Packaged Dangerous Goods Washed on to Beaches of England and Wales

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Summary
The safety hazards arising from accidental losses of packaged dangerous goods from ships have been identified by government departments and inter-governmental organizations. In the last decade at least 80 people in southern England have been advised to seek precautionary medical examination or treatment following exposure to the contents of packages washed ashore.

A questionnaire survey in which coastal local authorities participated, collected data showing the types and quantities of packaged dangerous goods recovered on beaches in England and Wales. A total of 254 packages was reported; 131 containing dangerous goods listed in the International Maritime Dangerous Goods Code. Only 8 percent of these packages carried both hazard warning and substance identification markings in accordance with the Code. The most dangerous substances included 842 l of ether and a small quantity of acetaldehyde. The local authorities concerned had received very few advance warnings of dangerous deck cargo losses, although an International Maritime Organization (IMO) cargo loss reporting scheme was in operation during the survey period.

A revision of existing regulations governing the carriage of packaged dangerous goods by sea is recommended including improvements in marking and labelling standards, mandatory reporting of losses at sea and the establishment of a convention on liability and compensation arrangements.

Introduction
Developments in industrial technology during the last few decades have resulted in more varieties of dangerous goods being transported world-wide in greater quantities and in packaged form. The United Kingdom's Department of Transport has estimated that packaged dangerous goods constitute some 5 to 10 percent of all cargo carried by commercial vessels (ACOPS, 1984).

The International Maritime Organization (IMO) has recognized the threat to the marine environment and the safety hazards posed by packages of harmful and dangerous substances carried in ships. Annex III of MARPOL 73/78 (International Convention for the Prevention of Pollution from Ships 1973, as modified by the 1978 Protocol) and the International Maritime Dangerous Goods (IMDG) Code in Chapter VII of the SOLAS Convention, both contain inter alia, regulations governing the marking, packaging, stowage and documentation of such packages.

In accordance with the IMDG Code, packaged dangerous goods, sometimes in containers and including hazardous chemicals, are often carried as deck cargo. In an emergency such as fire, they can then be easily jettisoned to protect vessels and their crews. Improper stowage, bad weather or rough seas can result in the loss of such cargo. In the three year period from January 1980, the shipping insurance market has estimated that at least $50 million worth of containers have been washed overboard from ships in storms or through inadequate stowage (Peet, 1984). In one recent incident off Papua New Guinea the OK Menga lost overboard 15 freight containers with 2700 barrels containing poisonous substances.

During the last decade in the water masses around the United Kingdom there have been several incidents of this kind. For example, 51 cylinders of chlorine gas (UN Number 1017) were washed overboard during a heavy storm from the Iraqi vessel Sinbad off the Dutch coast in December, 1979. The dangerous state of the cylinders caused the Dutch government to recover or destroy them using side-scan sonar equipment and a remote operated vehicle (Anon., 1984). On 13th January, 1984, eighty 205 l drums of DINOSEB, a toxic nitrophenol herbicide (UN Number 2779), were lost overboard with other deck cargo from the Danish

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vessel Dana Optima 240 km east of Newcastle upon Tyne, England. Eventually, most of them were recovered from the sea bed by the Danish government after a long and expensive operation.

Another incident affected the beaches of Dorset, southern England, between October and December 1984. During a five week interval 140 packages of dangerous goods including, ninety-three 23 l receptacles of hydrogen peroxide (UN Number 104), ten 23 l receptacles of concentrated hydrochloric acid (UN Number 1789), and thirty-one 205 l drums of inflammable liquids were recovered from the sea and shoreline by the emergency services. The inflammable liquids comprised of pentane (UN Number 1265), petroleum ether (UN Number 1271), methyl ethyl ketone (UN Number 1193), acetone (UN Number 1090) and isooctane (UN Number 1262). There was a spontaneous ignition of the contents of one of these drums close enough to a beach user to singe the fur of her dog (Fig. 1). In addition three children, four council workers and a fireman received minor chemical burns when handling the packages of hydrogen peroxide.

The incident was typical in that substance identification, or hazard warnings or labels, were visible on only one of the 31 drums of inflammable liquids and on just 10 percent of all the packages of dangerous goods recovered. The emergency services received no details of any hazardous cargo losses until the incident was almost over. Even then, the substances listed on the dangerous goods manifest of the Forum Hope, the Greek vessel which reported a loss of deck cargo, did not correspond completely with the substances and packages washed ashore. The Forum Hope lost 2400 drums, including 200 containing inflammable liquids on the night of 24/25th October 1984, in the vicinity of the Bay of Biscay. The master reported the loss of deck cargo on 1st November when the vessel docked in Malta. There is a strong suspicion that the packages containing the non-inflammable substances originated from one or more other vessels which could not be traced.

The consequences of such incidents may be far reaching because of the high mobility of packaged dangerous goods in surface waters. With favourable winds and currents they can be dispersed over a relatively large geographical area within a short period of time. For example, following the wreck of the ro-ro ferry European Gateway, off Felixstowe, eastern England, on 18th December 1982, drums of toxic chemicals from the deck cargo were washed ashore over a large area from East Kent on the shores of the Dover Strait to Schleswig-Holstein in the German Bight within a few weeks (ACOPS, 1983). Likewise, empty steel flasks, which had previously originated from the French vessel Mont Louis, which sank off the Belgian coast on 25th August 1984 and had been used to transport uranium hexafluoride, were subsequently recovered at Trimingham, eastern England on 15th February 1985, and Bjerregaard, western Denmark on 13th July 1985.

In the United Kingdom most reports of packaged dangerous goods washed ashore have come from local authorities in southern England, who are greatly concerned about the possibility of death or serious injury to beach users finding and opening such packages (Fig. 2) (Horsnell, 1977). Since 1976, at least 80 adults and children have been advised to seek precautionary medical examinations or have received treatment following exposure to the contents of chemical packages which have been found on the beaches in this region.

Despite the safety hazards arising from losses of packaged dangerous goods in the marine environment, few systematic data are available to enable an assessment of the magnitude of this type of pollution and its environmental implications. Consequently, the Advisory Committee on Pollution of the Sea in collaboration with the Keep Britain Tidy Group undertook a pilot study to establish whether suitable data sources exist, and if the appropriate type of information is