million to $3.5 billion–a seven-fold increase that represented an average combined annual growth rate of 21 percent during this period of new investment (*Military & Aerospace Electronics,* December 2008). Current funding plans for unmanned systems reflect their growing importance to the military. In FY 2009, the DoD requested approximately $3.5 billion for unmanned systems procurement and R&D—approximately $1 billion more than the department's FY 2008 request. In recent statements about shifting defense budget priorities, Secretary Gates stated that unmanned systems will continue to be a priority and will receive increased funding.

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Business and Industry Capacity: For the elements of Unmanned Systems not covered under C4ISR and Fuels and Power Sources, RTI identified at least 24 core industries that comprise the Unmanned Systems market area and recommended the following six critical industries for initial supply chain analysis in North Carolina: Search, Detection, Navigation, Guidance, Aeronautical, and Nautical System and Instrument Manufacturing; Scientific Research and Development Services; Boat Building; Military Armored Vehicle, Tank, and Tank Component Manufacturing; Aircraft Manufacturing; and Semiconductor and Related Device Manufacturing. As of 2007, North Carolina had approximately 26,000 people working in these six core industries.

Given the concentration of relevant industries in the state and the emergence of several key companies directly engaged in this area, the best opportunities for the state include supporting payload requirements of Unmanned Systems through C4ISR products and technologies and exploring further the growing market for the development of unmanned ground and underwater systems.

Seven UNC campuses offer a variety of engineering degree programs...

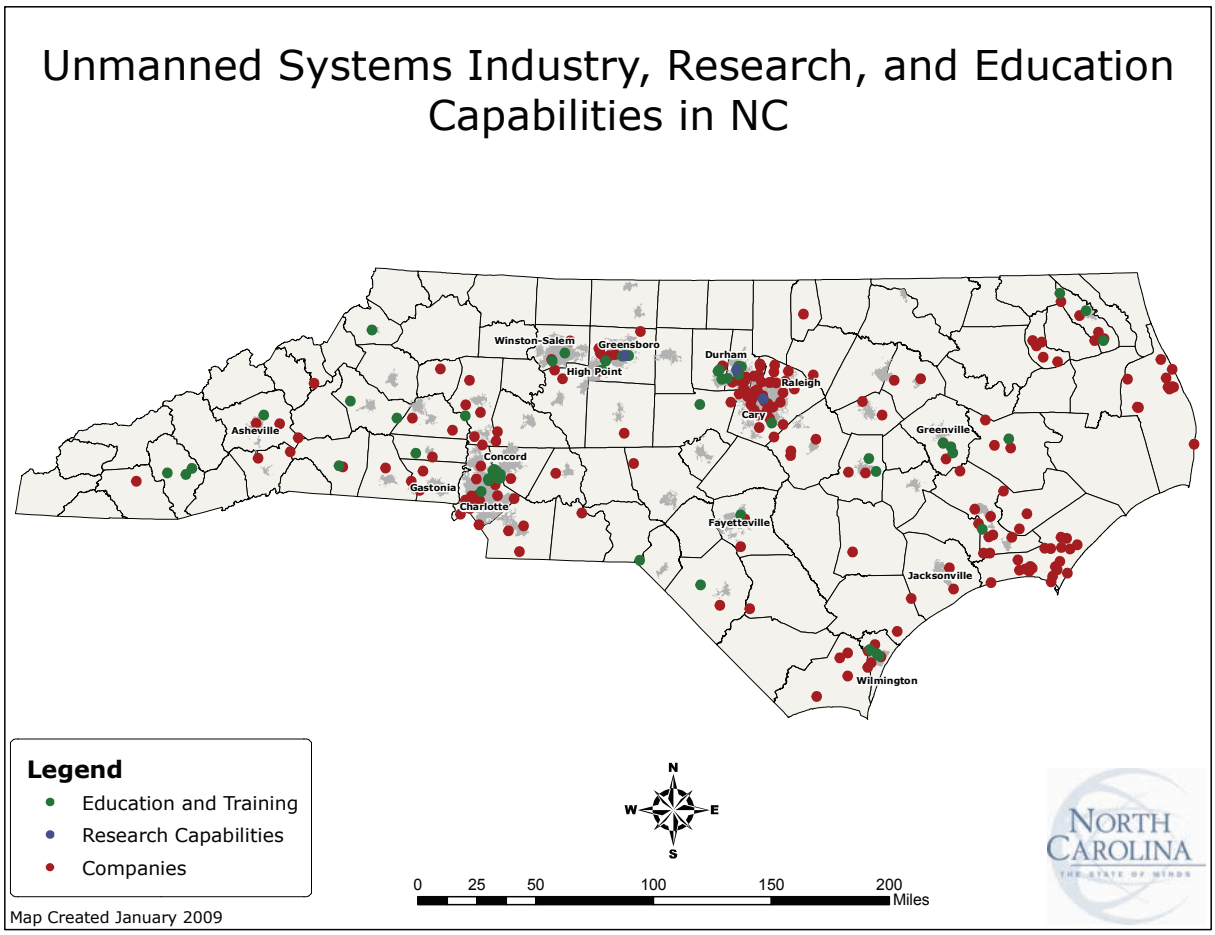
For ground systems, from the top-level industry analysis, no companies were identified that were already in this market, though North Carolina has some potential capability to support related programs from existing elements of the motorsports industry and vehicle supply chain. Regarding unmanned underwater vehicles, North Carolina has one company—iRobot—and a large boating industry that may be able to crossover and support this sub-sector. In late 2008, a leading unmanned systems company based in Massachusetts, iRobot, acquired Durham-based Nekton Research, and has designated them the lead in developing unmanned underwater vehicles for the parent company. A-B-Sea Research is a young start-up company based in Raleigh that makes underwater navigation and GPS "satellites" that also contributes to this market. In partnership with the U.S. Navy, Kinston-based Spatial Integrated Systems, Inc. has developed a robotics system that will allow any waterborne vessel to become fully autonomous and able to complete a vast number of missions without a human in control. Finally, 3 Phoenix, with a presence in Wake Forest, has developed on-board navigation and surveillance computer systems for unmanned underwater vehicles that has been recognized nationally as a small business success story by the DoD. Sensor fusion and sensor manipulation are niche growth areas for North Carolina companies that expand the usefulness and scope of Unmanned Systems.

