TESTIMONY

Testimony of:

Mr. Richard Carroll, Chairman and Chief Executive Officer of Innovative Defense Strategies, LLC

To: House Armed Services Committee Joint Subcommittee Hearing of the Tactical Air and Land Forces Subcommittee and Projection Forces Subcommittee

On: "Experiences and Recommendations for Innovation and Defense Transformation"

Washington, DC

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I want to first thank Chairman Weldon, ranking member Abercrombie, Chairman Bartlett, ranking member Taylor, and the all the members of the subcommittees for the opportunity to testify about small business innovation and defense transformation. I commend the subcommittee for being proactive on this issue, which I believe to be one of the most important national security issues for our country.

My name is Richard W. Carroll, and I am Chairman and CEO of Innovative Defense Strategies, LLC (IDS). IDS is an organization I founded in 2003 to develop and implement strategies for introducing innovation and creative transformation into our DOD. Prior to founding IDS, I was founder and CEO of Digital System Resources, Inc. (DSR). DSR was an innovative high tech company which was very successful transforming our defense customers, primarily the Navy, from costly legacy systems to innovative cost efficient technology based solutions. DSR's most recognized accomplishment is our very significant innovations in the development of new Sonar for our Nation's submarine fleet. The Navy's program, called the "Acoustic Rapid COTS Insertion Program", has been widely acclaimed as rapidly transforming Sonar onboard our feet of Submarines to address new threats. In addition, the process used and lessons learned in this program has been widely cited and recent published in the Naval Engineers Journal. This article, authored by William Johnson, who works for the Program Executive Officer for Integrated Warfare Systems (PEO IWS), is an excellent overview of the program, its successes, obstacles encountered, the processes used, and give a good sense of what program managers on DOD programs have to deal with in every day life. I am not going to repeat all the information contained in this article but I do want to commend the author, Mr. Johnson, and all of the other individuals and organizations that participated and are continuing to participate on this exemplary program. I also ask this article be incorporated in the official record.

What I do want to do is use my experience gained from involvement in this program, my experience as a past Chairman of the Small Business Technology Coalition, and my 20

plus years of experience in dealing with the acquisition of innovative technology in defense systems to make recommendations on how to facilitate pathways for this process.

In my 20 plus years of experience I have noticed one very common characteristic of most defense acquisition programs which I have come to learn is the biggest obstacle to affordability and innovation. This characteristic is that program managers and program executives usually have very limited alternatives to achieving their program technology objectives. By the time they are into the major technology developments in their programs they have usually down-selected their industry options to just one prime contractor. In spite of the fact that they may have had a competition to make their selection, the procurement process has left them with a winner take all result that they must manage for a very long time. It is not unusual to have one prime contractor for decades. While technology may change dramatically in 3 years, they have effectively eliminated competitive alternatives.

Developing strategies and training the acquisition system to have on-going competitive alternatives for defense programs is my first recommendation. Creating an on-going competitive defense marketplace is not met by simply holding a competition. The Department of Defense holds many competitions for defense systems and services, but this does not ensure a continual competition for more innovative solutions, new ideas, and technologies. In fact, I believe that most people would agree that once the competition to decide who will build a system or provide a service ends, so do the competitive pressures to perform. I feel that small high technology companies can and should be a major source of competitive alternatives for many elements of defense acquisition programs. Small technology companies also offer the best opportunities for creative transformations. The process of creative transformation is the phenomenon that enables rapid change in our market-driven society and would be the most powerful tool to accelerate the identification, maturation, and transition of advanced technology to our military forces.

I cannot stress the importance of creating a truly competitive defense marketplace. It is my profound belief that the best way to bring innovation, affordability, and rapid transition of technology into defense systems is to create more viable competing alternatives. Competition promotes innovative solutions, forces contractors to find ways to reduce costs, and lends a sense of urgency to defense programs. In stark contrast to today's environment, my vision for the Department of Defense acquisition environment would be the following:

- All DOD contractors would feel under continual competitive pressure to deliver the highest performance, most innovative, most affordable, and most capable systems; A lapse of one to two years would result in a loss of significant market share.
- DOD prime integrators would feel under continual competitive pressure to outsource subsystems and components to the most capable companies. To do otherwise would result in a loss of significant market share; and
- Competitive alternatives would exist for many DOD development and production programs.

