

An Exercise in Social Conditioning? The Joint Education and Training of Engineer and Navigator Cadets for Careers as Officers in British Merchant Ships, in the 1960s¹

Alston Kennerley

Les années 1960 ont vu les premières tentatives sérieuses pour intégrer l'éducation à terre et la formation des futurs officiers britanniques de la marine marchande (autant navigateurs qu'ingénieurs) avec la structure nationale de l'époque pour la formation professionnelle. La pratique traditionnelle dans l'éducation, la formation, le brevetage et l'entourage social des marins marchands, fournit un contexte pour l'introduction de cours abrégés pour les officiers stagiaires conformes aux qualifications professionnelles nationales. La fourniture de cours de technologie maritime en parallèle avec des cours de science nautique est examinée en se concentrant sur les éléments communs. La conclusion fait ressortir que cette disposition d'intégration d'éducation avec la formation professionnelle était importante en égalisant les différentes catégories d'âge, en fournissant des possibilités éducatives précédemment inaccessibles, et en contribuant à l'amélioration des rapports personnels à bord des navires.

“Navigating and Engineer Cadets live together in the School’s Halls of Residence, and as far as possible the activities and studies of the Cadets are integrated so that future officers undergo the same kind of training and are subject to the same kind of control and

¹ Some of the research for this paper was supported by the Nuffield Foundation as part of a wider project entitled “British Merchant Marine Engineers, 1820-1970: Origins, Training, Education and Careers.” An earlier version was presented at the International Congress of Historical Sciences at Sydney, Australia, 2-9 July, 2005. The author is indebted to the anonymous referees and the editor for their helpful comments. The sources for this treatment of borders and boundaries in mercantile marine education and training are diverse. An established basis lies in the author’s studies and publications on navigating and marine engineering education and training, and in his practical experiences as a navigating officer at sea and as a lecturer responsible for delivering liberal studies at Plymouth College of Technology. Important in the sources for the period in question are the records of the British government departments concerned with education and with shipping, now becoming available to historians including Her Majesty’s Inspectors’ (HMI) reports, papers on the development of liberal studies, institutional papers and, where they have survived, maritime college records, and shipping company training literature. Further, living witness, in the form of responses to questions from seafarers who experienced combined training in that period, has been sought.

discipline.”² Merchant seafarers tend to be set apart from society ashore. When a ship sails from a port it soon drops over the horizon away for significant periods from interaction with society ashore. Likely, the next port of call will bring a different culture, language, currency, and legal context from the previous one. At sea the ship’s hull, moreover, confines the seafarer, at least until the next port, within a “total institution” not dissimilar from a monastery or a prison,³ where the seafarer lives adjacent to, if not within, his place of work in a small hierarchical society which imposes its own vocational language, age, culture, behaviour and job specializations.⁴ It can be very daunting and lonely being a youngster surrounded by older men who all know their place in shipboard society. One aspect of that society, the “oil and water” boundary between engineers and navigators, has a particular bearing on the discussion here.

By the 1960s, most occupations having a scientific or technological basis required vocational educational courses which could be followed in parallel with gaining occupational experience as a trainee. Until the 1950s this had largely been achieved through attendance at evening classes two or three times a week, but increasingly day or block release attendance was being developed and some occupations were moving towards full-time day courses.⁵ Merchant seafarers aiming to be qualified as merchant ship engineer officers or as navigating (deck) officers were, of course, prevented by their work environment from following evening or day release classes in colleges anywhere, and the pattern of ship operation took no account of the dates adopted for block release approaches or full time day attendance. The only alternative was to give up seafaring temporarily and, unless the industry or the state helped, finance one’s own attendance.⁶

In order to understand the significance of the initiatives taken in the 1960s it is first necessary to explore the patterns which had evolved during the previous century or more, including statutory licensing, navigating and engineering training and education and the oil/water social problem. Then the discussion will turn to the factors which

² Plymouth College of Technology, *General Prospectus, 1967-68* (Plymouth, 1967), “School of Navigation and Maritime Studies” section, Engineer Cadets, 24.

³ This concept was explored in E. Goffman, *Asylums* (Harmondsworth, 1968). It is related to seafaring by Bryan Nolan, “A Possible Perspective on Deprivations,” in Peter H. Fricke (ed.), *Seafarer and Community* (London, 1973), 85-96.

⁴ For a discussion of hierarchy in merchant ships see Tony Lane, *Grey Dawn Breaking: British Merchant Seafarers in the Late Twentieth Century* (Manchester, 1986), Chapter 6, “Hierarchy,” which includes a section on ships’ engineers. See also Peter H. Fricke, *The Social Structure of Crews of British Dry Cargo Ships: A Study of Organization and Environment of an Occupation* (Cardiff, 1974).

⁵ For an overview in relation to a local technical college see Alston Kennerley, *The Making of the University of Plymouth* (Plymouth, 2000), Chapter 3, “Technical Education in Plymouth, 1914-1970,” 59-101. For engineering courses see C.L. Old, “Engineering,” in P.F.R. Venables, *Technical Education: Its Aims, Organisation and Future Development* (London, 1955), Chapter 8, 245-280.

⁶ Following the advent of the power-driven merchant ship in the nineteenth century, engineers were added to deck officers and master (ship’s captain) as the senior personnel groups aboard ship (within their own spheres), but they came from significantly different cultural backgrounds and their occupational socialization and vocational training was different. See Peter H. Fricke, “Family and Community: the Environment of the Ship’s Officer,” in *Seafarer and Community*, 132-150.

spurred on the changes, and the educational and training structures which were designed and married to create what in effect were residential maritime further education colleges. The final section will assess those course elements which might be said to have been designed particularly to unify the educational experiences of engineer and deck officer trainees, or cadets as they were called, with special reference to practice in Plymouth.

