

UNITED STATES NAVAL ENGINEERING

BY

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The common purpose and world-wide duties of the British and U.S. Navies prompts an interest in how our "opposite numbers" do the job.

We know that their set-up is different to ours in some respects, with less specialization and with fully navalized dockyards.

The possibility of having to work in company with United States naval units and the need to know something of their organization, prompts a few remarks from one who served in U.S.N. ships for a part of the war and had the opportunity of visiting the United States Naval Academy and American bases in recent years.

The cardinal policy for officering the U.S.N. is that line officers shall be capable of responsibilities in broad direction and detail in the navigation, gunnery, communications and engineering departments of a ship.

It is a personal opinion to say that, although the U.S.N. has certain specialists as will be described later, it does not consider that specialist engineer, gunnery, torpedo or navigation officers are essential for ordinary sea-going units. It is felt that senior officers should have a general knowledge of all branches rather than a detailed knowledge of one branch and too little knowledge of the others.

The U.S.N. has approached the problem from the business angle. They look at it as an executive running a department and do not expect him to know about every detail of that department. They feel that the best naval engineer or gunnery officer is not necessarily the best technical engineer or technical gunnery officer, but rather the one who has the most efficient department and who produces the best results.

Officers

The term "line officers" compares with our "executive officers" but includes besides non-specialists, aviators, submariners and officers who have taken post-graduate courses in technical specializations such as engineering, ordnance, aeronautical engineering etc.

It also includes officers who are restricted in their duties to their own particular specialization, such as engineering duty officers, aeronautical and ordnance engineering duty officers.

It is proposed to outline the methods of entry and training of U.S.N. officers as a background against which to focus particular attention upon the technical training and the careers of Engineering Duties Only (E.D.O.) officers, and their position *vis-à-vis* non-specialized officers holding technical appointments.

Obtaining a Commission

There are five avenues of approach to commissioned rank.

- (a) Graduation from the U.S. Naval Academy.
- (b) Successful completion of a four year course at any one of the fifty-two civilian universities which maintain a N.R.O.T.C. unit (Naval Reserve Officers Training Corps). This is known as the Holloway Plan.
- (c) Promotion from the ranks.
- (d) Transfer in a commissioned rank from the U.S. Naval Reserve to the U.S. Navy.
- (e) Direct Commission from civilian life.

Entry to the U.S. Naval Academy at Annapolis

Admission to the U.S. Naval Academy may be obtained by:—

- (a) Nomination.
- (b) Competition by enlisted men of any of the armed forces.

Nomination

Most Midshipmen gain entry into the U.S.N. Academy by nomination. Each Senator and Congressman is entitled to certain nominations, as are also the Secretary of the Navy, the President and the Vice President of the United States.

The candidates nominated are examined by the Naval Academy and the successful candidates enter as Midshipmen for a period of four years.

There are additional nominations available for men who have served in the Reserve. These are at the disposal of the Secretary of the Navy.

Competition by Enlisted Men

Many young men who have been unable to secure a nomination enlist on the lower deck or in the Reserve, and seek to gain competitive entry from there. About 20% of the total entry are from these sources.

Training at the U.S. Naval Academy

All Midshipmen take the same subjects except for a choice in foreign languages.

They do no specialized study in engineering, ordnance or communications, but graduates leave with the degree of Bachelor of Science.

The curriculum sets out to give a sound basic scientific education with a technical education superimposed upon it. Time is also spent on seamanship, O.L.Q., leadership, organization and administration.

The class-room methods bear a close resemblance to the new "basic" methods at the R.N.E.C. in that all class-room periods are preceded by private study, leaving the actual class-room period for discussion, analysis or elaboration of the important or difficult points arising.

The instructional staff is of the order of 260 Naval Officers and 180 civilian professors and technicians, backed by excellent instructional aids, models and displays.

During the four years training, Midshipmen do three summer cruises in various units of the Fleet and this helps theory and practice to go hand in hand throughout the academy training years.

On leaving the Academy, Midshipmen are promoted to Ensign in the U.S.N. or to 2nd Lieutenant in the Marine Corps.

Those promoted to Ensigns go to sea, or, to Flight Training if they are selected for naval aviation training.

Midshipmen may enter between 17 and 21 years of age ; leaving between 21 and 25.

The average leaving age is about $22\frac{1}{2}$ years.

Naval Reserve Officers Training Corps (Holloway Plan)

This scheme was initiated in order to make use of the university facilities in the United States, and when in full swing may provide officers equal in number to those graduating from the Academy.