My second recommendation is that the Congress and the Administration create "The Commission on Defense Innovation and Transformation" to develop additional recommendations for the modification of Defense Management processes to facilitate innovation and transformation. It has been nearly 20 years since President Regan created "The Presidents Blue Ribbon Commission on Defense Management, commonly known as the Packard Commission. Much of today's defense management structure is based on the Packard Commission recommendations. I believe these recommendations were excellent recommendations for the time and that many are still very appropriate. I also recognize that both our threat environment and technology environment are significantly different today. A review of defense management processes would be helpful to identify

more effective pathways to transformation, innovation and affordability. The 911 Commission identified many very useful items to be applied to the intelligence community which may also apply to the DOD. The Administration, Armed Services Committees and Government Reform Committees should take advantage of the reform momentum created by the 911 Commission and put in place "The Commission on Defense Innovation and Transformation". I believe that staffed properly, one year would be adequate to develop very useful recommendations. The creation of this commission would send the message to the U.S. public that the Congress and Administration are proactive in the transformation of defense capabilities to meet the rapidly changing threat environment.

In closing, I want to commend the Committee for holding this hearing. Given our aging military systems, constrained budgets, and changing war fighting environment, the question of how to accelerate the identification, maturation, and transition of advanced technology to our military forces is absolutely critical. I would like to close by reflecting on a part of Defense Secretary Rumsfeld's testimony to the Senate Armed Services Committee on June 21st, 2001, and I quote Secretary Rumsfeld "The new threats are on the horizon. And with the speed of change today – where technology is advancing not in decades but in months and years – we cannot afford to wait until they have emerged before we prepare to meet them. After the new threats emerge, this opportunity may not be available. The risks of transformation could be much greater then – perhaps unacceptably so".

Again, thank you for the opportunity to testify. I look forward to answering any questions you may have.

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Delivering Combat Power to the Fleet, Now!

A Case Study in Rapid Acquisition

The A-RCI Process --- Leadership and Management Principles

By William M. Johnson

Abstract

In the mid 1990's, it became clear that the U.S. submarine force had lost the acoustic advantage over contemporary Soviet new construction submarines. At the same time, investment in undersea warfare suffered a marked reduction as the Total Obligation Authority within the Services continually eroded the means to develop capabilities in the traditional manner. New acquisition processes had to be created to grapple with the need to rapidly increase warfighting performance while continuously decreasing cost. The keys to solving this dilemma are based on three fundamental truths. First, meaningful competition for ideas always yields a better product at reduced cost. Second, the commercial marketplace readily provides low cost, high performance general purpose processing technologies. Third, the U.S. forward deployed naval forces can provide rapid, hands-on customer feedback. These three elements are the centerpiece of the Submarine Acoustic-Rapid Commercial-Off-the-Shelf Insertion (A-RCI) Program, which provided the vision and strategy to institutionalize a rapid acquisition process through new leadership and management approaches, that has delivered to the Fleet a seven-fold increase in submarine towed array sensor performance --- while realizing a 60-fold decrease in real processing costs.

Introduction --- Why Change?

In the wake of the dissolution of the Soviet Union, we have experienced a series of regional conflicts, including the current global war against terrorism. Thus, the threat we face today is multi-faceted, often trans-national and generally asymmetric to our current combat forces and capabilities. Our forces must adopt new capabilities to address each new threat, on timelines never before experienced. Our acquisition processes must evolve to meet this challenge.

The rate of change of information technology has been increasing steadily for the last two decades. The focus has evolved from hardware to software, from data management to knowledge management, while the time to obsolescence of new information technology continues to decrease.

A new approach to acquiring and fielding warfighting capabilities is required to take advantage of new information technologies as they emerge, while affordably maintaining a decisive operational advantage with respect to our increasingly sophisticated adversaries.

Today's Constraints

In light of the rapidly changing operational and technological environment, it is imperative that the acquisition community become able to rapidly deliver appropriate warfighting capabilities. In undertaking to deliver this new, enhanced combat power to the Fleet, there are four fundamental issues constraining the traditional acquisition process that must be overcome for rapid, affordable acquisition to occur.

First, the closed business environment. Dominance of our combat system development process by a small number of industry giants inhibits the exploitation of rapidly improving performance and the reduced costs of commercially-derived equipment and systems that are "open" to other vendors. The Navy should not be inhibited by the business environment from engaging additional independent sources.

Second, the acceptance of a traditional development time. Increasingly, the inability to update previously developed software or change out hardware in a timely manner inhibits software refresh and hardware modernization. The Navy desires rapid technology re-fresh and capability improvement on timelines inconsistent with the traditional approaches.