In the late 1940s, British shipowners had been intent on reinstating the industry in the form that had become established before the Second World War and the world wide trading disruption and the severe shipping losses that the war caused. Initially the losses were replaced with second hand tonnage including notably a significant number of the Liberty ships built in America. A massive new building programme reinstated the cargo liner, tramp and tanker sectors of foreign-going shipping with more up-to-date but essentially similar types of ships to those operated in the 1930s. By 1952 British registered tonnage matched the figure in 1939 and numbered 3,211 vessels over 100 tons. Of the total effective seafaring manpower, there were 14,662 masters and deck officers, 22,274 engineer officers, 4,692 deck apprentices and cadets, but no engineer apprentices or cadets as until that year engineers underwent their apprenticeships in engineering works ashore.⁷ It must be borne in mind that seafaring turnover had always been high. Average deck officer careers (including apprenticeship/cadetship) lasted little more than about ten years, and those of engineer officers (after their shore apprenticeships), where there were endemic manpower shortages (particularly severe in this period), even less. This problem was the reason for introducing the Alternative Entry scheme for engineer apprentices/cadets, which incorporated sea-going experience, and by 1962 the numbers registered had reached 1038. The industry needed a flow of licensed engineers and navigators to maintain officer manning levels in the coming decades. Most training provision was made by the leading cargo liner groups, the large tanker companies and some tramp ship companies, and these supported the training initiatives of the 1960s discussed below. In the 1950s, described by Hope as “the halcyon years,” the impact that increasing ship size, advancing technology, flags of convenience, subsidized shipping and particularly containerization, would make on the industry had yet to be fully appreciated.⁸ In 1960 the number of vessels over 100 tons had declined a little to 2,919, but the trend was becoming apparent by 1965, when the figure had fallen to 2,403. But factors such as increasing leave allowances and extended course periods in colleges ashore sustained the need for officer trainees, the required pool relating of course to the number of ships rather than the aggregate tonnage.

Seafaring is a craft-based occupation with its traditions, hierarchy and training practices rooted in sail propulsion, and traceable at least to medieval times when craft

⁷ General Council of British Shipping, *British Shipping Statistics, 1979-80* (London, 1981), Table 2.8, “United Kingdom owned and registered fleet by type, 1 July 1850-1979,” 60; Great Britain, *Committee of Inquiry into Shipping: Report* [Rochdale Report], Cmnd. 4337 (London, 1970), Table 13.1 “Numbers in the Effective Section of the Central Register of Seamen at 31st December [1948-1968],” 222. Seafaring manpower statistics are fraught with complexities, and the data should be taken as no more than an indication of magnitude.

⁸ Ronald Hope, *A New History of British Shipping* (London, 1990), Chapter 22, “The Halcyon Years, 1948-57.” Hope is at his best in his handling of the shipping revolution and the decline in British shipping in Chapters 23 and 24.

guilds rose to prominence.⁹ There lie the origins of the twentieth century deck officer job titles: apprentice, mate and master. Boys went to sea as teenagers, and, as in most craft occupations, learned their job skills through experience, emulating more experienced seafarers and from time to time receiving *ad hoc* instruction in details. The whole emphasis was on the practical work involved in sailing ships between ports: handling the sails and rigging, steering, maintenance tasks, and dealing with cargo – all grouped under the term “seamanship.” By their twenties experienced seafarers with influence and some secondary education might achieve positions as junior mates, and, providing their ability in navigation progressed, might in a few years rise to the command of a ship as master. But this step depended upon the confidence of the owners and insurers and often required some financial investment in the ship.

Until the second half of the nineteenth century there was no school- or college-based training in seamanship for future ships’ mates, and it was well into the twentieth century before that for future able seamen (deck ratings) really developed.¹⁰ However navigation schools ashore for educating future mates and masters in the mathematically based techniques of ocean navigation (nautical astronomy) for which a sound secondary education was needed, date from the sixteenth century.¹¹ Navigation teaching became widespread in Britain in the eighteenth century, in endowed and proprietary establishments. State promotion and aid for navigation schooling had a brief upsurge in the 1850s, but private establishments predominated until the twentieth century when nautical vocational education and training was developed in the technical college sector.¹²

During the nineteenth century the voluntary sea apprenticeship, which settled at four years’ duration, became the normal preparation for positions as deck officers.¹³ This lasted until the 1960s when the non-indentured cadetship, long in use by some companies

⁹ For a background studies to this overview see Alston Kennerley, “Aspirant Navigator Training and Education at Sea During Commercial Voyages in British Merchant Ships, *ca.* 1850 to *ca.* 1950,” written for the proposed conference book, *Navigating the Northern Seas*, as an outcome of the XIIth Conference of the Association for the History of the Northern Seas, Middelberg, Netherlands, 18-20 August 2005.

¹⁰ Alston Kennerley, “Merchant Marine Education in Liverpool and the Nautical College of 1892,” *International Journal of Maritime History*, V, No. 2 (December 1993), 103-134; Alston Kennerley, “Ratings for the Mercantile Marine: the Roles of Charity, the State and Industry in the Pre-Service Education and Training of Ratings for the Mercantile Marine, 1879-1939,” *History of Education*, XXVIII, No. 1 (March 1999), 31-51; Alston Kennerley, “Vocational Further Education and Training for British Merchant Navy Ratings: the National Sea Training Schools, 1942-1972,” *History of Education*, XXIX, No. 4 (2000), 301-327.

¹¹ Alston Kennerley and Percy Seymour, “Aids to the Teaching of Navigation and Nautical Astronomy and its History from 1600,” *Paedagogica Historica*, XXXVI, No.1 (2000), 151-175.

¹² Alston Kennerley, “Early State Support for Vocational Education: the Department of Science and Art Navigation Schools, 1853-1863,” *Journal of Vocational Education and Training*, LII, No. 2 (2000), 211-224; Alston Kennerley, “Nationally Recognised Qualifications for British Merchant Navy Officers, 1865-1956,” *International Journal of Maritime History*, XIII, No. 1 (June , 2001), 115-135.

¹³ The author, for example, was apprenticed to the Liverpool shipowner, Alfred Holt & Co. (Blue Funnel Line), from 1951 to 1955. He then took the eight week course for the Board of Trade’s second mate’s examination at Liverpool College of Technology.

but otherwise indistinguishable from the apprenticeship, became the standard. There was no requirement for attendance at nautical school or college courses. However, a proportion of apprentices/cadets had from the mid-nineteenth century experienced pre-sea courses which taught seamanship and navigation, and during which a uniform emulating naval officers' dress might be worn. During the sea apprenticeship/cadetship navigation was supposed to be studied, but this was commonly neglected. On completion of that training period those hoping to become deck officers attended a convenient navigation school to be prepared for the first statutory certificate of competency, that as second mate.

Britain had introduced the compulsory licensing of merchant ship mates and masters under the Mercantile Marine Act, 1850.¹⁴ To administer the act's provision the Marine Department was established in the Board of Trade (BoT), which devised the examination regulations and oversaw the setting of the examination papers, the conduct of the examinations (including the important *viva voce* element), the marking of papers and the issue of certificates.¹⁵ Although the licensing applied only to a section of the shipping industry (all foreign-going ships and passenger ships in the home trade), this was nevertheless in modern terms a national vocational qualification. Much revised and updated, the requirement remains in force to the present.

