



Navy Lieutenant Mayra Perez, Tours With Industry fellow, speaks to George Washington High School students during Navy Promotional Day in Philadelphia, Pennsylvania, May 11, 2022 (U.S. Navy/Diana Quinlan)

Training With Industry

Integrating the Commercial Defense Industrial Base

By Michael K. Lima

I'm a proud United States Air Force veteran, and when I look across Raytheon Missiles and Defense, I'm not alone. The defense industry is full of veterans because we connect deeply with the mission of defending our nation and our allies' interests around the world. It's what motivates me to come to work every day.

—WES KREMER
President, Raytheon Missiles and Defense

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This article examines Training With Industry (TWI)'s impact on the joint force, and it assesses and reviews the perspective of the World War II-era historical TWI program and contrasts it with today's version. The article uses three research methodologies: assessment of the author's experience with the first-ever TWI program at Raytheon Missiles and Defense (RMD), review of other Department of Defense (DOD) TWI programs, and examination of research on the correlation between TWI and promotion. The program can connect DOD to the commercial defense industrial base (DIB) through Servicemembers participating in it. The aspects evaluated here include the origins of the program's history, the skills TWI participants gain for the future force, and disadvantages to senior-level promotion. Recommendations are made to incorporate TWI training objectives into the Joint Learning Continuum, ensure individual TWI lessons are captured in the Joint Lessons Learned Program, and modernize the TWI program as a fellowship to address strategic level gaps.

In February 2020, Raytheon Missiles and Defense signed a gratis agreement with the U.S. Army Human Resources Command TWI coordinator. The signed memorandum formed a mutually beneficial agreement for a new TWI position at RMD headquarters in Tucson, Arizona. RMD, a Raytheon Technologies business, agreed to provide annual on-the-job management training for mid-level Army Soldiers to gain experience and training that a military or civilian school cannot replicate to meet the objectives of the Army and DOD.

Today, each military department participates in the TWI program except for the Marine Corps. The Air Force's program is called Education With Industry (EWI), and the Navy's program is called Secretary of the Navy Tours With Industry (SNTWI). The DOD program has well-intentioned objectives, but it has had problems.

In 2012, the Senate directed the Government Accountability Office (GAO) to review DOD's use of fellowships and

TWI programs to determine the statutory provisions and oversight for these programs and the extent to which the Services benefit from these programs.¹ The GAO concluded that the benefits of participation in these programs could not be ascertained because:

- not all the Services conduct periodic or sufficiently comprehensive program reviews
- there is no clear guidance on what qualifies as a post-program assignment that uses the skills and knowledge developed during the program
- the Services do not know their overall program costs to determine cost-effectiveness
- some Services do not have memoranda of understanding with the non-DOD host organizations.²

In response to the stated GAO findings, the Office of the Under Secretary of Defense for Personnel and Readiness led an effort to revise DOD Instruction 1322.06, *Fellowships, Legislative Fellowships, Internships, Scholarships, Training-With-Industry (TWI), and Grants Provided to DOD or DOD Personnel for Education and Training*, published on October 12, 2016.³ Before these revisions to the modern-day TWI program, the program looked quite different than it does today.

Historical TWI Program

The program dates to the early U.S. War Manpower Commission, the War Production Board, and the Department of War from 1940 to 1945. The purpose was to meet the high demand for wartime materiel from a small workforce whose experienced personnel were being drafted during World War II.⁴ The shortage of trained and skilled personnel challenged the defense industry. The U.S. Government acted and created the TWI program (then called Training Within Industry), a decentralized program carried out throughout the country in defense industrial areas. To meet the supply shortfalls, TWI aimed to improve job training methods by emphasizing job progression (or upgrading), trade apprenticeship, and supervisory development.⁵

The former TWI program established a nationwide network of industry professionals. These professionals comprised volunteers and full- or part-time employees from private industry on loan from their companies.⁶ The network taught valuable techniques to the manufacturers of war materiel. The TWI's training program, which focused on learning by doing, trained primarily in:

- the five needs of a supervisor: knowledge of the work, requisite responsibility, and skill in instructing, improving methods, and leading
- the "J" programs: job instruction, job methods, and job relations.⁷