Third, the competition of ideas is often inhibited. Competition by industry and laboratories for limited funding creates an environment where it is not in any participant's best interest, either government or industry, to share information and scientific breakthroughs with others, especially true in the current, closed environment.
The Navy should desire and encourage an arrangement to engage all the brightest scientists and engineers in a process that fosters cooperation and rewards participation by all possible contributors. True competition of ideas improves the product.

Fourth, Fleet participation is detached from the acquisition process. Today, the end user (the Fleet) is too often not a party to the design and engineering process. There is a need for direct feedback from the Fleet in all acquisition stages: requirements generation, concept development, design and engineering, test and evaluation, and delivery, including training and logistics support. The complex systems and capabilities

being developed require an iterative process explicitly incorporating Fleet warfighter input, in each stage.

A-RCI --- An Example of a Relevant Success in the Submarine Community

In the mid 1990s, the U.S. Navy was at a critical juncture. The U.S. nuclear submarine force was losing its acoustic superiority over potential adversaries. The traditional response would have been a multi-billion dollar development program stretched over 12 or more years, unacceptable in the austere 1990's fiscal environment. America's edge in undersea superiority had significantly eroded, and something needed to be done quickly. The Navy undertook a novel approach to solving this loss of warfighting advantage by formulating the Acoustic-Rapid COTS Insertion (A-RCI) program. A-RCI was structured to overcome the four constraints discussed above through the introduction of five innovative approaches.

First, a program was initiated to create an open business environment, with the goal of forcing industry collaboration and creating incentives for individuals to excel. A new business model was adopted. The Navy used the competitive format of the Small Business Innovation Research (SBIR) program to select a company able to develop a new acoustic processing system composed of commercial-off-the-shelf hardware, a Multi-Purpose Processor (MPP), to be used for all submarine towed array acoustic processing. The advantage of utilizing the right small business over larger, traditional defense businesses is their agility, flexibility, and adaptability.

Second, new explicit architectural concepts were developed that allowed engineers to decompose new systems along natural and logical boundaries, at the functional string and thread level, to enable focused, iterative design and assessment. The application software was segmented along natural and logical boundaries, and then isolated in functional modules. Each functional module can stand-alone or be re-used and installed in another system application. The result is that modules of software developed for nuclear attack submarines can readily be used on different computer processing hardware for Surface Ship ASW functions and shore-based acoustic intelligence analysis, even though the hardware and specific end applications are different.

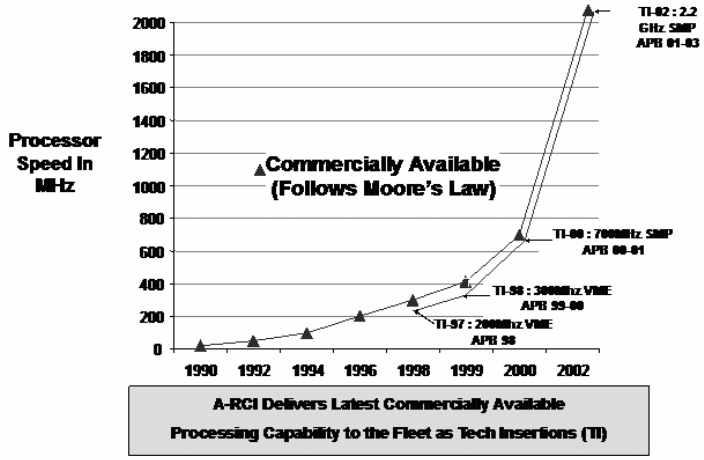
Third, a process was established that explicitly recognized that the development of adaptive, complex systems requires an iterative design and development approach that explicitly incorporates Fleet feedback at all stages. Toward this end, a new collaborative work environment known as Advanced Processing Builds (APB) was undertaken, for the development of modular application software. The Navy established a work environment of active peer review utilizing a Build-Test-Build process and using "real world" data sets to evaluate advanced processing techniques. This process accomplished the key objective of developing and delivering new, "best of breed" capabilities in a short period of time through collaboration among industry, navy and university laboratories and

acquisition program headquarters participants. Utilizing the results of each APB, the Navy was able to implement the new software builds quickly and systematically. The builds included not only the tactical software but also the training for each new detection technique.

Fourth, a new software concept, Transportable Middleware (TM), was used. Transportable Middleware isolates the hardware and associated operating system software from the application software, thereby allowing rapid insertion of new technology to be made to the software applications. Additionally, TM is hardware independent, so that application software can be readily transported to other host hardware computing platforms.