While deck apprentices or cadets went to sea straight from school (or via a nautical course) their industrial socialization was always to do with ships and their operation during voyages. But the merchant ship engineer traditionally went to sea to some extent pre-qualified by mechanical engineering experience ashore, and as a result did not get afloat until at least in his early twenties.¹⁶ The cause may be traced back to the early decades of the nineteenth century when the first steam engines were being installed in ships, and, as is often the case with new technology, the engine manufacturer supplied the first ship's engineers from amongst his experienced mechanics who had worked on the building of the engine. Engine breakdown at sea was common well into the twentieth century and ship's engineers had to be skilled in dismantling their engines, making new parts, and rebuilding. The prevention of failure through sensitivity to impending failure and the adherence to regular cycles of maintenance, demanded the kind of experience developed through mechanical engineering apprenticeships, typically of about five years, in heavy engineering workshops ashore, such as those in shipyards and marine engine works.

In time, work as a ship's engineer emerged as special area of mechanical engineering employment based on the apprenticeship ashore, and this requirement was enshrined in the certificate of competency regulations following the passage of the Merchant Shipping Act Amendment Act, 1862.¹⁷ This required foreign-going ships and all passenger ships to carry engineers holding certificates of competency as second and

¹⁴ 12 & 13 Vict., c.93. This act came into force on 1 January 1851.

¹⁵ In the twentieth century the overseeing government department underwent several changes of name. The erstwhile Marine Department is now the Maritime and Coastguard Agency.

¹⁶ Alston Kennerley, "Engineers in British Merchant Ships, 1850-1970 Origins and Careers", *Journal of Marine Design and Operations* (Proceedings of the Institute of Marine Engineering, Science and Technology, No. B10) (October 2006), 3-19.

¹⁷ 25 & 26 Vict., c. 40. This act came into force in 1863.

first class engineers, the process, as with mates and masters, being handled by the BoT Marine Department.¹⁸ Again these were national vocational qualifications, but unlike the deck certificates, they attested to experience and skill which could be applied in mechanical engineering ashore as well as at sea. There is ephemeral evidence that engineers went to sea just to obtain the certificate so they could apply for positions in charge of engineering plant ashore, which might otherwise have been outside their reach. Wastage of engineers from employment at sea and shortages of ship's engineers, seem to have been endemic in power-driven merchant shipping except perhaps in times of depression. Nevertheless, certificates of competency gave engineers equivalent status with mates and masters from whom they had usurped responsibility for ship propulsion. By the end of the nineteenth century, engineers in the largest ships were responsible for what was in effect the whole engineering plant of a small town, and the more able were beginning to take up seafaring already qualified to some extent in mechanical engineering subjects offered in evening classes at the emergent technical colleges.

As with the deck trainees, there was no educational attendance requirement before attempting the certificate examinations. Men who had completed their apprenticeship ashore could be offered appointments as junior engineers in ships, and it was not uncommon in tramp ships for engineers to be placed in charge of a four-hour engine room watch at sea on their first voyages, having to pick up the operational routine as they went along. After a year (later increased) in charge of a watch at sea, they could attempt the certificate of competency examinations (the *viva voce* was again a significant element). Most ships' engineers attended a marine engineering school for a few weeks to prepare for the second class engineer examination, and if successful, they could often secure positions as second engineer on the strength of the certificate. Many of these schools were private establishments, but again these had died out by the 1960s, and the certificate courses were being offered in technical colleges. After a further period at sea engineers returned to their chosen marine engineering school to prepare for the first class engineer examination. Armed with that certificate, a position as chief or first engineer might soon be obtained in tramp ships, though in the better paid liner ships that might not be achieved until in a man's forties. In the twentieth century time spent at technical colleges or even universities, on mechanical engineering courses earned exemption from the sea time requirements and later from parts of the written examination papers.

In the semi-enclosed society of the power-driven merchant ship the differences in age, vocational socialization, training and education between these parallel groups of ship's officers (as they developed by the latter decades of the nineteenth century), could lead to stresses in the social environment. Not immediately evident in the discussion above is the different social backgrounds from which members of the two groups were drawn and the spatial structuring of the shipboard society, found particularly in liner companies. The studies of Fricke, Lane and others all demonstrate the class and attitude

¹⁸ Alston Kennerley, "British Marine Engineer Licensing, 1865-1925," in Richard Gorski (ed.), *Maritime Labour in the Northern Hemisphere, 1750-1950* (forthcoming).

differences between engineers and mates.¹⁹ The former were blue collar skilled working class, the latter had lower middle class origins, having become upwardly mobile in culture and behaviour during the nineteenth century. Overlaid with this were mutual resentments. On the part of mates and masters examples include the loss of control over propulsion, dislike of the smells and dirt caused by steamship engines, the lack of understanding of engineering technology, and dependence on the superior technological knowledge of engineers. On the part of engineers there was their perception of superior attitudes adopted by deck officers, separate messing, and the inability to rise to command.²⁰

Engineers were ill prepared for instant officer status by their shore training and initially experienced difficulties adjusting to having authority over relationships with, in particular, engine room and catering ratings from similar backgrounds. In contrast deck officers were adjusted to their social positions in the shipboard hierarchy through their time as apprentices/cadets. As engineers became more highly educated technically, they could command higher wages at sea than deck officers of equivalent rank, and were often preferred for management positions, such as marine superintendent, in company staff ashore. There were many ships where the two groups hardly ever mixed either at meals or for social relaxation, contact being restricted to work requirements only. All these factors were summed up at sea in use of the term “oil and water don’t mix.”

Technical college development before the late 1950s had been seriously hampered through the two world wars and the depression of the interwar years.²¹ By the 1950s evening class teaching still predominated, full time staffing was small and there was heavy reliance of part-time teachers. Modernisation and development of buildings and facilities after the long years of under-investment, had yet to be started. Despite government encouragement in the late 1930s, it was the 1939-45 war which ensured that further education, and particularly higher technical and scientific education would move up the list of government priorities in the post war period. The recognition of the need for a better technically educated work force, the need to retrain large numbers of ex-service men, industrial rejuvenation, and the arms race, were among factors which were to produce an “explosion of further education” once the country’s finances had recovered.²² Significant stages were the publication of the government White Paper “Technical Education” in 1956, recommending the expansion of the post sixteen sector, already becoming known as further education, and the report of the Robbins Committee on Higher Education in 1963, which, despite recommending an expansion of university

¹⁹ Fricke, *Social Structure of Crews*; Lane, *Grey Dawn Breaking*; see also Social Surveys (Gallop Poll), *The Attitude of Seafarers to their Employment: Report Submitted to the Committee of Enquiry into Shipping* (London, 1970), Vol. I (Commentary), 58-63.