The state has some existing activity in the niche area of "lighter-than-airships" (LTA) in the region around Elizabeth City. TCOM is the only LTA company in the world with a facility, located near Elizabeth City, devoted to aerostat and airship manufacture, assembly, flight test and training operations. Additionally, Guardian Flight Systems LLC has developed a prototype unmanned airship for persistent surveillance that can be launched, operated, and recovered with a four-man ground crew.

While North Carolina has experienced tremendous growth in Aircraft Manufacturing (1047 percent employment growth versus a decrease of 36 percent nationally from 1992-2007), the leading sub-sector of unmanned aerial systems is relatively established by existing aerospace companies with little activity in the state. While North Carolina does not have strong access to restricted air space for testing, which is a disadvantage over the western U.S. states, the state is highly competitive in terms of manufacturing costs. Underscoring the limited access to restricted airspace, MCAS Cherry Point's aerial VMU-2 Squadron faces annual challenges to gain approval from the Federal Aviation Administration to fly unmanned systems in local airspace.

Potential Crossover Area: Interviews and research for this study indicate that underwater testing facilities are critical to companies that are developing unmanned underwater vehicles. EUE Screen Gems Studios (located in Wilmington) possesses one of the largest special effects water tank facilities in North America. This existing facility presents a potential crossover area where unmanned underwater companies could utilize this 60' x 60' x 10.5' tank for underwater testing — including saltwater—of their vehicles.

Higher Education Capacity: Leading R&D centers for this technology area include the Center for Autonomous Control and Information Technology as well as the Center for Cooperative Systems—both located at NC A&T SU; and the Center for Robotics and Intelligent Machines at NCSU. The UNC-C Mechanical Engineering Motorsports Center recently constructed the fifth largest water tunnel in the United states, putting it in a league with those operated by the U.S. Navy and MIT. Water tunnel research applications include the study of vehicle aerodynamics, fuel efficiency, aerospace experiments, and submarine/surface vessel efficiency. Seven UNC campuses offer a variety of engineering degree programs, including mechanical engineering degree programs at NCSU, NC A&T SU and UNC-C. Elizabeth City state University supports local industry through a degree program in Aviation Science. UNC campuses produce roughly 3,000 engineering graduates annually, roughly 500 of which are mechanical engineering degrees. Within the community college system, there are at least 16 campuses across the state that offer training in mechanical engineering technology and aviation systems technology, which could support the workforce needs of business and industry in this market area.



Note: Companies mapped using the following NAICS codes and are indicative of capacity: **336992:** Military Armored Vehicle, Tank, and Tank Component Manufacturing; **336612:** Boat Building (includes remotely operated); **336411:** Aircraft Manufacturing (includes drones, helicopters); **334413:** Semiconductor and Related Device Manufacturing; **334511:** Search, Detection, Navigation, Guidance, Aeronautical, and Nautical System and Instrument Manufacturing; **334513:** Instruments and Related Products Manufacturing for Measuring, Displaying, and Controlling Industrial Process Variables; **541712:** Research and Development in the Physical, Engineering, and Life Sciences (except Biotechnology); **335314:** Relay and Industrial Control Manufacturing.