Candidates of the right quality sit a nation-wide examination and the vacancies are filled from those gaining a sufficiently high place in the results.

Those accepted are under an obligation to serve in the U.S.N. for a minimum of one year at the end of the university course, after which they can volunteer to continue a naval career or transfer to the Reserve.

Subject to these provisos the Navy pays the cost of university education and makes a monthly allowance to the student in addition.

At the university the student may take almost any degree he chooses provided that his studies include certain designated subjects such as maths, physics, naval science, etc.

He must also do a summer cruise during his second, third and fourth years at the university.

At the end of the university course the student may be commissioned as an Ensign, and after one year on active duty, if he so wishes, be transferred from the U.S.N. as an Ensign in the Reserve ; reverting to inactive duty.

If on the other hand he continues active duty for an additional two years, he may select either of the following alternatives :—

- (a) Transfer to the Reserve, with a bounty.
- (b) Request consideration for a permanent commission in the U.S.N. in which case if accepted, he is on exactly the same footing as an Academy graduate of the same seniority.

Promotion from the Ranks

Candidates who have the necessary educational standard may be given a

preparative schooling before sitting the same entry examination as the Academy nominees.

Also, ratings may be given a permanent commission in the U.S.N. as Limited Duties Only (L.D.O.) Officers. In that case they continue to perform in a commissioned rank the specialist duties previously performed as a rating, but at a higher level.

Some L.D.O.s are limited to engineering duties.

Transfer from the Reserve

Officers transferring to the U.S.N. must normally drop the special duties of their reserve classification and take on the more general duties of commissioned rank in the U.S.N.

Direct Commission from Civil Life

This entry into the U.S.N. is usually limited to Staff Corps Officers, particularly medical, dental, civil engineering, supply corps and chaplains.

This general outline of entry into the U.S.N. shows that there is no special engineering training given prior to attaining commissioned rank, with the exception of officers commissioned from the ranks as L.D.O.s. or the few Reserve Officers commissioned as E.D.O.s who may have had technical training before entering the service.

Post-Graduate Courses

Post-graduate courses form an important part in the training plan for U.S.N. officers. They are carried out at the post-graduate school and at civilian universities.

Courses cover a wide range of subjects and vary in length from one to three years.

One begins to see why the American method works, after studying the range of subjects and appreciating the fact that the completion of any of these courses in no way ties the officer to that specialization for the remainder of his career. After a post-graduate course he may apply for designation as an E.D.O. or resume his ordinary naval duties, in which case he is normally appointed to duties involving his technical speciality whilst serving ashore, and at sea follow the career of a general line officer with rather more tendency to incline towards the technical side of duties afloat.

Courses :

- Aerological Engineering.
- Applied Aerology.
- Aeronautical Engineering.
- Civil Engineering.
- Applied Communications.
- Electronics Engineering.
- Law.
- Naval Administration.
- Naval Construction/Engineering.
- Naval Engineering.
- Naval Intelligence.
- Ordnance Engineering.
- Personnel Administration and Training.
- Textile Engineering.
- Business Administration.
- Advanced Management.
- Advanced Science.

Engineering Duty only (E.D.O.) Officers

To begin with, engineering duties as defined in the U.S.N. include the following:—

- Electronics Engineering.
- Naval Architecture.
- Propulsion.
- Ordnance.
- Aeronautical Engineering.
- Chemical Engineering.
- Metallurgy.
- Industrial Engineering.
- Mechanical Engineering.
- Hull.
- Diesel Engineering.

An officer appointed to engineering duties afloat does watchkeeping below and has the usual divisional duties.

He is usually a junior officer of the line without any special engineering background.

Where possible, large ships rotate the junior officers through the various departments of the ship, through gunnery, navigation, communication and engineering.

E.D.O.s are obtained from two main sources:—

(a) From selected volunteers of Lieutenant to junior Commander ranking who are considered to have the necessary promise fitting them in due course for the higher appointments open to E.D.O.s.

These officers will have done a post-graduate course in some engineering or scientific specialization or will take such a course on being selected.

(b) From selected Lieutenants (junior grade), who volunteer after 2-3 years sea service.

These are given a 3 year course at the Massachusetts Institute of Technology in naval architecture, marine engineering and electricity.

The course of study includes five different curricula, leading to specialization in five different fields of naval construction and engineering.