²⁰ See also H. Campbell McMurray, “Ships’ Engineers: Their Status and Position on Board”, in Stephen Fisher (ed.), in *West Country Maritime and Social History: Some Essays* (Exeter, 1980), 79-100. For the wider context of engineering occupations see Ian A. Glover and Michael P. Kelly, *Engineers in Britain: a Sociological Study of the Engineering Dimension* (London, 1987).

²¹ Venables, *Technical Education*, “Introduction,” 1-30.

²² Leonard M. Cantor & I. Francis Roberts, *Further Education in England and Wales* (London, 1969), Chapter 1, “The Explosion of Further Education,” 1-11.

education, made influential observations on technical education generally.²³ Ideas on the breadth of course content were also developing in the post-war period, and included the incorporation of general or liberal studies.²⁴ Maritime education would benefit in this climate through the development of a number of regional nautical colleges and new initiatives in course design. But its existing culture would undergo a major shake-up.

Although British technical education delivery remained predominantly a part-time affair into the 1960s, there had existed a respected national vocational qualification system since the early 1920s, providing certificates and diplomas at ordinary and higher levels. Certificates were awarded for the successful part-time study of a group of related subjects (students being at work most of their time), and diplomas for full-time study.²⁵ Each group of subjects was overseen by a central “joint committee” which set out guidelines, and validated the syllabuses, staffing and facilities of college departments presenting proposals for submission. Combined with oversight of management, assessment and awards, the system ensured a reasonable level of uniformity across the country. The parties joining to form the committees were industry, usually represented by the relevant professional institutions, and the education ministry, with the education inspectorate playing important roles. In practice a third important sector, technical colleges, were also heavily involved. Formal permission to run a course was given by the education ministry which also took account of demand and regional distribution. Grouped subject courses, taken for granted today, replaced the single subject certification approach which had predominated in the second half of the nineteenth century. The most successful committee and the earliest, was that for mechanical engineering, established in 1922, and in which the Institution of Mechanical Engineers represented industry. Before the 1960s, by far the greater number of awards were Ordinary and Higher National Certificates (ONC, HNC), the numbers of Diplomas (OND, HND) being in comparison very small. In contrast to the Board of Trade certificate of competency examination system, discussed below, college staff had an input into the syllabus, and assessment was internal, though with proper external moderation before recommendations for making awards were passed, with moderators’ reports, to the joint committee.

Maritime teaching was dominated by the voluntary preparation courses for the certificate of competency examinations, as they had been for the past century. Even if in the same college, these deck officer and engineer short, full-time day courses were in different departments, and maritime students did not mix with each other, or to any extent with students in other disciplines. Because the assessment and awards were not internal to the college or under the auspices of one of the recognized educational bodies such as a joint committee for national certificates and diplomas, City and Guilds of London Institute, or Royal Society of Arts, or even under the Ministry of Education, but under a non-educational government department, they lay outside what was readily recognized

²³ Command 9703, Command 2154.

²⁴ Cantor & Roberts, *Further Education in England and Wales*, 68-73.

²⁵ Venables, *Technical Education*, op.cit, Chapter 5, “Partnerships in Technical Education,” upon which this section is based.

and understood as the normal sphere of technical college activity.²⁶ Most of the maritime staff were former seafarers, deck officers or marine engineers, appointed for their experience and the certificates of competency they held, so maritime work could almost be free standing from the accommodating college. Like other technical college staff, maritime staff rarely held teaching qualifications.²⁷ They had no input into the examination syllabus, question setting, conduct or marking of the examinations over which the nautical and engineer surveyors in the marine section of the BoT held sway, when temporarily diverted from their survey duties aboard ships.²⁸

Certificate of competency examinations were conducted at a number of BoT examination centres (rented suites of rooms), which had long been established in the more important ports. The various examinations were offered at monthly or even fortnightly intervals. The concern under the Merchant Shipping Acts was with safety issues, not with educational matters, and the written papers and oral interrogation judged whether the responses led to safe or unsafe outcomes. Marking was by deduction from the total available, an error of principle[RS1] leading to a fifty percent deduction in the question concerned and non-safety errors a thirty or ten percent deduction. In addition the most important safety papers such as navigation, carried a seventy per cent pass mark, and the others fifty per cent. The overall pass mark was seventy per cent. This assessment regime was extremely rigorous, though in academic terms questions were wholly concerned with factual knowledge and not with critical interpretation. Viewed from an educational perspective the whole structure was seriously flawed. On the deck side the subject span was extremely broad, drawing in aspects of mathematics, electricity, meteorology, magnetism, astronomy, navigation, ship construction, stability, seamanship, communications, signaling, cargo handling and stowage and the legal regime.²⁹ The subjects studied by engineers in the 1950s for their certificates of competency included naval architecture, engineering knowledge, electro-technology, engineering science (applied mechanics), heat and heat engines, and engineering drawing.³⁰ Because of the frequency of the examinations, short cuts in the assessment process were adopted, such as discontinuing marking once enough marks had been deducted to indicate failure, and making up question papers from a bank of questions. However, there was no restriction on the number of attempts that candidates might make, though an immediate further attempt might be prevented through the imposition of the penalty of serving further

²⁶ However parallels may be found in tertiary agricultural education under the Board of Agriculture/Ministry of Agriculture, Fisheries and Food, and the education service of the Army.

²⁷ When the author was appointed to the Plymouth School of Navigation (within the College of Technology) in 1965, holding a certificate of competency as master mariner, he found he was the only graduate on its staff and unusual in also holding a teaching qualification.

²⁸ In 1941 responsibility for merchant shipping came under the Ministry of War Transport, instead of the BoT. Following the war came several changes to the name of the responsible ministry, such as Ministry of Transport, Department of Trade, Board of Trade, Department of Trade and Industry. For simplicity BoT will continue to be used here.

²⁹ Ministry of Transport, *Regulations for the Examination of Masters and Mates* (London, 1962).