Although the original TWI program has long been gone, its lessons can be seen in modern management practices, such as the Japanese *Kaizen* (continuous improvement) method, one of the most recognized methods in the Toyota Production System.⁸ Currently, the civilian TWI Institute provides organizations with a TWI certification process with an expansion of each module and applies job instruction, job relations, job methods improvement, job safety, and problem solving to organizational culture and excellence.⁹

Current TWI Program

Despite its tremendous usefulness at the time and lessons learned that have endured for more than half a century, the TWI program of World War II was far different than that of the current DOD TWI program. DOD Instruction 1322.06 states that the purpose of the TWI program is to provide selected DOD personnel the opportunity to gain career-broadening experience while working in a commercial industry environment.¹⁰ The program provides the participant's organization with the needed skills or expertise to accomplish its Service mission more effectively. In the Army, the TWI program is nondegree-producing and provides training and skills in best business procedures and practices that cannot be obtained through military or advanced civilian schooling programs.¹¹ For the Air Force, the EWI program's ultimate

goal is to develop leaders with greater business acumen and empathy and with the expertise to implement innovative practices after the assignment.¹² Finally, the Navy program (SNTWI) offers Servicemembers a chance to learn from (and with) leading industry partners to improve their leadership, management, and communications skills.¹³

Each Service participates with commercial industry leaders. However, these assignments offer more than training and skills in the best commercial business procedures and practices; they also provide a vital link for each Service to have key personnel with the training and skills necessary to integrate the commercial industrial base. The Army's TWI program was initiated in the 1970s in response to a critical need for skills in industry practices and procedures that could not be obtained through routine military education. These skills were mainly related to materiel acquisition and logistics management.¹⁴ The Air Force's EWI program dates back to 1947 and returns to the Air Force (and, as of 2021, the Space Force) an individual trained in industry best practices.¹⁵ Today, DOD's TWI program has evolved from enlisted-only participants to include noncommissioned and commissioned officers from most branches and training that is conducted throughout the country with major companies, including Amazon, Apple, Boeing, FedEx, GE Digital, LinkedIn, Northrup Grumman, Oak Ridge National Laboratory, SpaceX, Tesla, and USAA.¹⁶ To that end, the TWI participants' skills in industry practices and procedures enhance the ability for unified action. The comprehensive approach focuses on the cooperation between the U.S. military and other interorganizational participants toward common objectives.¹⁷

The term *interorganizational* refers to U.S. Government departments and interagency partners; state, territorial, local, and tribal agencies; multinational partners; nongovernmental organizations; and the private sector.¹⁸ The most notable private sector is the commercial defense sector, which comprises the defense industrial base but is separate

from DOD's organic industrial base. The DIB includes DOD, government, and private sector worldwide industrial complexes with capabilities to perform research, development, and design and to produce and maintain military weapons systems, subsystems, components, or parts to meet military requirements.¹⁹ The TWI host companies are composed of many program sponsors that provide essential services and products for DOD. For example, in the weapons programs, significant consolidations in the 1990s reduced competition, with the total number of U.S.-based prime contractors declining from 51 in 1993 to 5 in 2000.²⁰ The consolidation makes the TWI program even more critical for DOD as the right companies must be selected and the participants must be placed in the correct business units within the company.

Defense Contractor and Military Support

One such business unit is RMD, which provides the industry's most advanced end-to-end solutions, delivering innovation to detect, track, and defeat threats. The business cuts across each military Service's mission area, mainly focusing on airpower, land warfare and air defense, strategic missile defense, naval power, and advanced technology. These mission areas accounted for \$15.3 billion in 2020 sales, with slightly more than half of these in domestic business sales.²¹ RMD has 15,000 engineers and 30,000 employees across 30 states and 28 countries.²² With its headquarters in Tucson, Arizona, this diverse business unit presents an excellent opportunity for TWI participants to interact with various employees and understand their business processes.

