Editorial

Safety at sea: a forgotten frontier?

Every year 1100 people drown accidentally in the United Kingdom¹; more than a quarter (up to 40% in Scotland) occur in coastal and offshore water.^{1,2} Activities that expose groups to risk—above, on, and beneath the sea surface—may be regarded as either recreational or industrial; the former amount to 83% of coastguard effort whereas industrial (commercial) incidents account for the remainder.³ The land area of the United Kingdom ranks only 53rd out of 123 maritime countries but jurisdictional area (902 000 sq miles) within the 200 nautical mile exclusive economic zone is ranked 10th.⁴ Moreover, the United Kingdom coastline (2790 nautical miles)—in 11th place—is even longer than that of India.

Such facts emphasize the ease of access—actual and potential—to the beaches and the seas beyond. Unrestricted access presents hazards, risks, and governmental responsibilities to create and maintain an acceptably safe environment for those exposed to risk. Who is responsible for safety at sea? What hazards and risks confront marine commercial activities? And what strategy might be adopted to reduce loss of life and property at sea?

The Marine and Ports Directorate of the Department of Transport (DTp) has overall responsibility⁵ but 98 other organisations, excluding local authorities, have particular commitments.⁶ The Directorate's Marine Survey Service and its Marine Emergency Operations and Pollution Control Unit have health and safety functions which are guided by the principal Merchant Shipping Acts and Statutory Instruments.⁷ The DTp also promulgates Merchant Shipping Notices for guidance in the safe conduct of maritime activities.⁸

An exception to DTp responsibility dates from 1976 when the Health and Safety at Work etc Act 1974 (HSAWA) was extended to the offshore oil and gas industry, including divers.⁹ This charged the Health and Safety Commission (HSC) with responsibility for offshore installations. The Petroleum Engineering Directorate of the Department of Energy—acting as agents for HSC—discharges this occupational safety function.¹⁰ All merchant ships and fishing vessels not tied up at the quayside, however, remain within the scope of the DTp where only the Merchant Shipping Acts apply.

Industry at sea may be considered either as resource extraction and exploitation—oil, gas, and fishing—or as commercial transport including passenger carrying operations. The scale and distribution of the associated hazards are immense.

In the oil and gas industry fatal and non-fatal accident experience from 1974 to 1978 was reviewed by the Burgoyne Committee set up to assess the Department of Energy's safety regulations.¹¹ The incidence of all accidents affecting offshore workers was half the rate for coal miners but twice that for manufacturing industry. Fatalities from falls overboard alone decreased from 0.57 (1975–9) to 0.27 per 1000 at risk (1979–83) (A Gillam, 4th Annual Offshore Search and Rescue Communications Conference, Leith, 1985). Between 1971 and 1983, 34 fatal accidents involving United Kingdom commercial divers were reported, of which 24 (70%) occurred before 1977 when the Health and Safety at Work etc Act 1974 applied. Mean fatal accident rates for commercial divers declined from 8.8 per 1000 (1971–6) to 1.1 per 1000 (1977–83) and only three diving deaths have occurred since 1979 (M S J Reilly, unpublished observations). Findings for 1971–6 accord with previously reported death rates for 1970–4^{12,13} when North Sea diving was in its early¹⁴ and most dangerous stage.

Until 1979, but possibly later, naval architects seemed unaware of the order of magnitude of United Kingdom fishing vessel loss rates.¹⁵ An apparently increased incidence of losses (1961–80) was reported in 1984¹⁶ and the naval architectural implications have now been acknowledged.¹⁷ This increase occurred despite the recommendations of the Committee of Inquiry into Trawler Safety (CITS) in 1969¹⁸ and the phased introduction of the 1975 Fishing Vessels (Safety Provisions) Rules.¹⁹ In 1985 the DTp commissioned research to investigate the factors contributing to vessel losses but the findings have not yet been disclosed. Between 1981 and 1985, 226 fishing vessels were lost.²⁰ Loss rates appear to be stabilising now but still remain 60–70% higher than those which prevailed when the Committee of Inquiry into Trawler Safety reported. Elsewhere in this issue (p 7) inadequacies in the procedure for investigating marine losses in general, and fishing vessel losses in particular, are described.²¹ The time is

ripe for radical change in the accident investigation procedure: aviation safety authorities have shown a lead and offered a blueprint.²²

