

U.S. DEPARTMENT OF ENERGY
FIELD TASK PROPOSAL/AGREEMENT

1. WORK PACKAGE NUMBER	2. TASK NO.	3. REV. NO. 0	4. PROJECT NO.	5. DATE PREPARED 03/31/81	6. CONTRACTOR NUMBER MO-1 (000032)
7. TASK TITLE Medical Studies of the People of the Marshall Islands Accidentally.....			8. WORK PACKAGE TITLE		
9. BUDGET AND REPORTING CODE HA-02-01-01	10. TASK TERM Begin: Continuing End: Open		11. CONTRACTOR NAME Associated Universities, Inc.		12. CODE (see instructions) BNL
13. CONTRACTOR TASK MANAGER (Name: Last, First, MI) (FTS No.) Cronkite, Eugene P. (FTS 666-7538)			14. PRINCIPAL INVESTIGATORS (Name: Last, First, MI) Cronkite, Eugene P.		
15. WORK LOCATION (See instructions): Name of facility, City, State, Zip Code				16. Is this task included in the Institutional Plan? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	17. Does this task include any management services efforts? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO
18. TASK DESCRIPTION (Approach, relation to work package, in 200 words or less)					

The primary objective is the determination of the life-time effects of fallout radiation on the Marshallese who were accidentally exposed to radioactive fallout on March 1, 1954. Medical surveys of these people have been conducted at quarterly intervals. In the future, surveys will be semiannual in view of the improving medical care by Marshall Island Health Service under the direction of the Seventh Day Adventists (SDA) and the impending implementation of the Burton Bill. In the event that either or both fail to perform as expected, it will be necessary to revert to quarterly surveys. An unexposed Rongelap population is examined for comparison. The surveys, carried out jointly by Brookhaven National Laboratory under the auspices of the Department of Energy, and the Trust Territory of the Pacific Islands, are of great importance in view of the development in this population of growth impairment in some exposed children, thyroid lesions, and one case of acute leukemia.

19. CONTRACTOR TASK MANAGER
Eugene P. Cronkite
Eugene P. Cronkite (Signature) _____ 03/31/81 (Date)

20. DETAIL ATTACHMENTS: (See instructions)

<input checked="" type="checkbox"/> a. Facility Requirements	<input checked="" type="checkbox"/> d. Background	<input checked="" type="checkbox"/> g. Future accomplishments	<input type="checkbox"/> i. Explanation of milestones
<input checked="" type="checkbox"/> b. Publications	<input checked="" type="checkbox"/> e. Approach	<input checked="" type="checkbox"/> h. Relationships to other projects	<input type="checkbox"/> k. ZBB Detail
<input checked="" type="checkbox"/> c. Purpose	<input checked="" type="checkbox"/> f. Technical progress	<input checked="" type="checkbox"/> j. Environmental assessment	<input checked="" type="checkbox"/> l. Other (Specify): Capital Equipment HA-02-9

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**TASK REQUIREMENTS FOR OPERATING/EQUIPMENT
OBLIGATIONS AND COSTS**

CONTRACTOR NAME 1
Associated Universities, Inc.

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		0	03/31/81	MO-1

21. STAFFING <i>(in staff years)</i>	PRIOR YEARS	FY 1981	FY 1982 - BY-1		AUTHOR-IZED	BY-FY 1983
		BY-2	PRESIDENT'S	REVISED		
a. SCIENTIFIC		4.5	3.1	3.6		3.6
b. OTHER DIRECT		8.9	9.7	11.4		11.5
c. TOTAL DIRECT		<u>13.4</u>	<u>12.8</u>	<u>15.0</u>		<u>15.1</u>

22. OBLIGATIONS AND COSTS <i>(in Thousands)</i>					
a. TOTAL OBLIGATIONS		760	980	1,242	1,362
b. TOTAL COSTS		948	980	1,157	1,311

23. EQUIPMENT <i>(in Thousands)</i>					
a. EQUIPMENT OBLIGATIONS		6	9	9	34
b. EQUIPMENT COSTS		19	6	6	24

24. OTHER COSTS <i>(specify)</i>					
a.					
b.					
c.					
d.					

25. OPTIONAL FIVE YEAR PLAN <i>(in Thousands)</i> Constant BY dollars	BY-1	BY-2	BY-3	BY-4	TOTAL TO COMPLETE
a. TOTAL OPERATING OBLIGATIONS					
b. TOTAL OPERATING COSTS					
c. TOTAL EQUIPMENT OBLIGATIONS					
d. TOTAL EQUIPMENT COSTS					

26. MILESTONE SCHEDULE	PROPOSED SCHEDULE	AUTHORIZED SCHEDULE

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20. Detail Attachments.

a. Facility Requirements.