Raytheon Missiles and Defense headquarters is located near Davis-Monthan Air Force Base, a critical air combat command installation. The 355th Wing serves as the host unit and provides combat search and rescue capabilities. Most notably, the Davis-Monthan installation is known for the mission and facility of the 309th Aerospace Maintenance and Regeneration Group, called "The Boneyard," an aircraft storage and maintenance facility.²³ The Davis-Monthan

Welcome Center is a one-stop shop for new arrivals, with access to the Military Personnel Flight (same as the Army's Military Personnel Division), Comptroller Squadron (Finance), Traffic Management Office (Transportation), and the Medical Group (Medical Center). The Davis-Monthan Welcome Center can also provide information and contacts for the School Liaison Officer, Exceptional Family Member Program, and Military Housing Office. While not technically assigned to Davis-Monthan, Army Servicemembers attending TWI will receive all necessary support from the Davis-Monthan installation, which adds to the joint environment of the position while assigned to TWI with RMD.

Training Assignment

The TWI program enhances DOD personnel's professional, technical, and executive management areas in the commercial DIB. At the same time, experiences may be different for each military Service and various occupational skills. The Land Warfare and Air Defense division of RMD is the assigned mission area that provides day-to-day responsibility for the TWI position. The 1-year assignment additionally requires the completion of a 2-year mandatory follow-on utilization tour for the Army, concurrent with a 3-year Active-duty service obligation upon program completion.

As a nonimitative assignment in the highly selective and competitive career development program, officers who want to participate in the TWI program must submit applications to their respective branch managers.

Army TWI participants are administratively assigned to the U.S. Army Student Detachment at Fort Jackson, South Carolina, a small contingent of military and civilian personnel that provide support at various levels to more than 2,400 students.²⁴

Training Objectives

The rotational-style training implemented by Raytheon provides the TWI participant with a uniquely tailored experience that goes in depth into the techniques and industrial procedures of



Army Captain Pablo Mendez Adorno, Training With Industry banking officer student, helps customer at Armed Forces Bank, Fort Leavenworth, Kansas, March 23, 2022 (U.S. Army/Mark R.W. Orders-Woempner)

the various RMD directorates. Within the first month, the host TWI company and the TWI participant submit a training plan to the proponent office. The training plan provides a detailed outline for desired training and general learning objectives in partner management practices, acquisitions, technology, and mechanical engineering.

TWI participants are exposed to modern technologies and business practices in the commercial industry. These skills are needed to support new Army technologies such as the Integrated Personnel and Pay System—Army and gain exposure to industry software such as Oracle’s PeopleSoft, software engineering and testing, business analytics, and how data science is applied.²⁵ Participants’ ability to see the industry

leverage artificial intelligence and machine-learning capabilities enhances DOD efforts to modernize Joint All-Domain Command and Control. The 2022 National Defense Strategy calls for an integrated deterrence using every tool at the Defense Department’s disposal to develop, combine, and coordinate our strengths to the maximum effect.²⁶ Training and engagement offered in the TWI program is an untapped resource to build the future force. The RMD TWI billet and the DOD TWI program deliver the needed expertise to successfully integrate the commercial sector into U.S. defense strategy.

Benefits and Disadvantages

The recently conducted RMD TWI program fulfilled the initial general

learning objectives focused on partner management practices, acquisitions, technology, and mechanical engineering. This training included participation in the Diné facility in Farmington, New Mexico, which proudly boasts a workforce of which 90 percent are members of the Navajo Nation. The Raytheon Diné Facility stores and generates parts for 12 missile programs, such as the Tomahawk cruise missile, the Javelin weapons system, and the Advanced Medium-Range Air-to-Air Missile,²⁷ that provide critical experience in the munitions commercial industrial base. Participants gained insight into the intricate work required to build a weapons system at mass and understand all required inputs—as well as the inter-



Technical Sergeant Jules Ponton, former 316th Force Support Squadron manpower analyst and now Education With Industry fellow at Deloitte Consulting, poses for photo at SparkX Cell Innovation and Idea Center on Joint Base Andrews, Maryland, March 4, 2022 (U.S. Air Force/Bridgitte Taylor)

nal actions for lot acceptance—before sending it to government representatives for approval.