A review of total accident mortality experience for United Kingdom fishermen (1961–80) showed some reduction in the fatal personal accident rate for fishermen on medium sized and small boats (<24 metres) but the post Committee of Inquiry into Trawler Safety all causes accident rate, disregarding vessel size, increased slightly.²³ From 1981 to 1985 there were 112 fatal accidents, corresponding with a mean mortality rate of 1.0 per 1000.²⁰ Fifty per cent of total accident mortality in the industry had less to do with direct physical environmental influences on boats (the “Act of God” mentality) but rather more to do with traumatic amputation of limbs owing to inadequate or absent machinery guards; skull and spinal injuries rendered by falls from ill designed ladders or into unprotected hatchways; and drowning from falls overboard made more likely by inadequate or missing guard rails. Once overboard, survival is hampered by the absence of lifejackets, thermal protection, and personal locator beacons. Fishing boats are still not required to carry immersion suits for emergency use and, although survival training is now more widespread,²⁴ it is below the standards of the oil industry and it is still not compulsory. These avoidable shortcomings ignore the effects of hypothermia,^{25–29} particularly in the North Sea,^{30 31} and the value of survival training.³² Furthermore, within the apparent safety of ports, accidents and drownings still occur—possibly because of inadequate ship to shore access and poor artificial lighting.^{33 34} The Health and Safety Commission has proposed regulations governing the loading and unloading of fishing boats at the quayside but not for fishing operations at sea.³⁵ At sea, where the accident risks are greater, the Factory Inspectorate does not have the authority or, apparently, the intention to be concerned. This anomaly is compounded by the lack of any effort at sea by the DTp to detect and prosecute boats infringing minimal health and safety standards. And yet the ability to police legislation at sea is proved: officers of the Fishery Protection Squadron regularly board fishing boats to monitor compliance with far more intricate laws governing mesh size of nets and EEC fish quota restrictions.

The title of the recent well intentioned but very restricted statute—the *Safety at Sea Act 1986*³⁶ conveys an erroneous impression of all embracing legislation. This Act will require the fitting of automatically releasing liferafts and emergency position indicating radio beacons on fishing boats but the opportunity to introduce equally necessary items, such as the compulsory wearing of lifejackets, was strongly opposed by industry representatives or

ignored by the DTp.

Pre-employment medical examination is compulsory for merchant seamen,³⁷ commercial divers,³⁸ and pilots.³⁹ But fishermen require neither examination nor even health screening—an omission which is at variance with DTp requirements for seafarers³⁷ and with occupational health practice elsewhere.⁴⁰ One fifth of all deaths of fishermen at sea are due to undisclosed disease.²³ Gastrointestinal^{41 42} and respiratory^{41 43} illnesses account for most emergency treatment but genitourinary, psychiatric, and cardiovascular morbidity is also frequent.⁴² Physically disabled (one armed⁴⁴ and one eyed⁴¹) fishermen have been found working at sea. Medical evacuations and emergency admissions for epilepsy,⁴² diabetes mellitus,⁴⁵ acute asthma,⁴⁵ mitral stenosis precipitating congestive cardiac failure,⁴⁵ dental abscess,⁴⁵ and caries⁴³ not only waste resources but also place search and rescue (SAR) crews at entirely avoidable risk. All of these detectable medical conditions preclude or restrict employment in other marine industries.

The number, type, and distribution of merchant shipping losses, up to 50 miles from the British coast, was investigated for the period 1970–9.⁴⁶ Accident “black spots” included the Thames and Humber estuaries but, without standardisation for differential exposure to risk, these might merely reflect zones with greater density of traffic.

Commercial activity is not restricted to the sea surface: helicopter use in support of North Sea operations is likely to remain high because of helicopter versatility⁴⁷ and because 75% of oil and gas personnel in the 1990s will be based more than 100 nautical miles offshore (RG Procter, Edinburgh conference, 1985). Helicopter accident experience per 100 000 hours exposure is between five and 50 times greater than that of fixed wing jet aircraft.⁴⁷ About 60% of helicopter accidents has been attributed to “pilot error” and, increasingly, the ergonomic aspects of North Sea flying operations arouse concern.^{48 49} The contention that over-water safety is further compromised by the risks of pilot ill health arising from in-flight environmental hazards of noise, vibration, heat, and other factors (including seat and control layout) is under joint investigation coordinated by the Civil Aviation Authority. Helicopter ditching experience and factors influencing post-ditching survival in the North Sea (1970–83) have been discussed.^{47 50 51}

