U.S. Naval Radio School at Harvard
1917-1919

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ORIGINS OF THE STORY
How did these two historic American institutions create a complete school, from scratch with all critical components, that trained approximately 10,000 men in less than 22 months?
ORIGINS OF THE STORY

Harvard: the oldest institution of higher education in the United States

- Established 1636 by the Massachusetts Bay Colony
- Named after minister John Harvard of Charlestown, who left his library and half his estate to the institution
U.S. Navy: originated with the Continental Navy

- Effectively disbanded after the Revolution, it won a reputation in the Civil War and Spanish American War
- Saw little action during WWI due to senior command’s reluctance to engage, but grew under an ambitious building program, and successfully transported 2 million men to/from Europe
ORIGINS OF THE STORY

America’s public opinion about the war turned after Lusitania was sunk.

On May 7, 1915 a German U-boat torpedoed Lusitania which sank in 18 minutes, killing 1,198 and leaving 761 survivors.
Patriotic fever swept the nation as it prepared for war

George M. Cohan symbolized the era – he later received a Congressional Gold Medal for his contributions to WWI morale, in particular the songs "You're a Grand Old Flag" and "Over There"
American plans were disorganized

Rear Adm. Josiah S. McKean, asst. for material, Office of the Chief of Naval Operations: “...personnel was a vital question, and the key to getting the Navy ready.”

- Navy needed: ships, materiel, officers and enlisted men who could be trained for an evolving list of specialized tasks
- Navy completely reorganized its recruiting and training structure
ORIGINS OF THE STORY

Navy wireless operators were now badly needed, by the thousands

- Navy had no centralized or coordinated recruiting or training
- WWI changed everything – it suddenly needed a highly trained technical force, placing unprecedented demands on recruiters and trainers
- Naval Radio Reserve established Apr. 1917
- Trained amateur and commercial operators were heavily recruited

U.S. Navy Recruiting Poster, Charles Buckles, Falls (Authors’ Collection)
ORIGINS OF THE STORY

Navy hastily conceived and implemented a new “United States Naval Radio School” at Harvard University

- Operated 22 months from Jul. 1917 - Apr. 1919
- Provided 9 out of 10 American radio operators in the war
NAVY TRAINING BEFORE 1917
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In 1912, communications training and gear were scattered across regional Naval Districts.

Washington Navy Yard undertook a review of all Navy education and communications equipment.
NAVY TRAINING BEFORE 1917

New recruiting booklets featured drawings, photographs, descriptions of military training

- Civilian recruits were encouraged to value training for later careers in electricity and radio

Navy Recruiting Booklet With Views of the Brooklyn Yard Naval Electrical And Radio School In 1917 (Authors’ Collection)
NAVY TRAINING BEFORE 1917

Bureau of Navigation established a new Training Division in Apr. 1917:

(1) **Training stations** -- For regular Navy enlisted men at Newport (Rhode Island), St. Helena (Norfolk), Great Lakes (north of Chicago) and Yerba Buena (San Francisco)

(2) **Training camps** -- At many of the 18 Naval Districts for reservists within each District

(3) **National specialist schools** -- At various Naval Stations and Navy Yards
NAVY TRAINING BEFORE 1917

New “preliminary” radio schools in each Naval District provided introductory training in radio-telegraphy

- Advanced Naval schools located at: selected universities and colleges (i.e. Naval Radio School at Harvard; a smaller one at Mare Island, California Navy Yard; and a Naval Aviation Ground School at MIT)

- Harvard selected as primary advanced school to receive students from across the country

- Combined capacity could train 5,000 radiomen every 4 months
ORIGINS OF THE NAVAL RADIO SCHOOL AT HARVARD
Naval Radio School at Harvard emanated from BNY, Building 26

- BNY provided basic radio training -- 100 total staff and students
- Course ran 24 weeks -- weekly attendance of 80 students and 7 students graduated weekly
- Instructors: 4 Chief Radio Electricians and 1 Radio Gunner
From Apr. 1 - Jun. 1, 1917, the school expanded to 400 students

