

DEVELOPMENT OF INTERNATIONAL STANDARDS AND CODES

The peaceful uses of atomic energy, with all their enormous potentialities for benefiting mankind, also involve certain hazards. These arise mainly from the fact that many atomic energy applications cause ionizing radiations which can be harmful to man. The International Atomic Energy Agency has accordingly been entrusted with the task of developing various regulations, standards and codes of action to assure that these hazards will not deter the successful fulfillment of the Agency's statutory objective - "to accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world".

There are a number of reasons why it is important for these measures to be developed on an international basis. These include the following:

1. Should nuclear accidents occur, the radioactivity released might conceivably affect populations outside the country in which the affected facility is located.
2. Radioactive wastes, if discharged into the sea, rivers, the ground, or the atmosphere, may conceivably affect populations of more than one nation.
3. Atomic energy developments in most parts of the world are dependent upon international commerce, since there are few nations which have the raw materials, the manufacturing capacity, and the scientific capability for a self-sufficient atomic energy industry.
4. In view of the world-wide shortage and great cost of developing specialized atomic energy personnel and equipment, and the basic similarity of problems which all nations must overcome in developing the applications of atomic energy, it is far more economical and efficient for regulatory measures to be worked out on a co-operative, international basis than to have each nation work them out independently.

One may consider that the regulatory actions which the Agency has initiated fall into two main categories: (1) actions to assure that employment of atomic energy for peaceful purposes does not impair man's health, safety or property, and (2) actions establishing the legal obligations which may be involved if, despite all precautions, nuclear accidents should occur. These are considered in turn below.

HEALTH AND SAFETY STANDARDS

In the present state of knowledge radiation is an inescapable accompaniment of atomic energy. It is possible, however, to direct human skill and organization so as to eliminate as far as possible the chances of exposure and hence the possibility of harm.

The importance attached by the Agency to health and safety problems is emphasized in its Statute,

which authorizes the Agency to provide for the application of health and safety standards to its own operations and those undertaken with its assistance or with which it is otherwise directly associated, or to the activities of States at their request.

The Agency's Health and Safety Measures

The list of activities which should ultimately be covered by safety standards is an extensive one. The Agency has already initiated work in several of these fields. Before indicating the status of this work, however, it is advisable to set forth the conditions under which Agency safety standards are likely to be applied, and the procedures which would be involved. These conditions and procedures have been spelled out in a document entitled "The Agency's Health and Safety Measures", which was approved by the Board of Governors on 31 March 1960.*

The document points out that the health and safety responsibility faced by the Agency requires it to promulgate safety standards of two broad types: first, basic safety standards which prescribe maximum permissible levels of exposure to radiation and fundamental operational principles; and second, detailed operational standards relating to particular fields of application. The second type may take the form either of specialized regulations or of guides for States which will at some later time prepare their own codes of practice.

The document provides that when States request the Agency to apply safety standards or to determine safety measures, either for a bilateral or multilateral arrangement or for a State's own activities, "such application or determination shall be made in an agreement between the Agency and the State or States concerned."

Insofar as Agency-assisted operations are concerned, it is stated that Agency standards will be applied to any which may lead to a radiation hazard. When asking for assistance, a State must therefore provide the Agency with such information as will enable it to determine whether safety standards should be applied, and if so, whether they should be the Agency's standards or some other equally effective standards proposed by the State. If standards are to be applied the agreement on assistance between the Agency and the State will include an undertaking to this effect and various other provisions to ensure that the standards are applied.

* Available on request to IAEA Division of Public Information, Kaernterring 11, Vienna I, Austria.

Finally, the document on "The Agency's Health and Safety Measures" provides for its own modification from time to time as new information becomes available. Its first review by the Board of Governors is to take place not later than January 1962, and other reviews are to follow biennially thereafter.