Risks to ship and aircraft crews and to passengers travelling on and over the sea justify attention. Firstly, the inadequacies of legislation governing medical supplies aboard ships^{52–54} and the absence of basic equipment and drugs for life threatening emergencies on passenger ferries have been illuminated by recent debate.^{55–60} Medical or nursing

presence is not required on ships at sea for up to 24 hours with more than 1000 passengers. Even when search and rescue (SAR) craft have medical expertise on board, the difficulties of administering first aid in a helicopter^{61 62} (auscultation is virtually impossible) or on a lifeboat are considerable. A modern lifeboat, unless one of the large ones, is "... not equipped to treat sick persons on board."⁶³ Whichever mode of emergency transport is chosen, management is difficult and may well end in the death of the patient.⁶⁴ Secondly, the ability to evacuate high sided passenger ferries in accordance with regulations—requiring the clearance of 1500 persons on board within 30 minutes of the decision to abandon ship—has been rigorously questioned.⁶⁵ Recommendations enabling rapid evacuation include the installation of helidecks, inflatable chutes, and canopied liferafts additional to rigid hull lifeboats. Thirdly, new dimensions of risk to commercial aircraft arise from in-flight engine shut down on extended range twin jet operations which will be permitted on transoceanic routes.^{66 67} The frequency of engine shut downs is low (0.05 per 1000 hours)⁶⁸ but certification authorities apply the "60 minute rule" so that, after single or double engine failure, there is an opportunity to "glide" to an airfield within a 60 minute radius.⁶⁷ Because this demands more northerly routings for twin jets on transatlantic routes, it means, in the event of controlled ditching, less tolerable sea surface temperature and wind-chill conditions. Moreover, in waters to the west of the United Kingdom there appears to be a reduced likelihood of rapid SAR response and of post-ditching survival (MSJ Reilly, Edinburgh conference, 1985). Response to the catastrophic loss of the Air India Boeing 747 south west of Ireland showed that four hours elapsed before the first helicopter arrived (A Sneddon, Edinburgh conference, 1985). If survivors from a controlled ditching in this locality failed to board aircraft liferafts, drowning or hypothermia would supervene even in summer sea surface temperatures.²⁷ The relative safety of the liferaft, however, does not guarantee survival.^{69 70}

Under the 1974 Convention on the Safety of Life at Sea, the United Kingdom is required to provide a search and rescue organisation for ships, aircraft, and individuals in distress. The last commissioned and publicly available official review of the civil maritime search and rescue system⁷¹ expressed concern about organisational and locational aspects which remain unchanged.⁷² This was despite reorganisation which began in 1978. More recent evaluation of the spatial efficiency of search and rescue helicopter distribution showed improvements since 1970 (particularly in the northern North Sea) but crucial gaps in coverage (in north west Scotland) and transit time deficiencies

were identified (MSJ Reilly, Edinburgh conference). The potential of pre-1981 stand by vessels to perform adequately during offshore emergency rescue or installation evacuation has been investigated and criticised⁷³ and inadequacies in true emergencies have been exposed.⁷⁴ Shortcomings in poorly adapted life saving apparatus, designed for entirely different purposes, were shown when the "Alexander Kielland" platform capsized in 1980 and 123 Norwegian workers died.⁷⁵

The contention that concern for the safety of shipping has grown in recent years but only "... as an aftermath of maritime disasters rather than in anticipation of them..."⁷⁶ is too simplistic but there is evidence to lend partial support for this view.⁷⁶⁻⁷⁸ The reality is more complex: the United Kingdom has taken major initiatives—notably in the search and rescue arena. Nevertheless, parts of the maritime frontier are forgotten or, at best, command less priority. Fishing industry safety, particularly the investigation and prevention of losses, clearly demands scrupulous attention: policy objectives should be formulated, published, discussed more widely and openly, and their implementation independently monitored.

A recent review of the functions and inter-connections of United Kingdom organisations concerned with maritime safety concluded that responsibilities are excessively fragmented and that the boundaries of areas of jurisdiction of these organisations are irrelevant to current safety needs.⁶ Furthermore, the United Kingdom approach "differs radically" from that of other major maritime nations. As for a wider preventive strategy, these authors also point to the UK Civil Aviation Authority, established partly to rationalise air safety functions, as a practical model for the government to replicate in pursuit of enhanced maritime safety. The need for a statutory marine safety authority was recommended more than 15 years ago.⁷⁹ This advice was ignored. Now, the United Kingdom would not be able to boast that it had the first Civil Marine Authority but, given time and a fair wind, it could have the best. Do we have the imagination, the purpose, and the will?

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