In another example, an Air Force captain who participated in a recent EWI at SpaceX was assigned as lead manufacturing engineer for the first time from the West Coast.²⁸ The participant completed tasks aligned to host TWI procedures to understand the flexibility to solve uncommon problems that DOD may ask of him. Additionally, the officer was selected for transfer to the Space Force, which will allow the officer to bring some of the most advanced knowledge of the space domain back to the newest and most relevant department in DOD.

Other significant experiences include that of a Navy lieutenant commander, a maintenance officer, who participated in the SNTWI at Amazon headquarters in Seattle. This position placed the officer as a senior program manager in the customer excellence department, working on a small team project to improve Amazon's customer service.²⁹ The officer saw how the commercial industry handled supply problems and applied innovative solutions at a national level that could not be accomplished within government bureaucracies.

One major drawback for participants of the TWI program is that it does not provide a direct correlation for promotion. In a Naval Postgraduate School

research project, the authors concluded that there are no major positive or negative effects on an officer's promotion or career after completing a TWI program.³⁰ The assessment was based on data from 12 TWI participants' promotion histories where the TWI participants were promoted within their "in-zone" period.³¹ While the sample size was small and the outcome was not favorable, the assessment shows no correlation in not getting promoted, which led this author to conduct additional research on the correlation to promotion.

The author completed an in-depth review of 200 general and flag officers' official biographies of the three Services that have a TWI program: Navy, Army,

and Air Force (table). The assessment discovered that not one of these officers mentioned the TWI program as part of his or her military service. The vast majority listed a fellowship program (40.5 percent), followed by not listing a broadening assignment (38 percent), and the next highest listing was an assignment as an instructor (9 percent).³² A few conclusions can be drawn from the assessment. Many of the officers had experience serving in program executive/management offices in their field, and those with highly technical backgrounds (doctors, aviators, engineers, and others) opted to receive additional certification or professional training. From the research, a conclusion can be drawn that the performance of operational assignments must be strong enough for promotion to support a broadening assignment that will have a Servicemember perform work outside of his or her functional area.

TWI produces Servicemembers with insights into the commercial sector that can provide necessary linkage to the DIB to inform joint doctrine and to integrate and synchronize the actions of the joint force to conduct globally integrated operations with interorganizational cooperation against priority challenges and achieve national strategic objectives.

Recommendations

The first recommendation moving forward with the TWI program is to incorporate the training objectives of each Service into the Joint Learning Continuum, a fundamental systematic approach to ensure professional devel-

opment throughout an individual's career,³³ and aligning the individual training with organizational training within the Joint Training System Methodology, a four-phased methodology that aligns joint training strategy with assigned missions to produce trained and ready joint organizations.³⁴

Individual joint training is considered one of four pillars for joint officer development across the Joint Learning Continuum. Specifically, the joint force must evaluate current TWI training objectives through the Joint Training System Phase I, requirements initiated by assessing current capability and identifying gaps to determine if they can be closed through training.³⁵ Each Service in the joint force must receive the desired training to leverage cross-organizational capabilities for unified action during war. Chairman of the Joint Chiefs of Staff Instruction 3500.01J, *Joint Training Policy for the Armed Forces of the United States*, already states that individual joint training "can be delivered through various methods, depending on the requirements of the learning organization," including commercial training programs.³⁶

The second recommendation is to mandate all organizations with a TWI position to submit their reports to the Joint Lessons Learned Program for validation.³⁷ The validation is a submission of observation into the lessons learned process for the best practices and issues to proceed to the resolution phase.³⁸ The resolution would solve any collective issues across the Services with utilization tours that may need to be aligned with organizations with Tier 1 national- and

combatant command-level training, which is training designed to prepare national-level organizations to integrate interorganizational partners in highly complex environments.³⁹ Additionally, even the authors of the Naval Postgraduate School research project called for further research into the benefit of assigning specific utilization tours.⁴⁰ The resolution processes would allow for further analysis by a potential office of primary responsibility and subject matter experts, along with developing solutions to address any root causes.⁴¹

The third recommendation is to incentivize the program to our most talented personnel by realigning the TWI program as a fellowship. Currently, military personnel are selected by their branch and left to the host organization as a participant to train for the gaps identified by their organizations. Instead, create a fiscal year cohort across the Services and with the same career field into a fellowship sponsored by DOD organizations that deal directly with the commercial industry in that field, such as the Defense Security Cooperation Agency, Defense Logistics Agency, and Joint Program Executive Office Armaments and Ammunition, and their respective project offices. The fellowship would allow for collaboration among Servicemembers across the joint force to solve challenges faced at the strategic level. TWI fellows could explore problems and focus their training experience to provide solutions—linking individual and organizational training objectives to gaps and ensuring that the individual lessons are captured for evaluation and provide direct value.