- Basic operating classes became overcrowded
- Navy Board deemed BNY too small for expansion
- Personnel: 46 staff, 6 Chief Petty Officers, and 1 Radio Gunner
A NEW RADIO SCHOOL AT HARVARD
A NEW RADIO SCHOOL AT HARVARD

First Commanders


- From a prominent Boston cotton manufacturing family
- Graduated from Harvard in 1900, worked in Boston at Farwell Cotton Mills and Farwell Bleachery
- Enlisted U.S.N.R.F. Mar. 1917, appointed as aide to chief of staff of Boston Navy Yard
- Commander of Radio School Jul. 23, 1917
A NEW RADIO SCHOOL AT HARVARD

First Commanders

Capt. J.P. Parker commanded the School for Ensigns, Lt. E.F. Green oversaw teaching Naval Science -- school for electricians, other than radio, remained at BNY

Capt. J.P. Parker, NNV, Cadet School For Engineers In 1917 (Harvard Graduates, Dec. 1917)

Lt. E.F. Green, U.S.N., Teaching Naval Sciences In 1917 (Harvard Graduates, Dec. 1917)
Almost overnight, Harvard’s campus effectively became a government military school until the end of hostilities

- Navy customs and discipline with Navy instructors
- Classes conducted in military style: sailors called with bugle or alarm and marched through hallways; uniforms at all times
- Navy teaching staff instilled Navy culture, spirit, discipline and taught its own practices using Navy equipment, methods, procedures
- University faculty taught 1 course for Naval Reserve
- Government School for Ensigns, the Cadet School (later known as the Radio Material School), also operated on campus
A NEW RADIO SCHOOL AT HARVARD
Cruft Laboratory and The First Students

1 Chief Electrician and 2 staff began teaching in Harvard’s new Cruft High Tension Laboratory Apr. 17, 1917, 11 days after the U.S. declared war

- Cruft built 2 years earlier
- 25 rooms -- latest designs in high voltage laboratory specs and fire safety
- 2 distinctive rooftop antenna towers
- Each room had: 500VDC /220VAC
- Largest storage batteries in the world capable of storing charge at 100,000V and discharging up to 80V to 10 rooms
- Widely regarded as the best laboratory in the country
A NEW RADIO SCHOOL AT HARVARD

Student Population

The size of the new radio school was unprecedented

- Initial arrangements contemplated 1,000 students training as operators, primarily for 1st District Naval patrol boats
- Students received a daily Navy stipend ($1.25/day) and paid for: food ($5.00/week) and dormitory accommodation ($3.25/week)
- 32 recruits enrolled in the intensive 4 month program
- After BNY’s Radio School relocated to Harvard, the student population grew to 830 naval reserves under instruction
A NEW RADIO SCHOOL AT HARVARD

Navy Domination of the Campus

Harvard’s campus expanded under Navy operation

- Renovated buildings, modified electrical installations, redesigned interiors to Navy specifications
- Installed classrooms, dormitories
- Rented nearby boarding houses
- Constructed new buildings
- The Navy remained formally independent and operated under strictly military guidelines and procedures

1936 Harvard University Map Showing Buildings Used By Naval Radio School (Red Dots) (Harvard University Map, 1940)
LIFE AT HARVARD

Campus Routine

Reveille was at 6am, days involved practical radio instruction, lectures, study of machines, paperwork, and simple infantry drills

- Navy students ate with Harvard’s general student body at Foxcroft Hall and Memorial Hall
- Formal work ended 5pm
- Call to quarters 8pm
- Taps 10pm
Within weeks, Navy administration/school services offices moved to Pierce Hall, adjacent to Cruft.

- **Pierce**: commandant’s office, paymaster, executive offices, lecture rooms, operating rooms for practice sending and receiving telegraph code.