Basic Safety Standards

A document setting forth the Agency's basic safety standards is currently in preparation. It is being prepared with the assistance of an international panel of experts under the chairmanship of Professor L. Bugnard of France. The panel met first during the week of 31 October 1960. A draft document prepared following that meeting has been circulated to Member States for comment. The panel is to convene again in May 1961 to consider a final draft incorporating comments submitted by Member States. The document produced will then be submitted for approval, probably by the end of this year, to the Board of Governors.

The standards will be based to the greatest possible extent on the recommendations of the International Commission on Radiological Protection (ICRP) and on standards published by other international organizations. It is hoped that they will gain wide acceptance by Member States and that they will serve as a guide in drawing up national codes and regulations in this field. At the same time they will provide a yardstick by which the Agency may judge the adequacy of national standards and regulations for assuring health and safety in Agency-assisted operations. Furthermore, the basic standards will provide a point of departure in the preparation of detailed operational standards in various fields, e. g. waste disposal.

As has been indicated, there are two aspects to the basic safety standards, the prescription of maximum permissible levels of exposure to radiation ("maximum permissible doses") and of fundamental operational principles.

Maximum permissible exposure levels are expected to be prescribed separately for workers directly engaged in radiation work, for other workers who may be in exposed areas as a result of their employment, for other individuals in the population, and for the population as a whole. The doses referred to will include both radiation reaching the body from external sources and that which may arise from radioactive substances which find their way into the body. They will not include radiation to patients resulting from medical examination or treatment, or radiation from natural sources.

The section on fundamental operational principles is expected to set forth minimum requirements for effective protection and surveillance of the health of radiation workers and other members of the population who may be exposed to radiation hazards. It is expected that only basic requirements will be stated, leaving it to the competent national authorities to establish more detailed administrative and operational procedures. Among the topics which may be treated

in this basic way are the need for registration and licensing of atomic energy activities, some fundamentals of administrative organization in atomic energy establishments, necessary physical and medical controls, maintenance of records, surveillance outside atomic energy establishments, and provisions for government inspection and intervention.

Detailed Operational Standards

The Agency has initiated work on detailed operational standards relating to the following activities: the handling of radioisotopes; the transport of radioactive materials; construction and operation of research reactors and critical assemblies; disposal of radioactive substances into the sea; and disposal of radioactive substances into fresh water.

A manual on the "Safe Handling of Radioisotopes" has been published. Transport regulations are to be published in the spring of 1961. Standards relating to the other subjects listed are in various stages of preparation or review. It is foreseen that still other potential sources of hazard, such as the operation of larger reactors, and disposal of radioactive substances into the ground and atmosphere, will in due time also be covered by applicable standards. Practical limitations prevent the simultaneous preparation of all the needed standards, and require that the more urgently needed of them be prepared ahead of others.

Handling of Radioisotopes

First priority was given to work on radioisotopes because it appeared likely that the Agency would become operational in this field very quickly; and because such standards seemed likely to be somewhat less difficult to establish than those in some of the other fields. A further reason for urgency in preparing a radioisotope manual was that many of the States which were beginning, with Agency assistance, to use radioisotopes, were among the atomically less-developed nations and had no national codes relating to radioisotope handling.

Accordingly, late in May 1958, an expert panel consisting of 13 scientists from ten countries, presided over by Professor Gunnar Randers of Norway, was convened to prepare a manual on the "Safe Handling of Radioisotopes". A first draft prepared by the Panel was sent for comments to Member States, interested institutions and international organizations. The Panel met again in August 1958 and prepared a further revision based on the comments received. This draft was approved by the Board of Governors in October 1958, and published on 15 December 1958. It was designated No. 1 in the Agency's Safety Series and was, in fact, the Agency's first technical publication.

The Manual is directed particularly "to small scale users who may not have direct access to other sources of information". The authors state that large scale users may prefer to apply more stringent and more



A handy instrument for a radiation worker to monitor all parts of his body and clothing

extensive national instructions. While it is stressed that the recommendations are to be interpreted with scientific judgment in any case, it is also indicated that "the choice of wording is intentionally precise" and users are urged to understand its implications before departing from any recommendation.