Although the Liktanur II does not fulfill all the requirements for the BNL medical team, the Marshall Island Airline will be able to transport personnel to Rongelap and Utirik commencing in FY'81 and, in part, fulfill the necessity of having a larger ship. Since there is adequate air transportation from Kwajalein to Majuro, the Liktanur II will not be required after a Medical Facility is built on Majuro next to the new hospital site. Recent discussions with Marshall Island Government officials indicate that the new hospital will not be constructed for at least three years. Since its laboratories and x-ray facilities will be used, the services of Liktanur II will be required to provide laboratories and x ray until the new hospital and the BNL Medical Facility are constructed.

b. Publications.

None in FY 1980. In the interest of economy, the 25th year Report will be combined with the 26th year Annual Report and published in FY 1981.

c. Purpose.

Post-exposure surveys in the Marshall Islands have been conducted for 26 years. In addition to the 244 persons originally exposed, a group of unexposed Marshallese are examined for a "comparison population" to assess late effects of radiation from fallout.

d. Background.

The continuing development of thyroid neoplasms, biochemical hypothyroidism, and the appearance of one case of acute leukemia indicate the need for frequent examinations. In addition to routine physical, hematological, and other laboratory examinations, the surveys involve special studies related to aging, malignancy, reproduction, and measurement of body burdens of radionuclides resulting from the slight contamination remaining on the islands. Patients with thyroid nodules are returned to the United States for hospitalization and surgical treatment as indicated. In view of the diverse medical problems and their management, a physician, a Marshallese nurse-practitioner, and a laboratory technician are in residence at Kwajalein and make intermittent trips to Rongelap, Majuro, and Utirik to supervise care and perform interim examinations of the exposed Marshallese.

e. Approach.

R & D Methodology

The work is conducted in conformance with generally accepted methodology for investigations of this character.

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20. Detail Attachments. cont.

e. Approach. cont.

Management Controls

Fiscal control will be exercised in the form of monthly comparisons, over the task term, of actual costs incurred against corresponding line items of the budget. Technical results shall be monitored through a periodic review, by the Contractor Task Manager, of accomplishments by measuring actual performance as compared to expected progress. All work shall be conducted in conformance with generally accepted standards for R&D and other investigative or analytic procedures, as observed by universities and large independent research facilities including Brookhaven National Laboratory.

f. Technical Progress.

Technical Progress in FY 1980.

In FY'80 there were two surveys: a September-October 1979 and a May-June 1980. The first survey was primarily pediatric with consideration of those adults not seen in last survey, parasitologic, and dental examinations. The May-June survey considered adult exposed and non-exposed persons with emphasis on hematology and endocrinology. During FY'80 6 patients were transported to BNL for general workup and thence to Cleveland for thyroid surgery. One patient had adenopapillary carcinoma and the others benign lesions.

Dental, ophthalmologic, and parasitologic studies were continued.

The incidence of spontaneous thyroid tumors in the unexposed Marshallese is still not known with any degree of certainty and, until this is established, the significance of the thyroid tumors seen in the Utirik population remains uncertain.

SEPTEMBER-OCTOBER 1979 - MARSHALL ISLAND EXAMS

	M	E	R	U	Total
Pediatric Exams	53	49	7	45	154
Pediatric Sick Call	-	1	25	17	43
Adult Exams	34	18	-	1	53
Adult Sick Call	9	5	11	43	68
Diabetic Sampling	13	16	-	4	33
Thyroid, Lab, X Ray	9	3	3	4	19
Dental	-	19	27	66	112
TOTAL	118	111	73	180	482

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20. Detail Attachments. cont.

f. Technical Progress. cont.

Technical Progress in FY 1980. cont.