Fifth, because of the short life span of COTS products and the ever-increasing requirement for more computing processing capability, a specific hardware refresh cycle, known as Technical Insertion (TI), was established. The TI cycle ensures that the latest commercially available processing hardware is used in each yearly APB software refresh cycle. As shown in Figure 1, the TI cycle assures the Fleet the same high-performance processors available in the commercial marketplace.

Figure 1
A-RCI Achieves Rapid COTS Insertion
Fleet Deliveries Mirror Commercial Availability



Production baselines last for two fiscal years, and all PC technology can be procured within 12 months. Production contracts are cost plus rather than fixed price and provide the flexibility that allows lead ships to go to sea with hardware that was procured only six months after the product was delivered to the commercial market. Delivery of APB's and TI's are tied to each submarine's deployment schedule. Typically, within a four year

window, a submarine deploys twice. The ship gets a new APB package for each deployment; prior to every other deployment, it gets a Technology Insertion build, providing enhanced computing power that translated to faster response time.

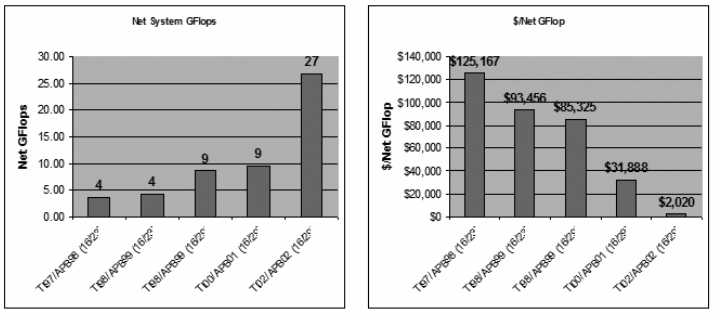
An early example of an APB timeline is APB 99. This effort included towed array (TB-16/29) Processing Improvements involving in excess of 1,000,000 Source Lines of Code and included Concurrent Training Development and Delivery. The effort was initiated in January 1999, Lab Evaluations were completed in July 1999, and a Sea Test was successfully conducted in November 1999. A tactical program integration and delivery for USS MEMPHIS (SSN 691) was conducted from December 1999 through March 2000. USS MEMPHIS deployed on an operational mission in the summer of 2000, with widely publicized positive results.

Then Assistant Secretary of the Navy (Research, Development & Acquisition), the Honorable Lee Buchanan stated that " ... the ARCI program, leverages recent commercial computer hardware and software advances to significantly increase signal processing speed. Early test reports have been outstanding, suggesting up to a seven-fold increase in towed array…tracking ranges and very significant improvements in exploiting unique submarine transient noise." Admiral F. L. Bowman, Director, Naval Nuclear Propulsion, wrote that: "If we are serious about technology deployment, we need start creating opportunities to deploy new capabilities quickly ... Today's successful example of this is A-RCI.[1] "Figure 2 illustrates the dramatic improvements in system and cost performance, in a very short period of programmatic time, yielded by the A-RCI process.

[1] The "Pull" for Submarine Technology - Get Real, ADM F. L. Bowman, USN, The Submarine Review, Naval Submarine League, July 2002

Figure 2

A-RCI System Processing Improvement and Cost Savings



7x Increase in Real Processing from TI 97 to TI 02
60x Decrease in Real Processing Cost from TI 97 to TI 02

Leadership and Management Principles

Our defense acquisition system is designed to seek concurrence from a number of legitimate stakeholders within the Services and OSD. It falls to the Program Manager to provide leadership and management in order to deliver necessary warfighting capability to the Fleet. To be successful, the Program Manager must create an environment that addresses all legitimate programmatic needs, balancing the cost, schedule, performance, and risk dimensions of complex systems. In order to accomplish this daunting task, the Program Manager must develop and adhere to a set of principles that guide effort to a successful outcome. The Program Manager must:

- Set and maintain the **vision**,
- Develop a **strategy** to implement the vision,
- Develop and **cultivate allies** at all levels,
- Instill within the team a sense of **empowerment and entrepreneurial spirit**, and
- Set the **expectations for excellence and the operational pace**.