The recommendations apply only to radioactivity surpassing the limit of .002 microcuries per gram of material or a total activity in the working area of 0.1 microcuries. The first part of the Manual is primarily administrative in emphasis, containing recommendations on such subjects as staff organization, medical supervision, personnel and area monitoring, and maintenance of records. The next two sections relate to the handling of sealed and unsealed radiation sources. Then follow sections on storage of sources, transportation of radioactive material, accidents, decontamination of personnel and equipment, and disposal of radioactive wastes. An appendix quotes data from recommendations of the ICRP as to maximum permissible levels for exposure of humans to external radiations and maximum permissible concentrations in air and water of individual radioisotopes.

The foreword to the Manual states that it will be subject to revision from time to time and a first revision is now being prepared.

The Panel which prepared the Manual recommended that it be supplemented by annexes which would enable health physics and medical officers to implement more effectively the controls given in the Manual. This recommendation was endorsed by the Board of Governors. Accordingly, a Health Physics Addendum was published in July 1960 and a Medical Addendum

in August 1960, as numbers 2 and 3, respectively, in the Agency's Safety Series. Each Addendum was prepared with major assistance from consultants appointed by the Agency. For the Health Physics Addendum the consultants were Mr. G. J. Appleton of the United Kingdom Atomic Energy Authority and Dr. P. N. Krishnamoorthy of the Atomic Energy Establishment at Trombay, India; for the Medical Addendum, they were Dr. F. Hercik of the Institute of Biophysics, Czechoslovak Academy of Sciences, and Dr. H. Jammet of the Saclay Nuclear Research Center, France. As in the case of the Manual itself, the Addenda are particularly relevant to the problems encountered by the small user of radioisotopes, although the basic principles are applicable to all work with radiation sources.

Transport of Radioactive Materials

The second operational field to be given attention in the development of detailed standards was the transport of radioactive materials. Although a number of codes had been drawn up by various national and international bodies, a strong need was felt for a set of basic regulations which would be applied uniformly by all countries and which also would be uniform for all modes of transport.

It was recognized that the Agency was in a unique position to examine the problems involved in this field. Thus, the United Nations Expert Committee for Further Work on the Transport of Dangerous Goods recommended to the Transport and Communications Commission of the United Nations in 1959 that the task of drafting recommendations on the transport of radioactive substances be entrusted to the Agency. A similar recommendation was made in July 1959, by the Economic and Social Council of the United Nations (ECOSOC).

In approaching this task the Agency recognized that the technical and administrative requirements for safety would vary according to the levels of radioactivity of the materials being transported. Accordingly, the task of preparing the standards was divided into two parts, one concerned with transport of radioisotopes, radioactive ores and other materials with low or medium levels of radioactivity; the other with transport of materials, such as irradiated reactor fuels, where the level of radioactivity is high and a danger of criticality may exist. A panel of experts was convened for each of the two categories.

The Panel on the Transportation of Radioisotopes and Radioactive Ores of Low Specific Activity first met at IAEA headquarters in Vienna in April 1959 under the chairmanship of Mr. G. E. André of Belgium. The Panel on the Transportation of Large Radioactive Sources and Fissile Materials convened in July 1959, with Mr. H. N. Sethna of India presiding. Each panel prepared draft standards which were then sent to Member States and to 28 affected international organizations for comments. Twenty-three Member States and a number of international organizations made substantial comments which were considered in a second series of meetings of the two panels, held respectively from 1 - 6 and 8 - 13 February 1960. The



Safety regulations in operation in the USA. Photo shows a radioactive sample, ready for shipment, being put in a lead shield centered in a wooden box for radiation protection required by regulations of the Interstate Commerce Commission. A radiation meter is being used as a safety precaution for personnel

conclusions reached by the panels were then incorporated in a revised set of draft standards. These were presented to the Board of Governors in May 1960.