- **Hastings**: detention facility for newcomers before they began classes.
LIFE AT HARVARD
Campus Expansion

Housing shortages arose due to rapid expansion, and sailors were scattered across Cambridge

- Craigie, Russell, Perkins became barracks/dorms (4 sailors per room)
- Classrooms packed into any available space
- Families hosted sailors for meals
- Divinity House was a clearing house for community relations
- Perkins operated at 3x capacity, over 500 men in double-deck berths (cots) with 2 units/room
- Hemenway Gymnasium had sleeping berths in the main hall, on the running track, and in locker rooms
- Temporary barracks built on Cambridge Commons for 1,800 men in summer 1918
LIFE AT HARVARD
Other Buildings

YMCA built “Y-Hut” with a fireplace and heating stoves located next to the Ships’ Store and Commissary

- Operated as a Ladies Canteen for movies and entertainment
- Staffed by volunteers 7am-10pm daily

YMCA Y-Hut Built On Holmes Field In 1918
(Harvard Alumni Bulletin, Feb. 28, 1918)
28 Navy cutters placed at Weld Boathouse for training on the Charles River, and 19 26-ft cutters could be rented at Harvard Boat Club.
By mid-1918, almost all the university buildings north of Harvard Yard, including Memorial Hall, had become “ships” or temporary barracks

- By Jan. 1919, 2,500 sailors were under instruction from 150 staff
- Austin Hall (Harvard Law School) used to teach groups of 600 at one time
- “Double shift” instituted as school ballooned to 3,200 men: two shifts 7:20am - 9:00pm, each providing 6 hours instruction in 3 periods
- Course length expanded from 16 to 17 weeks
- Construction of supplemental buildings allowed a return to 1 shift
- Curriculum changes lengthened course to 18 weeks, keeping more students on campus
LIFE AT HARVARD
Overall Campus Occupancy

By the end of the war, Radio School used 36 buildings: 15 school buildings, 1 private residence, 14 new buildings, and 6 others.

Receiving Class In Pierce Hall In 1918 (Harvard Alumni Bulletin, Jan. 3, 1918)
LIFE AT HARVARD
Medical Operations

Radio School operated its own Medical Department
- 5 asst. surgeons, 1 chief pharmacist, 2 yeoman, 14 hospital apprentices, 1 dedicated ambulance
- Winthrop Hall operated as a Navy “sick bay”
- Dental Corps used 12 rooms and provided services to MIT’s Naval Aviation Detachment
- Daily sick call was at Pierce Hall, contagious cases transferred to the Naval Hospital at Chelsea, Massachusetts
- In Sep. 1918, a worldwide outbreak of Spanish Influenza occurred -- only 258 sailors and students were impacted, a very low rate compared to thousands of civilian cases in Cambridge and Boston, and 18 million worldwide deaths
Radio School’s Medical Department had dedicated equipment
The Navy published at its separate stations and ships

- *Radio Sparks* published semi-monthly at Great Lakes Radio School beginning Dec. 1917
- *The Great Lakes Recruit* and *The Recruit* were similar tabloid-style magazines
The Oscillator was published at Harvard Oct. 27, 1917 - Mar. 5, 1919

Notice to Reader.—When you finish reading this magazine, place a 1-cent stamp of this notice, mail the magazine, and it will be placed in the hands of our soldiers or sailors, destined to proceed overseas. No wrapping, no address.

A. S. BURLESON, Postmaster General.

HERO OF “THE MOLE” TO ADDRESS RADIO SCHOOL

Captain Carpenter, of the Royal British Navy, known as the man who bottlenecked the submarines at Zeebrugge, will address all the men of this station at the Instruction Hall at 10.30 Monday morning, Dec. 9. All men will have an opportunity to attend and hear this celebrated hero of the great war.