³⁰ Merseyside Maritime Museum: Maritime Archive and Library (MMM:MAL), B/Har/8/8/8, "Examinations for Engineer Officer?," Department of Marine Engineering, City of Liverpool College of Technology (1951): a publicity card.

periods at sea, say three or six months, before submitting another examination application. Although the examination syllabuses were updated from time to time, the system was not responsive to recent developments, and could lag perhaps as much as twenty years behind important developments. Further, they by no means covered all the subject material with which the most senior people in merchant ships, masters and the chief engineers, would need to be conversant when they reached those appointments. Educationally, the system was a dead hand on initiatives that maritime teaching staff would like to have been able to make, and led to “cramming” techniques in course delivery and student practice, and to question spotting by staff.

Maritime course delivery had long been conditioned to the admission of students as they were discharged from their ships on completing the required sea time, and to the frequency of the examinations. The arrangements made in the nautical department at Liverpool Central Technical College illustrate in outline one way in which these unusual circumstances could be handled.³¹ Lectures on the various nautical subjects were timetabled for the middle hours of the day, say 1100 to 1500, and the series was delivered over an eight week cycle, endlessly repeated. As far as possible lecture topics were free standing so students could join the cycle at any point. At the beginning and end of the day all students attended study tutorials during which they worked the answers to questions in the nautical departments’ printed books of examination questions. The lecturer on duty called each up to his desk in turn where work was marked. If the answer matched his model answer in every respect, including the layout and labeling of mathematical answers, that question was marked off on the check list pasted in the back of the student’s work book and he could continue to the next question. If incorrect in any way, the whole answer had to be repeated until the required correct solution had been presented. The question books contained very large numbers of questions. When a student had completed the lecture cycle he joined an all day tutorial group and continued working answers until he had attempted all questions on offer. Students were expected to arrive in the morning with some answers, attempted as home work, ready for marking. They were of course free to enter themselves for the examination at any time, but most waited until the responsible lecturer said they were ready to make an attempt. After the examination candidates were expected to return to the tutorial to report on the questions set, if possible giving exact details. These were recorded and allowed the teaching staff to make fairly accurate predictions of the content of the next examination. While this example relates to deck officer courses, engineer courses were under similar pressures and adopted their own cramming techniques.

Although the discussion immediately above is about studies and assessments prior to deck officers and engineers achieving their first statutory qualifications, and the core discussion will be about the role of new maritime educational approaches in breaking down barriers before that stage is reached, it is essential to the understanding of the culture that would be changed and the flexibility that the BoT marine section would have to display. The wider further educational culture might have been favourable to

³¹ This description is based on the author’s own experiences when studying in Liverpool for his certificates of competency as second mate (1956), first mate (1958) and master (1961), and his exercise books.

change in the 1950s, but it was the problem with the supply of ships' engineers that led to a new approach to the training of ships' engineers. In 1952, after a lengthy debate within the BoT (engineer surveyors and examiners) and consultation with the shipping industry, the Alternative Entry Scheme was approved and publicized.³² The preferred source of ships' engineers remained the craft apprenticeship in heavy engineering works ashore, but under the new scheme school leavers could be recruited by shipping companies as engineer cadets if they had reached sixteen years of age and were qualified for entry to the two year "Joint Committee" Ordinary National Diploma Course in Mechanical Engineering.³³ Only selected technical colleges in port towns were allowed to offer the course. Cadets wore Merchant Navy uniform, and were accommodated in a hostel or lodgings. Additional practical training in engineering workshops and ship visits were compulsory during vacation periods. In this context Engineer cadets received a certain amount of maritime socialization, but two years still passed before they actually went to sea in a merchant ship, when they then had to serve about eighteen months. There followed twelve months training in a shipyard or marine engine works following which they could then attempt the second class certificate of competency examinations. Success in the OND in mechanical engineering, gained exemption from the knowledge subjects in the certificate of competency examinations but not from the practical subjects.

Despite the delay in getting to sea compared with deck cadets, these recruits as ships' engineers now had much more in common with deck recruits. They started at much the same age and became intending seafarers as soon as they left school; the apprenticeship/cadetship period was much the same and they could attempt the first professional qualification at much the same age. Further, they were drawn from a wider social background than engineers recruited in the traditional way. As some of the courses approved were in the colleges which also offered (non-compulsory) pre-sea training for deck cadets there was some chance of interaction, though no guarantee that they would end up in the same ships. However, at sea there was a good chance that they would have the company of deck apprentices/cadets. But, in the college context of the early 1950s, numbers of engineer cadets were not large and developments would be needed in facilities and scale if this first crossing of the boundaries between deck and engine careers was to progress further.

Staff in maritime colleges were by no means unaware of the educational limitations of the context and the section of the Ministry of Education closest to problem, Her Majesty's Inspectors of Schools and Colleges (HMIs) responsible for nautical education, had long been active behind the scenes encouraging the adoption of sound educational approaches.³⁴ But college staff on the engineering side were probably more in

³² Alston Kennerley, "The Alternative Entry Scheme for the Education and Training of Merchant Marine Engineers, 1952," a paper presented at the History of Education Society Annual Conference, Cambridge, 12-14 December 2003.

³³ This refers to national diplomas overseen by joint industry/educational committees for individual subject areas set from the early 1920s.

³⁴ Formal HMI reports on nautical establishments and internal memoranda in TNA:PRO classes ED 46, ED 114, 166, etc., show this emphasis in the interwar years as well as more intensively post war. HMIs were former teachers who worked for the education ministry in London, through a

tune with national technical education qualifications than their colleagues on the deck side. From the turn of the century, the regulations for engineer certificates of competency had taken account of engineering course attendance at technical colleges and universities.³⁵ The influence of the HMIs included three particular initiatives, in addition to the effect of their advice when visiting colleges and in their involvement in committee work with shipowner and maritime trade union representatives.³⁶ For some years they actively promoted and searched for a site for a national maritime college. Secondly, HMIs were influential in the establishment of a one year post experience teacher training course for nautical teachers, offered in the 1950s at Garnett College in London. Thirdly, they promoted the inclusion of liberal/general studies in courses not constrained by certificate of competency limitations. A single national nautical college was not achieved, but the 1960s saw the development of existing provision into regional residential nautical colleges, for example, in Glasgow, Leith, Liverpool, London, Plymouth, Southampton, and South Shields. The teacher training course ran for several years and planted trained maritime teachers in the maritime colleges, several of which underwent considerable expansion during the 1960s and 1970s. The HMI promotion of liberal/general studies was of course part of a thrust in the 1960s impacting on further education generally and led to the creation of large departments concerned with its delivery. The influence on staff teaching the deck side manifested itself in an appeal for educational change circulated for signature around the colleges and presented to the annual meeting of the Association of Navigation Schools in the early 1960s, which was attended by the BoT Principal Examiner of Masters and Mates, college principals and heads of navigation schools.³⁷