In September 1960 the Board authorized the Director General to apply the standards to Agency and Agency-assisted operations, and recommended their application by Member States and international organizations as a basis in preparing national legislation and international codes. The Board also recommended that the regulations be revised at suitable intervals. As a basis for these revisions, the Board invited Member States to inform the Agency of their experience in applying the regulations and of any deviations which they found it desirable or necessary to introduce.

In September 1960, the fourth General Conference of the Agency unanimously adopted a resolution welcoming the transport regulations and endorsing the Board's recommendation that they be taken as a basis of relevant national regulations and applied to international transport.

The Regulations are being published during the spring of 1961 as a document in the Agency's Safety Series.

Radioactive Wastes

Improper disposal of radioactive wastes practices could affect a large number of people over long periods of time with little hope of any corrective measures undoing the harm. The Agency has thus far given attention to two of the most urgent aspects of the problem, namely, disposal of wastes into the sea and into fresh water. Other aspects, such as discharge into the atmosphere, must in due course be considered.

The Agency's work on radioactive waste disposal into the sea was started in response to a resolution adopted at the 1958 United Nations Conference on the Law of the Sea, which urged:

"that the IAEA, in consultation with existing groups and established organs, having acknowledged competence in the field of radiological protection, should pursue whatever studies and take whatever action necessary to assist States in controlling the discharge or release of radioactive materials to the sea, in promulgating standards, and in drawing up internationally acceptable regulations to prevent pollution of the sea by radioactive materials in amounts which would adversely affect man and his marine resources."

A similar program of work had been recommended by the Agency's Preparatory Commission in 1957 and by its second General Conference.

In October 1958 the Director General set up an ad hoc Panel of Experts chaired by Mr. Harry Brynielsson, Head of the Swedish Atomic Energy Company. The Panel conducted its studies at a series of meetings at IAEA headquarters in Vienna. A report of its conclusions and recommendations was made public in May 1960. The main conclusions were as follows:

1. Highly radioactive wastes should not now be released into the sea.
2. Wastes of low and intermediate activity should be released only into disposal sites designated by responsible national or international authorities, which should also set out the conditions of disposal for the site, provide for any necessary monitoring of the area to verify that safe conditions are maintained, and collect disposal records which adequately indicate the state of the site.
3. The IAEA should maintain a register of waste disposals into the sea, and should provide for any

Two scientists of the UK Atomic Energy Authority's Windscale factory surveying the surrounding countryside for traces of beta-gamma radiation



necessary standardization of monitoring techniques.

4. Wastes from nuclear powered ships should be released in such a way as not to injure the harvest of marine products, conforming, in harbors and national waters, to conditions established by local authorities, and, in international waters, to those laid down in the vessel's license or by appropriate international authorities.

In January 1961 a further panel met to consider the organizational, administrative and legal measures which might be taken to implement the Brynielsson panel's recommendations, as well as some fundamental problems of international law arising in connection with waste disposal into the sea.

During the meeting a debate ensued regarding the technical data and conclusions in the Brynielsson panel's report. It was suggested that the IAEA organize certain further technical studies. Meanwhile, it was suggested that the legal panel's Secretary prepare tentative legal texts to reflect the panel's various views and interim conclusions and that a second series of meetings might be held in the spring or summer of 1961.

Radioactive wastes discharged into fresh water can present international problems since rivers, lakes and other fresh water bodies may be shared by more than one country and since ground water also may move across national boundaries. An international panel, under the chairmanship of Mr. Johannes J. Hopmans of the Netherlands, was convened late in November 1960 to consider this subject. Two more meetings of the panel are planned during 1961. From the work of this group it is expected that a report will be prepared which can provide scientific guidance for whatever administrative, legal or political actions governments or international bodies may wish to take in this field.

Reactor Safety

Thus far the operation of reactors throughout the world has had an excellent safety record. A few incidents have occurred, however, which have shown that a reactor accident can endanger both operating personnel and persons living in the vicinity. The task of ensuring that reactors operate safely is, therefore, an important one, and, in view of the rapidly increasing number of reactors, an urgent one.