Table. Review of General and Flag Officers' Official Biographies

Broadening Assignment (Name)	Navy	Army	Air Force	Grand Total
Fellowship	50	14	17	81
Not Listed	26	27	23	76
Instructor	5	6	7	18
Faculty	2	6	2	10
Legislative	5		1	6
Aide	4		1	5
Career Manager	2	2		4
Grand Total	94	55	51	200

The Russo-Ukrainian war has proved that U.S. defense supply chains are susceptible to war demands that unexpectedly shift from crisis to armed conflict. To prepare for large-scale combat operations, the joint force will have to support ground, maritime, and air forces on a scale not seen since World War II, further complicated by the introduction of the new space and cyberspace domains. The Defense Department must urgently integrate a whole-of-government approach and modernize the TWI program to ensure unified action and foster interorganizational cooperation. Servicemembers who have trained with commercial industry partners and share what they have learned with their respective Services and the joint force are critical to closing gaps and strengthening our deterrence against hostile nations. JFQ

Notes

¹ *Military Education: Improved Oversight and Management Needed for DOD's Fellowship and Training-With-Industry Programs* (Washington, DC: Government Accountability Office, April 2012), 1, <https://www.gao.gov/assets/gao-12-367.pdf>.

² Ibid.

³ Department of Defense (DOD) Instruction 1322.06, *Fellowships, Legislative Fellowships, Internships, Scholarships, Training-With-Industry (TWI), and Grants Provided to DOD or DOD Personnel for Education and Training* (Washington, DC: DOD, October 12, 2016), <https://www.esd.whs.mil/Portals/54/Documents/DD/issuances/dodi/132206p.pdf>.

⁴ Jim Huntzinger, "The Roots of Lean. Training Within Industry: The Origin of Japanese Management and Kaizen," Lean Enterprise Institute, 2001, 4, <https://www.lean.org/search/documents/105.pdf>.

⁵ *The Training Within Industry Report, 1940–1945* (Washington, DC: War Manpower Commission, September 1945), 5, <https://www.allaboutlean.com/wp-content/uploads/2018/02/Training-With-Industry-Report.pdf>.

⁶ Huntzinger, "The Roots of Lean," 5.

⁷ Ibid., 11.

⁸ Ibid., 17.

⁹ "TWI Certification," TWI Institute, <https://www.twi-institute.com/twi-certification/>.

¹⁰ DOD Instruction 1322.06.

¹¹ "TWI Eligibility and Application Requirements," U.S. Army Human Resources Command, July 13, 2023, <https://www.hrc>.

[army.mil/content/TWI%20Eligibility%20and%20Application%20Requirements](https://www.army.mil/content/TWI%20Eligibility%20and%20Application%20Requirements).

¹² "Education With Industry Program," Air Force Institute of Technology, <https://www.afit.edu/CIP/page.cfm?page=1567>.

¹³ "FY20–21 Secretary of the Navy Tours With Industry Announcement," U.S. Navy, <https://www.navy.mil/Resources/NAVADMINS/Message/Article/2338854/fy20-21-secretary-of-the-navy-tours-with-industry-announcement/>.

¹⁴ "TWI Eligibility and Application Requirements."

¹⁵ Josh Tarrant, "EWI Fellows Creating Tangible Results in a Virtual World," Air Force Institute of Technology, February 19, 2021, <https://www.airuniversity.af.edu/News/Display/Article/2509316/cwi-fellows-creating-tangible-results-in-a-virtual-world/>.

¹⁶ "Training With Industry," U.S. Army Acquisition Support Center, 2023, <https://test.asc.army.mil/web/career-development/programs/aac-training-with-industry/>.