Captain Carpenter startled the world early in the fall when, in command of H. M. S. Vindictive, he led a squadron of British vessels which invaded the harbor at Zeebrugge. As the harbor was the seat of German U-Boat operations. “The Mole,” now world famous as the entrance to the harbor, was practically demolished and was closed as a sea-entrance when British vessels were purposely sunk, after the example of the memorable Merrimac, across the mouth of the harbor.

That this distinguished naval man, now on a visit to America, has accepted the invitation to speak here, is deserving of our thanks, for there is no man in America who knows more of the Navy than he does.
**The Oscillator** became the official Navy radio service journal

- “Published weekly for radio men everywhere”
- Distributed to ships and naval stations, average weekly circulation 2,000
- Profits from subscriptions, advertising, and sales donated to Navy Relief Fund, Navy Welfare Fund, other charities
- 21 staff produced 4-column folded-broadsheet newspaper similar to the larger five-column *Harvard Crimson*
- Provided general news, promotion of wartime fundraising, advertising, poetry, commentary, sports, military notices, casualty lists, military promotions, student contests, honor rolls
- Leading experts wrote technical articles in topical series
Advertising helped Radio School achieve 80% participation in Liberty Loan Drive, far higher than Harvard College’s participation.

Radio School’s participation in Fourth Liberty Loan exceeded 75% and raised more than $260,000 (approximately $4.5 million today).

The Oscillator promoted Harvard as the “concentration center” for Navy radio instruction.
LIFE AT HARVARD

Student Life

Navy committees encouraged student life - overseeing health, recreation, dances, and social functions

- President Lowell hosted Radio School and Harvard faculty and wives
- Writing desks installed across campus
- Movies, vaudeville nights, minstrel shows, lectures, dances
- Divinity Library opened 6,000 volume “Radio Library”
- Harvard faculty presented colloquia
- Hostess House offered ironing, mending, magazines, newspapers, a kitchen, other services
LIFE AT HARVARD

Student Life

Radio School had an official song and school mascots

- Cmdr. J. B. Rowdin, USNRF composed “In The U.S. Radio” -- it received positive reviews, reprinted in newspapers
- Mascots Little Salty and the Goat appeared at special events
Radio School Band played concerts on campus and at guest appearances in sporting events and parades.
Celebrity visits, parades, marching displays, competitive company inspections, and drills occurred daily.
Navy held a “Review” on Sep. 19, 1917 to parade and inspect its 1,400 men, presented colors to Japanese Mission, French, British officers

- 20,000 participated in a military and navy carnival at Harvard Stadium
- Army-Navy football game, a two-mile relay, chariot races, tug-of-war contests
- Parade of 6,500 sailors and soldiers

*The Great Navy Day Celebration, Jul. 15, 1918. Pierce Hall(L), Cruft Hall With Antennas(C), And Memorial Hall (Center Distance) (Authors’ Collection)*
Cmdt. Ayer presented awards and recognized Championship Harvard Naval Radio School basketball team.
“Harvard Radios” drew regular crowds in its 1918 season

- Radios outscored all opponents that season by 193 to 71
- Harvard Radios v. Princeton Aviators football poster circa Nov. 23, 1918 is now highly collectible
TRAINING AND STAFF
U.S. Navy had: 750 naval vessels, 2,500 merchant vessels, and shore stations – Each needed radio crews with 4-40 radiomen – Navy initially planned to train 13,000 radio operators

- 50 experienced Navy “Electricians” and radio operators surveyed to identify best teaching techniques
- New approaches, custom operating tables, and practice installations for instruction constructed
- Large instructional charts, many with red, white, and green electric lights installed
- Classrooms accommodated over 300 students each
- While designed for mass teaching, each student was “treated as an individual, with aptitude and application governing his progress”
Central control switchboards and trunk lines permitted instructors to work with separate operating tables, in small groups, or the entire classroom – students also worked in pairs: one sending and one receiving.
New admission requirements and new aptitude testing were used at Harvard Radio School