From the flurry of ideas for change in nautical education that emerged in the late 1950s and 1960s came the adoption of the block sandwich principle which was practised in connection with a variety of engineering courses and in other subject areas. In nautical education the first stage was the introduction of the two-term (26 week) Mid-Apprenticeship/Mid-Cadetship Release Course (MAR/MCR) from 1958, for which sea time credit was allowed.³⁸ Then in 1962 came phased training in which attendance at a two term pre-sea cadet course was linked developmentally with the MAR/MCR course and a correspondence course, producing Phase I in college, Phase II at sea, Phase III in college and Phase IV at sea. At the end of this programme, theoretically, navigating Cadets ought to have been ready to attempt the second mate certificate of competency

regional network, providing the link between the government department and individual schools and colleges.

³⁵ Kennerley, "Alternative Entry Scheme."

³⁶ Kennerley, "Nationally Recognised Qualifications"; Kennerley, "Vocational Further Education and Training."

³⁷ MMM:MAL, Records of the Association of Navigation Schools (as yet uncatalogued).

³⁸ G.W. Wakeford, "An Explanation of Mid-Apprenticeship Release" (unpublished, 19 August 1964), a paper tabled at a meeting on the teaching of Liberal Studies in nautical colleges on 4 October 1965, at the Seafarers' Education Service, London (author's collection). Wakeford was Director of the School of Navigation, Southampton. He claimed to have been advocating sandwich courses for deck cadets since 1946, and had lectured on the subject at the Royal Society of Arts, in 1960. Initially the courses catered largely for navigating apprentices which were being phased out in this period in favour of non-indentured cadetships.

examination, though most probably also took the normal courses which remained on offer. As yet there was no nationally recognized educational qualification attached to this regime, but following the formation of the Joint Committee for Ordinary National Diplomas in Nautical Science, college proposals for the OND in Nautical Science began to be approved, the first group of cadets starting in September, 1965. Since then both engineer cadets and deck cadets have been able sit for a national qualification like other college students, with which the certificates of competency arrangements have been partially integrated.³⁹ The changes had the effect of more than doubling the numbers of maritime students in attendance at maritime colleges with similar numbers still registered with the college through the block release arrangements. The government's investment in facilities meant that halls of residence were built to accommodate deck and engineer cadets, and classroom, laboratory, and other practical facilities such as boats, training ships and navigation simulators were up-graded or developed to meet the demand. The leading maritime colleges become technical boarding establishments of some size. The boundary between maritime education and general technical education had been breached, and the stage set for improving the interaction between deck officers and engineers.

To illustrate the features of the parallel delivery of two OND courses, which crossed the boundaries between marine engineer cadet and deck officer education and training, this section will take as a case study the techniques adopted at Plymouth College of Technology in the 1960s. The development of facilities and the increased student numbers which were part of the changing context making the new approach possible, have already been touched upon. But before examining the detail note must be taken of the experience that maritime departments of colleges had begun to develop over the preceding decade, the array of conflicting elements that had to be managed and the very considerable logistical problems that had to be overcome.

Colleges were used to working with local industry in making arrangements for groups of trainees to attend for day or block release courses. But with the introduction of the engineer cadet Alternative Entry Scheme the participating colleges found themselves working with most of the major shipowners, typically based in London, Liverpool or Glasgow. Having agreed to the arrangements, the companies were to some extent in control of the courses offered through their recruitment of future students from all over the country, the booking of places on courses and their finance of the residential provision that the colleges now had to make. Liaison with company training officers became much more important, and delivery of courses became something of a joint operation. Companies themselves faced major logistical problems assembling viable groups of cadets completing their sea phases and returning them to college for the start of terms. This problem impinged on engineer cadets returning after their sea stage from about 1956, and deck cadets being brought back to college for the MAR/MCR courses from 1958. It was these earlier courses that provided both the shipping companies and the colleges with management experience while maritime student numbers were still

³⁹ Owing to repeated changes in state imposed systems of national qualifications, arrangements in 2005 have changed considerably, but the fundamental principle remains.

growing, and the introduction of phased training may be seen as something of a culmination.

Course delivery was not just a matter of lecture, laboratory and tutorial timetabling. Shipping industry involvement was bought at the expense of integrating as much as possible of the safety training required by the certificate of competency regulations. Over the years in addition to the BoT engineer and deck examinations, a number of preliminary qualifications had been added to the regime, which, particularly, impinged on deck cadet training. Before being examined for second mate, deck cadets were expected to obtain the Efficient Deck Hand and Lifeboat Efficiency certificates, each normally preceded by a one week course. In 1956 a two week radar observer course was added to the list, and in the 1960s fire training, and survival at sea courses. All these had to be fitted in to the college phases and invariably cut across the academic timetable. Practical training in the handling of ships' boats had long been considered essential for pre-sea cadets, and colleges had already developed their boat or seamanship centres to deliver those training elements. Several had acquired their own sea going tenders in which cadets were given short working coastal trips. Also seen as desirable were elements of initiative training practised by the armed services and developed by the Outward Bound Sea School movement, and attention to social skills. On the sporting side swimming was considered another important skill for which provision needed to be made. Though engineer cadets did not take all these training elements, they were included in many of the activities. On the other hand, deck cadets did not take the workshop training which engineer cadets undertook in their vacations, and might be seen as an equivalent skill to practical seamanship.

While Plymouth is used as an example here, it must be remembered that the other colleges round the country were finding their own solutions to the problems indicated above. There was also an element of competition between colleges on a national scale. Shipping companies chose the colleges to which they would send their cadets. In setting up arrangements which were intended to be more than short term, their training staff made numerous preliminary visits which gave them an overview of what was on offer nationally. Of course geography played a part as did the supply of places at colleges, and the nature of the accommodation made available. Companies tended to have close links with particular colleges, for example Alfred Holt & Co. with Riversdale Technical College in Liverpool, P&O with Southampton School of Navigation, and the Shell Tanker Company with Plymouth College of Technology's School of Navigation. Dealing with the Plymouth case, the discussion will first address accommodation and the improvement of facilities. Then it will turn to the social dimension, the various practices and activities introduced into the out of class life of what had become a residential establishment. Finally it will look at classes in which deck and engineer cadets were mixed.