The Agency's approach to this problem has been twofold. It has prepared a set of recommendations regarding the safe operation of research reactors and critical assemblies, which together constitute the most numerous class of reactors in the world. It has also developed procedures whereby the Agency itself undertakes to review the safety of individual reactors.

The Manual on the Safe Operation of Research Reactors and Critical Assemblies will be published in the spring of 1961 as a document in the Agency's Safety Series. It was prepared with the assistance of a panel of experts headed by Mr. D. W. Jefferson-Loveday of the United Kingdom. This panel met in February 1960 and again in July 1960.



Research reactor at Petten, Netherlands, for which IAEA has performed a safety evaluation

The Manual is intended to be particularly useful "to those users who have no direct access to other collected sources of information". It contains seven main sections. The first is an Introduction setting forth the purpose, scope and limitations of the Manual. The next section contains suggestions on safety problems in the design, instrumentation, construction and operation of critical assemblies. A similar section on research reactors follows, but with less emphasis on their design and construction, which are considered to be beyond the scope of the Manual because of their complexity. The remaining four sections are administrative in their emphasis, dealing respectively with personnel qualifications and training; the organization and functioning of safety committees; the types of documents which safe operation requires; and procedures to be followed in emergencies.

The Agency's procedures for review of the safety of individual reactors involve, first of all, the co-operation by members of its scientific staff with the reactor designers in the preparation of a detailed technical report dealing with all aspects that might have a bearing on safety. This report is then presented to an advisory panel composed of internationally recognized experts in reactor safety. The next step is for the panel to hold hearings questioning the reactor designers, constructors and operating staff to resolve any doubts remaining concerning the reactor's design and construction, and the competence, organization and operating procedures of its staff. The experts then render an opinion to help national authorities decide on the granting of permissions for operation of the reactor.

These procedures were applied for the first time to the Swiss research and materials testing reactor, "Diorit". Following their inspection of the plant and detailed questioning of the reactor staff, the panel of experts, which consisted of leading reactor safety experts from Canada, France, Norway, and the United States of America, concluded that the reactor could

be operated without undue risk to the health and safety of the public and so reported, in November 1959, to the Federal Council of Switzerland. "Diorit" has been in operation since August 1960.

The second application of the procedures concerned the Netherlands High Flux Reactor, a research reactor at Petten, Netherlands. The panel of experts, unchanged but for replacement of the US expert by another one from the same country, visited the reactor site early this year.

Preliminary discussions regarding reactor safety evaluations for still other countries are in progress.

In a related activity, the Agency is co-operating with the Danish Government in the evaluation of the safety of the harbor of Copenhagen for use by nuclear merchant ships.

LEGAL MEASURES IN CASE OF NUCLEAR DAMAGE

To eliminate all the hazards involved in the peaceful utilization of nuclear energy is theoretically impossible, although much has already been done to minimize them. To the extent, therefore, that accidents which may cause injury to persons or property cannot be prevented, there must be provision for compensating the victims.

Special legislation dealing with this problem has been enacted in several countries and is planned in a number of others. But national, or even regional, solutions are not sufficient to cope with all aspects of the problem. Radiation damage resulting from a nuclear incident may occur at a considerable distance from the source of radiation; the malfunctioning of a nuclear installation may result in legal claims against manufacturing industries located in a number of countries; and accidents could occur in the course of the international transport of radioactive materials over large distances. Any of these contingencies, under the existing situation, could generate suits in several States where courts might apply different laws to different claims arising out of the same incident.

Having in mind the clear need for an international solution, the Director General of IAEA in December 1958 established a panel of experts, under the chairmanship of Dr. Paul Ruegger of Switzerland, to advise him on the problems of civil liability and state responsibility for nuclear hazards. The Panel convened for three series of meetings in February, May and August 1959, respectively. Their concern was the hazards connected with land-based nuclear installations and the transportation of fissile or other radioactive materials; problems of liability for nuclear-powered ships were not considered by this group.