- Set and Maintain the **Vision**

The Program Manager, with his team and stakeholders, develops a shared vision for the program. The ideal: keep the message simple and consistent, and jargon free. In A-RCI, emphasis was on phased introduction of new capabilities providing improved performance, and measurement of actual performance of the new capabilities

when deployed. A-RCI vision development always heeded the primary Rule of Paleontology: "Complication precedes extinction."

- Develop a **Strategy** to Implement the Vision

To make the vision a reality, the Program manager requires a clear strategy, capturing both long and short-term perspectives. The strategy must define the top program objectives and ensure stakeholders' issues and concerns are addressed so team alignment is possible. This approach is characterized by flexibility, rapid movement and leverage, in order to implement and institutionalize the vision across the enterprise. This type of management approach was characterized in Harvard Business Review in 1999 as a "judo strategy." [2]

A-RCI principles to consider in strategy development include:

- Create an open technical architecture reducing the barriers to competition.
- Require that all systems and components "Design to a 'Virtual Machine' such as a Transportable Middleware interface, to decouple from the accelerating changes in the COTS hardware and software markets.
- Acquire as much management decision authority, as well as funding and contract tasking authority, as possible.
- Stress the traditional infrastructure to create a business focus rewarding rapid change and innovation.
- Exploit rapid contracting mechanisms for industry to allow rapid development, integration and deployment of "best of breed" ideas.
- Conduct level playing ground evaluations featuring peer reviews of "data driven" results to prevent "fixed competitions". Peer Review participants are selected based on their technical credentials and Chairpersons by their independence.
- Use small, highly trained teams, mandating minimal reporting requirements, obviating the natural creep in bureaucratic staff review.
- Ensure a continuous resource stream in all necessary Appropriations, supporting continuous introduction of new capabilities.
- Complex systems need an iterative design and development process explicitly incorporating user feedback.
- Publish and widely promulgate successful results in simple, easy to understand language.

- Develop and **Cultivate Allies** at all Levels

[2] Judo Strategy: The Competitive Dynamics of Internet Time; David B. Yoffe and Michael Cusumano, Harvard Business Review, 1 January 1999

The strongest ally is the Fleet user --- the ultimate customer. Including the Fleet in all phases of the program galvanizes relationships and creates mutual trust and respect essential for success. The Program Manager must continuously develop and nurture allies in a range of communities. From the experience of A-RCI, other key allies included the Science & Technology (S&T) community, other Undersea Warfare platform communities, the Congress, and senior leadership of the Acquisition Community.

A-RCI principles to consider when cultivating allies include:

- Create allies in industry and at all levels of Government who have the power to obstruct, but can also be extraordinarily helpful.
- Create informal relationships with key enabling stakeholders, including multi-platform and associated systems stakeholders.
- Create an organizational structure to allow the best experienced individuals in Government / Industry to influence the design of critical components at a functional string or thread level.
- Changes should be implemented during the tours of individual sailors who will become program advocates, increasing demand pull for more performance improvements.

- Instill within the Team a sense of **Empowerment and Entrepreneurial Spirit**

The Program Manager is responsible for maintaining the motivation, enthusiasm and entrepreneurial spirit of his program team. Participants in the enterprise should see themselves and their contributions mirrored in the successful product. Rapid development, integration and successful deployment of enhanced warfighting capability provide powerful gratification.

A-RCI principles used to create empowerment and develop entrepreneurial spirit include:

- Create incentives for individuals to excel.
- Require continuous technical competition at component, subsystem and system levels.
- Use open and collaborative business environment to determine “best of breed” alternatives for introducing new capabilities, forcing industry collaboration.
- Continually assess deployed operational performance, incorporating Fleet feedback and explicit data gathered from real-world operations.

- Set the **Expectations for Excellence and the Operational Pace**

Finally, the Program Manager must articulate his expectations and define the operational pace by example. This includes setting clearly defined specific, quantified, challenging goals and demanding data-driven analysis and assessment as part of the

decision process at component, subsystem and system levels. Perfection may be unachievable; however, excellence in behavior and action should be expected. Speed to deployment is an essential driver of the process. A key to success from the Fleet's point of view, in additional to performance, is the quality and responsiveness of the logistics support and training.