As the navigation school for the far south west of England, Plymouth had always had a proportion of students living away from home in lodgings, and almost certainly maintained a list of landladies it could recommend to students.⁴⁰ Plymouth School of

⁴⁰ For a more detailed study of the history of Plymouth School of Navigation see Alston Kennerley, *The Making of the University of Plymouth, op.cit*, Chapter 4, 103-129. This section is

Navigation introduced a nine month pre-sea cadet course in 1949, following prompting from the HMIs, and its out-of-town students were accommodated in lodgings. This was also the case with engineering cadets following the Alternative Entry Scheme in the Engineering Department for which Plymouth had obtained approval by the 1960s, and originally quite separate from the Navigation School. With the advent of MAR/MCR courses in 1958, Plymouth Education Committee approved the opening of a hall of residence, Merrifield Hall. During the 1960s, with increased numbers and responsibility for engineer cadets out-of-class passed to the Navigation School, a further seven buildings were converted for this use, accommodating in the end about 300 cadets, about half of whom were engineer cadets and half deck cadets. Towards the end of the decade the cadet operation was unified in a School of Maritime Studies with the transfer of engineer cadets and marine engineering staff from the engineering department. Meanwhile plans for a new suite of buildings for the maritime school, the working name being “residential nautical college,” had been on the drawing board since 1961, but delays in government approval and then funding meant that they were not completed until 1970. The residential block for 200 cadets replaced most of the temporary accommodation. This provided six-berth dormitories for most cadets with three-berth and single-berth rooms for those designated cadet captains. A formal dining room, kitchens, recreation rooms, a medical suite, warden’s accommodation and administrative offices completed the social facilities. A new teaching block provided general purpose class rooms and a series of laboratories: oceanography, meteorology, naval architecture, radar simulation, magnetism, electronics, manoeuvring tank, chart room. A planetarium was installed in its own building. The existing engineering workshops and laboratories were adequate for engineer cadet training. A new seamanship centre was opened at a waterside location in 1967, and, in 1964, the school had acquired its own training ketch, *Tectona* (80 tons), which could take twelve cadets at a time on training voyages. Before these new facilities became available, cadet teaching took place in a variety of locations using, typically, old school buildings, and a certain amount of travel between buildings was involved. Nevertheless, the arrangements indicated below had been fully developed before the improved facilities became available.

“The Objects of the Course... are to produce a well-educated, well-trained officer, whose character and ability have been developed to fit him for leadership and eventual command of a ship... an officer must be self reliant, must understand men, and must have the knowledge to use to the full extent the instruments and equipment that science has placed at his disposal.”⁴¹ Plymouth’s publicity literature, from which this statement is taken, was explicit in stating that there were social objectives in the education and training programme that had been devised to integrate deck and engineer cadet experiences whilst at the college. As was the practice at other maritime colleges, cadets

based on the author’s research into the history of Plymouth School of Navigation, and as a lecturer in Nautical Subjects with responsibility for the Liberal Studies programme. He was at one time or another involved in most aspects of the phased training, and had mixed groups of deck and engineer cadets in his Liberal Studies classes.

⁴¹ Plymouth College of Technology, *General Prospectus, 1967-1968*, “School of Navigation and Maritime Studies” section, Sandwich Courses for Navigating Officers, 18.

had been required to wear Merchant Navy uniform since the pre-sea cadet course had been established in 1949. That alone was a significant social distinguishing feature designed to engender a feeling of “belonging” to the Merchant Navy, though it gave a false impression of a unified service like the Royal Navy, which in fact was far from the truth.⁴² But it also created a boundary between maritime students, students in other fields, and society outside the college. Cadets were occasionally targets for assault by youth gangs in the town. Nevertheless uniform was the standard wear throughout the day at meals, classes, at parade, drill and inspection, and at college social events. Midday and evening meals were formally served, and on occasion instruction was given in dining etiquette. Members of teaching staff were usually in attendance. Classes were also formalized with the class standing at the entrance of the lecturers. A parade and drill was held each week, with inspection in military fashion. This found expression in the provision of guards of honour for visiting dignitaries, and in particular at the annual parade and service of remembrance held at the Merchant Navy Memorial at Tower Hill, in London, to which two coach loads of cadets were sent each year. Owing to the rapid turnover of deck cadets, especially, who attended for two terms at a time with an entry each term, maritime staff led the organization of social events and much of the sporting programme. Each new group was welcomed at an evening sherry party attended by members of staff. Amongst other events were the school’s prize giving, but the most formal event was the Maritime Studies Dinner and Dance, held two or three times a year. This was attended by the Lord Mayor of Plymouth and a guest speaker from the shipping industry. One or two more significant prizes were awarded, and the speeches ended with an address from the chief cadet captain. The designation of cadet captains, given particular responsibilities and duties, was part of the leadership training provision.

The sporting programme was quite extensive despite the instability in the formation of teams, the difficulty of hiring playing fields and other facilities, and the difficulty of arranging fixtures with local sides. Nevertheless cadets had access to rugby, football, hockey, cricket, rowing and canoeing. Its rugby side was a match for most in the area, and rowing good enough to beat crews from Britannia Royal Naval College. Other outdoor activities were compulsory and cadet groups engaged with them in cycle. Boat work (rowing and sailing the school’s cutters, whalers and dinghies), was part of the weekly timetable. Groups from the school were to be found most weekends map reading their way across Dartmoor, spending a night or two under canvas. During the summer months all students found themselves crewing the training ketch, *Tectona*, on voyages from Plymouth, perhaps to the Channel Islands or along the coast to Falmouth, away for three to five days.⁴³ It will come as no surprise that the timetabled week ran to thirty-eight and a half hours, though of course a significant proportion was devoted to the compulsory practical activities. The management was so complex that a special office, called the Regulating Office, was devoted to making the system work. It issued daily order sheets which reminded cadets of the irregular activities. It might have had military overtones but all cadets knew where they stood in relation to the course.

⁴² Both the uniform and the collective title Merchant Navy had been given official sanction as an outcome of shipping losses during the Second World War.

⁴³ The author served a mate of *Tectona* for two seasons in the late 1960s.