The Panel came to the conclusion that an international convention would best meet the twin needs of providing maximum protection to the public and encouraging the development of nuclear industry. As a first step, the Panel accordingly prepared a draft of such a convention. The draft represents an effort to achieve a result acceptable to as great a number

as possible of countries of different legal traditions. Because of these differences, it was essential to leave a large number of specific points for national legislation and to confine the draft to what might be considered a "framework convention", the main principles of which represent the common denominator considered to be indispensable to meet the problems of nuclear hazards on an international scale.

Among these principles are the following:

1. Liability for property damage and personal injuries from nuclear incidents should be absolute, i. e., it should exist without requiring proof of fault or negligence to be brought by the victims. It would, however, be necessary to prove causation of damage by a given source.
2. Liability should be concentrated in the operator of the installation responsible for the damage. This principle is devised in the interest of the public, which should not be compelled to proceed separately against every person contributing to the damage, and for the benefit of supplying industries in order not to expose them to claims of unknown magnitude for the supply of even minor components of a nuclear installation.
3. All liability for nuclear damage should be covered by adequate insurance or other financial security, with each State to determine the amounts of private coverage for operations on its territory and the need for intervention by the State itself.
4. Liability for nuclear damage should be limited in amount, with minimum limits to be prescribed in the convention and actual limits to be established by each State. There should also be a limit on the time within which claims may be made, which should not be less than ten years.
5. Jurisdiction over actions regarding nuclear damage should lie exclusively with courts of the State in which the installation causing damage is located or, in the case of goods in transit, the State in which the incident occurs.

In March 1960, the Board of Governors authorized the Director General to circulate the draft convention to the Agency's Member States for comment. As of 15 February 1961, substantive comments had been received from 20 governments. These comments were in turn communicated to all Member States. In February 1961 the Board of Governors established a committee composed of representatives of 14 Member States to consider the initial draft and the comments thereon and to prepare a further draft. This Committee is expected to convene in Vienna early in May 1961 following which it might be expected that the draft convention prepared by the Committee would be submitted, perhaps before the end of 1961, to a diplomatic conference for formal enactment.

Liability for Nuclear Ships

An additional panel of experts met in March and again in August 1960 under the chairmanship of Mr. Albert Lilar of Belgium to consider liability for nuclear-powered ships. Other members of the panel

were drawn from 23 countries. The panel's work was facilitated by the experience of the earlier group dealing with liability. It also had before it the conclusions of a September 1959 meeting of the International Maritime Committee at Rijeka, Yugoslavia, where the problem of liability for nuclear ships was considered in some detail.

The experts concluded that the problems of nuclear ship hazards called for quick action on an international basis. It was noted that two nuclear ships for peaceful purposes had already been built and others were planned, any of which could be involved in collisions or make visits to any coast or port.

It was decided that the panel should attempt to define the principal legal issues arising in connection with liability for nuclear-powered ships, and to formulate generic recommendations based on the personal views of the experts.

A majority of the panel reached conclusions similar to those of the earlier panel on civil liability with regard to absolute liability; concentration of liability in the operator; the need to limit liability in amount and time; and the need for adequate insurance or other financial coverage. As to jurisdiction, the majority felt that it should lie exclusively with courts of the State on the territory of which a nuclear incident oc-

curred, with the State which licensed the vessel to have jurisdiction in certain special cases, such as when the incident occurred on the high seas. Recommendations were made as well on a variety of other detailed legal questions which would have to be considered in drafting any international convention on this subject.

A report reflecting the panel's conclusions as well as divergencies of views was submitted to the Director General in September 1960. With the approval of the Board of Governors, the Director General presented this report in November 1960 as a working document for the Diplomatic Conference on Maritime Law scheduled to be held in Brussels in April 1961. The Agency is co-sponsoring the item on the agenda of this Conference relating to the liability for operations of nuclear ships.