Some specific A-RCI principles that apply to setting expectations for excellence and operational pace include:

- Create a sense of "urgency of action" by mandating and holding to a disciplined annual deployment of new capabilities.
- Use interlocking award fee structures such that if one contractor fails, all fail --- to ensure cooperative collaboration and participation. Mandate specific Terms and Conditions to insure collaboration among participants (one fails, all fail).
- Conduct annual well defined at- sea test routines to verify performance prior to commitment to deploy.
- Demand Data-Driven Analysis and Assessment as part of the decision process at component, subsystem and system levels.
- End user performance matters --- include the Fleet in the system design process and training definition.
- Institutionalize a development test & evaluation environment using "real world" standard, site-specific data sets for analysis, modeling and simulation.
- Require independent testing, assessment and validation of the system (component) based on Fleet-defined performance value.
- Rapid change mandates that logistics support must be part of upfront engineering. COTS based components require a modern logistics support approach.

Why Did It Work?

The driving energy in the A-RCI process is competition --- at every level. At the product level, the commercial marketplace treats computers, networks and displays as commodities. Customer demand in the commercial marketplace creates competition, drives down costs, and increases speed to market. The Navy must take advantage of these phenomena. At the component level that integrates COTS products into a system component, competition is also realized. In A-RCI, the towed array signal processing, called the Multi-Purpose Processor (MPP), was a substantial and complex part of the acoustic system that was competed. At the intellectual level, there is competition for new, innovative ideas and engineering excellence. The A-RCI developed the Advanced Processor Build process to create an environment where the "best of the breed" ideas and engineering approaches were constantly being sought, identified, evaluated through peer reviews, and rewarded.

In the traditional acquisition process, the power of competition at both the system integrator level and the system prime developer level can be seen. Both approaches offer significant one-time enhancements, but can leave the customer tied to a single developer, who can inhibit or slow change and modernization. Innovation will then become very costly. A-RCI overcame this constraint by introducing real competition at every level.

When products are considered commodities, competition drives down costs. When considering the applicability of the A-RCI process to one's program, one should assess the maturity and adequacy of system performance and the design-constrained performance envelope. When the program or system performance is deemed adequate and system hardware and software components can be perceived as commodities, a larger competitive base can be established --- driving down costs at system, component, software and hardware levels.

Conclusion

In conclusion, budget constraints will continue to be a consideration for all combat system development. Nonetheless, the world and the operational environment in which our naval forces must fight continue their rapid rate of change. The A-RCI process provides an approach to acquiring and fielding capabilities required to take advantage of new information technologies and capabilities as they emerge, and affordably maintain a decisive operational advantage with respect to our increasingly sophisticated adversaries.

By the very nature of the way they operate far forward today, the Fleet itself is the most knowledgeable regarding what new or enhanced capabilities are required. As a consequence, it is vital that the Fleet warfighters be involved in every step of system design and the development process. Every surface ship and aircraft combat system should be considered as potential candidates for employment of the A-RCI leadership and management principles.

Biography:

MR. WILLIAM M. JOHNSON IS THE DIRECTOR OPEN SYSTEMS IN PEO INTEGRATED WARFARE SYSTEMS. MR. WILLIAM M. JOHNSON RECEIVED HIS BS IN ELECTRICAL ENGINEERING IN 1970 AND HIS ME (ELECTRICAL) IN 1975 FROM CORNELL UNIVERSITY, ITHACA NY. IN ADDITION, HE IS A GRADUATE OF THE PROGRAM MANAGERS COURSE AT THE DEFENSE SYSTEMS MANAGEMENT COLLEGE, FT. BELVIOR, VA IN 1989 AND THE SENIOR OFFICIALS IN NATIONAL SECURITY PROGRAM AT HARVARD UNIVERSITY, CAMBRIDGE, MA IN 1994. MR. JOHNSON SERVED AS THE ACOUSTICS APM WHERE HE

SPEARHEADED THE A-RCI PROGRAM. HE HAS OVER 30 YEARS OF EXPERIENCE RELATED TO ALL ASPECTS OF DESIGN DEVELOPMENT AND FIELDING OF SURFACE SHIP AND SUBMARINE COMBAT SYSTEMS. HE WAS AWARDED THE SUPERIOR CIVILIAN SERVICE AWARD BY THE SUBMARINE FLEET SPONSOR FOR HIS LEADERSHIP AND MANAGEMENT OF THE A-RCI PROGRAM. IN ADDITION, MR. JOHNSON HAS TWICE RECEIVED THE PRESTIGIOUS, VICE PRESIDENT AL GORE, HAMMER AWARD; THE DOD AND DON DEFENSE ACQUISITION EXCELLENCE AWARDS; TEAM EXCELLENCE AND THE DEFENSE STANDARDIZATION AWARD; AND THE COVETED BRONZE AWARD FROM THE NDIA.