- Admission from preliminary schools required Morse code proficiency of 10 WPM sending and receiving
- The Navy and Harvard developed methods to stratify students and designed customized support services, improving student performance
  - Dr. R. E. Tullos provided psychiatric/mental acumen examinations to screen candidates for their abilities
  - This was one of the first applications of aptitude testing (initially developed by Harvard for the U.S. Army) -- it was a precursor for broad use of aptitude testing in American education
Training and promotion became a merit based system for the first time

- Training included radio theory, emphasized practical applications
- Supplemental tutoring and training was developed
- Primary schools and Harvard Radio School exchanged monthly reports on student qualifications, competition between schools was encouraged
- Screening, flexibility, applied education, and greater student support services significantly raised incoming proficiency levels -- students who continued to have difficulty attended night school
- By 1919, only 6% of the men from Great Lakes failed in Harvard’s more advanced radio course
TRAINING AND STAFF
Navy Education

Curriculum was subject to rapid and multiple revisions

- Dedicated classrooms used for different topics
- Harvard’s 25kW arc transmitter used for demonstrations
- Curriculum revised in 1918
  - 5 new Navy Chiefs with wireless experience and aptitude for teaching theory appointed
  - 14 new assistants (2 per classroom) appointed
Courses incorporated demonstrations, classrooms fitted with examples of apparatus and equipment that the students would actually use.

- Curriculum encompassed: magnetism, static electricity, AC/DC currents, electromagnetism, generators and batteries, DC/AC motors, radio power circuits.

- Navy expected students to acquire and study key textbooks which were used in class.
School operated 5 days/week for 16 (later 17) weeks: 3½ hours operating instruction, 3½ hours technical instruction, daily lectures, daily military drills 1 ¾ hours except Sunday, with inspections on Saturday

- Exams occurred weekly on Fridays -- those passing rated Electricians 3rd class, with a few high performers rated Petty Officer second class, exceptional students became instructors

- Graduates (165/week) went directly to the fleet or armed-guard duties in the merchant marine and transports
  - Electricians 3rd class (radio) went to larger vessels
  - Electricians 2nd class went to destroyers and gunboats
  - Electricians 2nd class who served 2 years at sea in radio eligible for shore duty
Standardized instruction, supplemental instruction and tutorials, and better pre-qualification of students all improved the quality of graduating students

- All sailors took a common course for 12 weeks, then split into specialties: Fleet Course, Armed Guard Course, High Power Course, Aviation Course
- By Aug. 1919, the now 18 week course was taught by 75 instructors to approximately 3,400 men
- Graduates had proficiency of 25 WPM -- Higher qualifications for incoming/outgoing students improved the overall competency
- By Dec. 1918, the interim deficiency rates reduced from 1,500 in week 1 down to 200 by week 10
Hands-on experience was essential – telegraph codes were taught and practiced at operating tables with headphones, sounders, transmitting keys – *The Oscillator* advertised practice equipment for private purchase.
University classrooms and laboratories rewired for actual Navy equipment and operating radio stations

- Photographs of demonstration equipment were featured in recruiting booklets, general magazines, popular books
- Recruiters publicized educational opportunities and benefits of naval training

Operating 2KW Transmitter Set At Navy Electrical School New York - Similar Installations Were Built At Harvard (Navy Publicity Bureau, New York, 1917)
Radio Apparatus

Equipment demonstrations included portable field sets used by the U.S. Army and U.S. Marine Corps.

- Portable sets had a range of 40-50 miles and operated with a 75 foot, telescopic, collapsible aerial.
- Larger, fixed/mounted sets operated at 500, 1,000, and 2,000 watts, could broadcast/receive transmissions hundreds of miles.