Achieving integration of engineer and deck cadets on the academic side to any great extent was difficult owing to differences in the subjects taught. Mathematics might have been a candidate but there were differences in emphasis demanded by the different technical and scientific subjects which used mathematics as a basis, and also differences in progression caused by the attempt to set the two year continuous OND in Mechanical Engineering against the deck cadets' two term sandwich attendance with an entry each term, and the later OND in Nautical Science course with a similar pattern of attendance. However by manipulating the time table it proved possible to bring all the first year engineer cadets and all the Phase I deck cadets together for a twilight session, 1830 to 2030 on two days each week, and on another two days, the second year engineer cadets were merged with the Phase III deck cadets. It was during these periods that the Liberal Studies programme was delivered.

The programme that was devised involved delivering a mix of complementary, communication and contrasting studies. One of the evenings was devoted to communication and complementary studies. Communication covered the traditional attention to written and spoken English in a variety of contexts, partly addressed in individual classes and partly through whole group events such as debates. Cadets also completed a dissertation. Complementary studies involved subjects not on the curriculum, but judged to be relevant to life at sea. Topics included subjects such as hygiene (delivered by a health visitor), personal finances, and the shipping industry, which were taken by visiting teachers and also addressed through invited visiting speakers. Contrasting studies had no particular relevance to a sea career, except that some topics might be suitable as recreational activities at sea. This also drew upon as many as twelve teachers, some full time members of maritime staff, but mostly visiting teachers. Subjects on offer included maritime history, religion, psychology, sculpture, photography, model making, languages, ballroom dancing (female partners were arranged) and carpentry.

Different syllabuses for complementary and communication studies applied between Year 1/Phase I and Year 2/Phase III. Contrasting Studies was offered anew each term, and classes made up through cadets exercising first, second and third subject preferences. Class sizes were equalized and less popular topics usually made up with third choices. By keeping detailed records it was possible to ensure that in subsequent terms topics were not repeated, and that all cadets at some time received their first preferences. As a result all cadets were exposed to at least four generally unfamiliar topics. Contrasting studies were not assessed but there was sufficient variety to maintain interest.

This approach to integrating the college experiences of deck and engineer cadets was made to work through a great deal of attention to the administration, and discipline on the part of teaching staff and cadets in their allocated roles. From an educational perspective, the reach of the college needed to extend to the sea phases. This was achieved through the provision of continuation courses (written work putting into practice the learning in the previous college phase), through the liaison with the shipping companies for the transmission of scripts for marking and their return, and through having a shipboard programme and record book, designed to ensure that each cadet had experience of a wide range of tasks, and that the two kinds of cadets had experience of

each other's sphere of work. Masters, mates and engineers of ships carrying cadets were briefed by the companies and their oversight of shipboard training was an important dimension.

Questioning retired ship's engineers on their observations of joint engineer and deck cadet training at sea revealed some hesitation and some support.⁴⁴ One respondent felt that engineer cadets' shore training had not prepared them for the amount of work in dirty boiler suits, though he conceded that some "knuckled down." A man with a traditional background, he put it down to the "rosy" impressions given by the recruiting publicity. Also he found being asked to sign cadets record books something of an imposition. In contrast another commented that he admired the scheme and would have liked to have been trained himself under those arrangements. With both deck and engineer cadets aboard, another respondent commented that a healthy rivalry was generated which was good for *esprit de corps*. A more considered comment with respect to engineer cadets argued that the Alternative Training Scheme provided an excellent blend of practical experience and engineering training requiring levels of commitment and responsibility to fully prepare participants for success in subsequent careers whether at sea or ashore. With respect to the "oil and water" problem, a respondent noted that it was certainly present when he went to sea, but that it was much reduced later in his time at sea. The exchange of engineer and deck cadets between tasks in their areas was certainly a help, while another comments that joint training certainly removed the "oil and water." There were, however, other factors such as changes in the social facilities aboard ship.

This paper has examined the special circumstances which surround maritime education and training for future merchant ship engineers and navigating officers. Two principal boundaries were identified. The "oil and water" problem was internal to the industry but also manifested itself in the separate provision of courses ashore for the two groups of students. The academic boundary was between historical educational and licensing practices which had led maritime education and training to lie outside national developments in technical education, despite increasingly being offered in local authority technical colleges. In order to illustrate why new approaches were necessary, it has been necessary to explain the historical context of state licensing of engineers and mates and masters, and the resultant nature of maritime courses which evolved originally in the private sector, and which later were absorbed in to technical colleges. The discussion then moved on to consider the factors influencing the development of new approaches, culminating in the 1960s in the marrying of the phased training structures for deck cadets with the by then established arrangements which constituted the Alternative Training Scheme for engineer cadets.

The integration of merchant seafarer vocational courses with the prevailing national arrangement came at the cost of endless revision of educational schemes as the government repeatedly changed the national arrangements. Changes came in the 1970s,

⁴⁴ With the co-operation of the Institute of Marine Engineering, Science and Technology, the author has circulated a questionnaire on the educational experiences of marine engineers. The views which follow are drawn from the small number of responses so far received at the time of writing.

1980s and 1990s, and entrants only a few years apart might be following three different schemes, as the linkage started at the cadet level was extended through the grades of certificate to master and chief engineer.⁴⁵ Fifteen or more years could elapse from entry at 16 to the highest awards. The impact of British shipping decline only began to affect the maritime departments in technical colleges in the late 1970s, and a number were closed following a national review in the 1980s. Those that survive have partly been sustained by the admission of students from overseas, which was a factor even in the 1960s. Annual recruitment of cadets by British shipping declined in the 1990s to under 100, with probably well under 1000 under training at any one time, though in recent years there has been some recovery.

That the development of the OND in Nautical Science, and a variety of successor national educational qualifications under succeeding national regimes such as Technician Education Council and the later National Vocational Qualifications regimes, has retained a recognized national educational qualification for engineer and navigator training, is evidence of the successful crossing of the boundary that once existed. Whether the social arrangements, set out with respect to practice at Plymouth, but also practised at other regional maritime colleges, has had the impact intended in breaking down social barriers between the two groups of seafarers is not so clear. However ephemeral evidence suggests that the social integration of courses had some effect, but that other changes in life at sea will also have had an impact.

⁴⁵ Maritime education, training and licensing, complex enough before the 1960s, has since become excessively convoluted and a history of developments since the 1970s, yet to be attempted, will be a formidable task.

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