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The Agency's regulatory work has proved even more important than was originally expected. It is clear that these activities must be continued for several years, as there are several fields not yet covered, and several which must be followed through by incorporation into international conventions or other administrative frameworks.

EFFECTS OF RADIOACTIVITY IN THE SEA

Increasing applications of atomic energy have focused attention on the problem of possible pollution of the sea by the deposition of radioactive materials. One of the obvious hazards is return of the radioactivity to man through marine products. The importance of adequate research into this problem is now widely recognized, and the first United Nations Conference on the Law of the Sea adopted a resolution saying that

"the IAEA, in consultation with existing groups and established organs having acknowledged competence in the field of radiological protection should pursue whatever studies and take whatever action is necessary to assist States in controlling the discharges or release of radioactive materials to the sea, promulgating standards, and in drawing up internationally acceptable regulations to prevent pollution of the sea by radioactive material in amounts which would adversely affect man and his marine resources."

Scientific knowledge about the redistribution of materials in the oceans, particularly in the biological cycles, is very limited at present, but it is possible to study this process with the help of radioactive substances used as tracers. A program of

research in this field is to be conducted under a trilateral agreement between the International Atomic Energy Agency, the Government of the Principality of Monaco and the Institute of Oceanography in Monaco. The program will have three major objectives. Firstly, it will be aimed at acquiring knowledge about the movement of water and marine organisms and the deposition of organic and inorganic matter. Secondly, there will be a special study of the distribution in marine organisms of radioactive materials already existing or that may be introduced into various locations. And thirdly, there will be a study of the effects of radioactive materials at various concentration levels on the marine ecology.

In studying the effects of radioactive materials on the marine ecology care will be taken to see that the necessary experiments do not contaminate edible fish in the sea. Preliminary experiments in tanks or laboratory vessels can determine the concentration levels below which the materials do not produce any observable effects on marine organisms, and in subsequent experiments in the sea to determine the distribution and redistribution of materials the radioactive substances to be used as tracers can be chosen accordingly. Because of the extreme sensitivity with which radioactive materials can be detected, the redistribution can be studied with amounts too small to have any observable effects on the biological systems.



The agreement for research being signed at IAEA headquarters by Mr. Emile Pelletier, Minister of State of the Principality of Monaco, (left), and Mr. Sterling Cole, Director General, IAEA, (right). In the center is Mr. A.D. McKnight, chairman of the IAEA Board of Governors

It can be expected that certain chemical elements will be found to undergo abnormal redistributions in the sea; for example some may be concentrated while others may be excluded by marine life. When such effects have been identified, the research is likely to narrow towards studying these particular elements in detail. In the beginning, however, the materials will be selected on the basis of their availability, radioactive life and detectability. As regards detectability, it will also be necessary to establish by experiment the background levels of radioactivity from the natural elements and from the artificial radioactive materials already present in the sea.

The research will be conducted at the Scientific Center of the Government of Monaco; the laboratory and working facilities of the center will be made available for the research project. A wide variety of electronic and monitoring equipment will also be available. The Oceanographic Institute, on its part, will put at the disposal of the project a number of valuable facilities, including marine biology laboratories, an oceanographic vessel and a boat, as well as some specialized fishing equipment. Certain other facilities, including a 360-ton oceanographic ship, may also be procured through the Institute.

The Monaco Government will this year make a voluntary contribution of 200 000 French NF to the Agency's General Fund, to be used to cover expenses in connection with the research project. It has also agreed to contribute the same amount for each subsequent year of the project.

The Agency will appoint a chief scientist to be in charge of the conduct of research and provide the necessary personnel for the project. In agreement with the Agency, personnel may also be provided by the Monaco Government and the Oceanographic Institute. The Agency will put at the disposal of the project any additional specialized equipment that may be necessary for the project, and will provide scientific and technical supplies of up to \$10 000 in value.

It has been agreed that all results of the research project, including any inventions or discoveries, will be made available for the development and practical application of atomic energy for peaceful purposes throughout the world. To that end, steps will be taken to ensure that the results are promptly and extensively published.