Three-quarters of the time is given to a study common to all students:—

- Strength of Materials and Dynamics.
- Heat Engineering.
- Properties of Metals.
- Heat Transfer.
- Statics of Ship Design.
- Dynamics of Ship Design.
- Warship General Arrangement.
- Warship Basic Design.
- History of Warships.
- Elementary Ship Design.
- Warship Propulsion.
- Warship Machinery Design.
- Economics and Labour Relations.

The remaining quarter of the course is devoted to one of the following subjects:—

Hull Design and Construction
 Marine Electrical Engineering.
 Electronics Engineering.
 Ship Propulsion Engineering.
 Nuclear Engineering.

This course is called the Naval Construction-Engineering Course, and on completion officers are designated E.D.O. (Hull), E.D.O. (Marine Eng.), E.D.O. (Elect.) etc.

To give some idea of the “balance” in the E.D.O. strength, the present strength is roughly as follows:—

Lieut. (junior grade)	...	...	...	40
Lieut.	...	...	...	180
Lieut. Cdr.	...	...	...	350
Commander	...	...	...	280
Captain	...	...	...	150
Admiral	...	...	...	15

E.D.O.s are employed on design and administrative duties within the Bureau of Ships in Naval Shipyards, and in Research and Development establishments administered by the Bureau.

In all these they can rise to command. At sea they may be employed as the E.O., the Main Propulsion Officer of cruisers and above, and as Staff Officers in a Fleet.

In battleships and large carriers an E.D.O. may fill the position of the E.O., or Main Propulsion Officer, but rarely both positions.

Space does not allow of a complete list of the varied appointments which may be held by E.D.O.s. A selection of typical E.D.O. appointments is as follows:—

Repair Officer in Repair Ship.
 Main Propulsion Officer in large ship.
 Engineer Officer in large ship.
 Electronics Repair Officer in large ship.
 Damage Control Officer in large ship.
 Logistics Officer on a Fleet Staff.
 Electrical Officer on a Fleet Staff.
 Command Petroleum Officer.
 Management Analysis Officer.
 Technical Intelligence Officer.
 Fleet Maintenance Officer.
 Standardization Officer.
 Chief of Naval Research.
 Chief of Industrial Relations.
 Chief of Bureau of Ships.
 Director of Contracts.
 Head of Turbine and Gear Branch in Ship Technical Division.
 Head of Boiler and Heat Exchange Branch in Ship Technical Division.
 Head of Electrical Branch in Ship Technical Division.
 Director of Naval Branch Laboratory in Ship Technical Division.
 Shipyard Commander.
 Planning Officer in Shipyard.
 Design Superintendent in Shipyard.
 Shop Superintendent in Shipyard.
 Docking Officer in Shipyard.

The picture is incomplete without brief mention of the technical ratings in the U.S.N. who may be said to have a more detailed structure, and advance on a narrow front with less all-round qualifications than the R.N. rating. This is evident from the group categories, a few of which are given below:—

Machinist Mate (MM).
 Engineman (EN).
 Machinery Repairman (MR).
 Boilerman (BT).
 Electricians Mate (EN).
 I.C. Electrician (IC).
 Metalsmith (ME).
 Pipe Fitter (FP).
 Damage Controlman (DC).
 U.W. Mechanic (UM).
 Fireman (FN) etc.

The Supply Corps

The duties of this corps touches on our duties as Engineer Officers ; the Supply Corps being responsible for the following:—

Purchase, receipt, custody, storing, issue and shipment of all supplies, fuel and other materials for the Navy ; pay and naval accounts.

The Chief of the Bureau of Supplies and Accounts is therefore equivalent to an integration of our D of S, D of VS and D.N.A.

The officers are drawn from the U.S.N. Academy ; by transfer from line officers ; from the lower deck ; the N.R.O.T.C. and from college graduates with a business background.

The Civil Engineer Corps

This corps has officers qualified for special duties in connection with administration and technical duties in the Bureau of Yards and Docks, Public Works officers in Naval Yards ; and the training, administration and command of “ Sea Bees ”—the construction battalions.

Officers enter from the universities direct or under the N.R.O.T.C. scheme.

They must have an engineering degree in civil, electric or mechanical engineering, and a few top graduates from the U.S.N. Academy are also taken in.

Conclusion

This outline will have shown something of the differences between the U.S.N. and R.N. in achieving an efficient technical organization with which to maintain the mobility of fleets and the support necessary to the exercise of sea power.

Opinions will differ as to the relative value and suitability of the different methods followed and it is always interesting to know how the other fellow does the job.

There is a good deal of evidence to show that the two ways of doing the job are each suited to the respective traditions, temperament, educational background and economic structure of its particular country and people.

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