Outdoor Demonstration Of Portable Radio Equipment, Suitcase Pack Set And Hand Generator, At Harvard (Wireless Experimenter, Dec. 1918)
Instrument laboratories had full shipboard/land-based naval station sets plus Army and Navy testing and demonstration apparatus.
Theory courses included live demonstrations and operators were expected to understand the functions of the sets

- Students worked with individual instructors
- Students expected to assemble, adapt, work with sets under any conditions
- Submarine Chasers/Mosquito Fleet used equipment for small spaces vs. destroyers that could house larger units - Radioman were trained to adapt
DEMOBILIZATION
DEMOBILIZATION

The war ended suddenly -- Harvard operations quickly demobilized after Nov. 11, 1918 Armistice

- 3,480 students reassigned: Aircraft Radio School relocated to Pensacola, FL; most other operations went to Great Lakes by Mar. 1919
- Temporary barracks and buildings removed, university grounds restored to pre-war condition

- May 3, 1919, he was recalled, commissioned as Commander, and retired
- In 1942, Ayer disposed of his interests in the Farwell family businesses, but continued on several boards of directors: Boston Safe Deposit and Trust Company, National Shawmut Bank, New York Life Insurance Co.
- Ayer died on a vacation in Canada Jul. 26, 1948
LEGACIES
Harvard University’s commitment to WWI was massive

- 11,319 Harvard students/alumni served
- 200 teaching staff went into national service
- Major portions of the campus faced shutdown
- Harvard’s offer to the Navy was fortuitous and benefitted both
- Never before, or since, has a major university converted itself into a significant military installation
The Navy left a lasting impact on Harvard

- Cruft Laboratory and Pierce Hall became centerpieces of the new Harvard Engineering School:
  - Navy rebuilt the laboratories for permanent peacetime use
  - Buildings now contained best facilities in the country for electrical engineering research and education
- Other buildings renovated by Navy accommodated: sanitary engineering department, mechanical engineering laboratory, division of mining, new aeronautical engineering department

LEGACIES
Harvard University
U.S. Naval Radio School at Harvard: world’s first large-scale military educational center for advanced training of wireless radio operators

- Radio School trained 9 out of 10 American radio operators serving in WWI
- 16,031 men reported on its rolls from Oct. 1, 1917 – Apr. 16, 1919
- Approximately 8,400 men graduated from Aug. 1, 1917 – Jan. 1, 1919, and another 517 under instruction at closing

U.S. Naval Radio School Medal Issued To Carl P. Leffler, Aug. 31, 1918 (Authors’ Collection)
By the end of the war, the U.S. Navy operated the largest radio communication system in the world

- Recruitment and mass training were a tremendous success
- Nearly 80% of all U.S. amateur radio operators served, and civilians with no experience learned essential skills

Radio Ring (L) And Sweetheart Pin (R) From U.S. Naval Radio School At Harvard Circa 1917-1919 Made By Walker Military Ring Co. And Sold At The Harvard Watch And Jewelry Shop - The Rings Were $2.75 Each, And Pins Ranged From $0.50 To $1.00 Each (Authors’ Collection)
Josephus Daniels, Secretary of the Navy (1917-1921):

“At Harvard University we established the largest radio school that ever existed... The Navy not only transported and distributed supplies but also took over the repair and operation of the telegraph and telephone, the operation of wireless, and made possible communication by trained radio men and other naval personnel ... [H]alf a million men and thirty thousand officers were enlisted and trained by the United States Navy in eighteen months. No navy in the world ever had as large a personnel, or ever attempted to raise and train as large a sea-force in so brief a time.”
Sir Eric Geddes, First Lord of the British Admiralty:

“The dauntless determination which the United States has displayed in creating a large, trained body of seamen out of landsmen is one of the most striking accomplishments of the war. Had it not been so effectively done, one would have thought it impossible and words fail me to express admiration of the feat undertaken and accomplished by your Navy Department....”
QUESTIONS
QUESTIONS

Harvard Naval Radio School Banner By New England College Banner Company Showing The Navy Rating Patch For Wireless Operators, 1918 (Authors’ Collection)
References/Acknowledgements


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