¹⁷ Joint Publication (JP) 3-0, *Joint Operations* (Washington, DC: The Joint Staff, October 22, 2018), x.

¹⁸ Ibid., xi.

¹⁹ JP 3-27, *Homeland Defense* (Washington, DC: The Joint Staff, April 10, 2018), GL-8, https://www.jcs.mil/Portals/36/Documents/Doctrine/pubs/jp3_27.pdf.

²⁰ Office of the Under Secretary of Defense for Acquisition and Sustainment, *State of Competition Within the Defense Industrial Base* (Washington, DC: DOD, February 2022), <https://media.defense.gov/2022/feb/15/2002939087/-1/-1/1/state-of-competition-within-the-defense-industrial-base.pdf>.

²¹ Wes Kremer, "Raytheon Technologies Investor Day 2021," Raytheon Technologies, 2021, 48, <https://investors.rtx.com/static-files/78ed3bc0-545d-4c87-ba92-ff6b-c3b29d22>.

²² Ibid.

²³ "About Davis-Monthan Air Force Base," Davis-Monthan Air Force Base, <https://www.dm.af.mil/About-DM/Units/Tenant-Units/>.

²⁴ "U.S. Army Student Detachment," U.S. Army Training and Doctrine Command, <https://usacimt.tradoc.army.mil/lbt/usasd/index.html>.

²⁵ Gregory S. Johnson, "Train With Industry to Retain and Develop Army Talent," U.S. Army Human Resources Command, February 7, 2022, <https://www.linkedin.com/pulse/train-industry-retain-develop-army-/>.

²⁶ *2022 National Defense Strategy of the United States of America* (Washington, DC: DOD, October 27, 2022), iv, <https://media.defense.gov/2022/oct/27/2003103845/-1/-1/1/2022-national-defense-strategy-npr-mdr.pdf>.

²⁷ "Raytheon Completes New \$5 Million Warehouse at Diné Facility Near Farmington," Raytheon Technologies, April 24, 2017, <https://raytheon.mediaroom.com/2017-04-24-Raytheon-completes-new-5-million-warehouse-at-Dine-facility-near-Farmington>.

04-24-Raytheon-completes-new-5-million-warehouse-at-Dine-facility-near-Farmington.

²⁸ Tarrant, "EWI Fellows Creating Tangible Results in a Virtual World."

²⁹ Meghann Myers, "Navy Officers Start 1st Industry Tours at Amazon, FedEx," *Navy Times*, October 14, 2015, <https://www.navy-times.com/news/your-navy/2015/10/14/navy-officers-start-1st-industry-tours-at-amazon-fedex/>.

³⁰ Melissa S. Flynn and Amphay Souksavatdy, "Return on Investment for the United States Navy's Training With Industry Program" (master's thesis, Naval Postgraduate School, June 2017), 69, <https://apps.dtic.mil/sti/pdfs/AD1046366.pdf>.

³¹ Ibid.

³² Author researched professional information about DOD general officers and flag officers from official military Web sites.

³³ Chairman of the Joint Chiefs of Staff Instruction (CJCSI) 3500.01J, *Joint Training Policy for the Armed Forces of the United States* (Washington, DC: The Joint Staff, January 13, 2020), A-2, https://www.jcs.mil/Portals/36/Documents/Doctrine/training/cjcsi3500_01j.pdf?ver=2020-01-21-111919-340.

³⁴ Ibid., B-1.

³⁵ Ibid., B-2.

³⁶ Ibid., B-6.

³⁷ Author researched Joint Lessons Learned Information System and found only one TWI Lessons Learned Observation.

³⁸ Chairman of the Joint Chiefs of Staff Manual (CJCSM) 3150.25B, *Joint Lessons Learned Program* (Washington, DC: The Joint Staff, October 12, 2018), B-1, <https://www.jcs.mil/Portals/36/Documents/Library/Manuals/CJCSM%203150.25B.pdf?ver=2018-10-26-172524-850>.

³⁹ Ibid., B-5.

⁴⁰ Flynn and Souksavatdy, "Return on Investment," 70.

⁴¹ CJCSM 3150.25B, A-4.