MAY-JUNE 1980 Exams

Island	Rongelap Exposed Group	Utirik Exposed Group	Rongelap Unexposed Group	Utirik Unexposed Group	Sick Call	Total Complete Exams	Total Sick Call
Majuro	10	29	19	-	-	58	-
Ebeye	28	17	65	-	20	110	20
Rongelap	19	-	57	-	44	76	44
Utirik	-	55	-	103	110	158	110
Hono	1	1	-	-	-	2	-
Total	58/64	102/111	141	103	144	404	144
	92%	92%			Grand Total:	578	

Anthelmintic therapy (Vermox) continues. Dr. Krotoski, USPHS, New Orleans supervises this and either he or an associate makes surveys annually.

S&EP, BNL, continues to re-evaluate the thyroid dose from the iodine family of radioisotopes.

The BNL technician in residence has been exceedingly valuable in assisting the resident physician to continue to deliver improved medical care to the exposed populations and to consult with the Marshall Island Health Services.

The revision to Liktanur II improved the ship considerably, although it is still not large enough to really supply the needs of the medical program. In addition, its sailing characteristics even in moderate seas induce a high incidence of severe seasickness in susceptible personnel.

Expected Progress in FY 1981.

The Tabershaw contract for an epidemiological survey of Likiep was not implemented. The problem of disease on Likiep, asserted by others to be radiation-induced, remains unresolved.

The educational activities of Dr. Naidu in 1979 were very helpful in bettering an understanding of the Marshallese and improving their attitudes towards the medical team. No untoward encounters were experienced although the political and legal activities of the Marshall Island Atomic Testing Litigation Project are beginning to stir up further unrest.

The survey of October-November 1980 was completed. Four thyroid tumors were discovered. Three are in exposed persons (1 Ailinginae, 2 Utirik, and 1 an

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20. Detail Attachments. cont.

f. Technical Progress. cont.

Expected Progress in FY 1981. cont.

unexposed person from Wotje). The three exposed were brought to BNL on January 8, 1981 and were operated on in Cleveland the week of January 12th. Two tumors were benign, and one was an adenocarcinoma.

To date, summaries of pertinent diagnoses of all exposed personnel have been completed and will be forwarded to the resident physician and to Majuro after the exposure history and other pertinent data are microfiched.

The examination of large numbers of Bikini people and extension of surveys to Wotje, Likiep, and other atolls cannot be undertaken without additional funding for BNL. It is probably unwise for BNL to undertake such epidemiologic surveys. The study of the Bikini people resident at Ejit and Ebeye is reasonable if planned ahead. The entire BNL program should be revised if and when the Burton Bill is implemented, to assure that there is no duplication and that the programs complement each other.

Expected Progress in FY 1982.

In view of the serious late effects of fallout exposure, continued medical surveillance of the exposed populations is mandatory as the studies are still in the latent period of a number of significant carcinomas. Special examinations for the thyroid abnormalities, as well as for neoplasia of other organs and tissues, and other late effects, must be continued. In light of the recent renewal of interest of long-term effects of "low level" radiation, the data from this study, even though the population is small, should serve as one of the longest prospective studies of the effects of both acute high level and long-term low level external and internal radiation. Other studies to be pursued include: a) thyroid comparison studies with thyroid surgery in the United States on unexposed Rongelap and Utirik people in the extended comparison study where such surgery is indicated; b) reevaluation of dosimetry of the Utirik people, including thyroid doses; c) study of the nature and the treatment of diabetes in Marshallese to include trace element analysis of the people and the ecosystem; d) studies with Dr. Raymond A. Popp of Oak Ridge for frequency of isolucine substitution in hemoglobin of Marshallese blood as an index of somatic mutations associated with radiation exposure and aging; and e) studies of polymorphism and rare protein variance in the blood cells of children of exposed and unexposed parents—Dr. James V. Neel at the University of Michigan has expanded his battery of tests for these variants and has agreed to continue these studies on Marshallese children.

Expected Progress in FY 1983.

Continuation of the medical surveys and limited primary care of the Marshallese is anticipated on an indefinite basis. Emphasis will be placed on examinations for thyroid abnormalities, the previously-mentioned cancers,

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20. Detail Attachments. cont.

f. Technical Progress. cont.

Expected Progress in FY 1983. cont.

hematologic disorders, and other possible effects of radiation exposure. Coordination with the patient and ecosystem monitoring teams from the Safety and Environmental Protection Division will continue. The scope of this program will be revised as the Burton Bill is implemented.

g. Future Accomplishments.

Data obtained from this study will continue to provide baseline statistics for all studies of human health effects of acute high level and long-term low level internal and external radiation.

h. Relationships to Other Projects.

The studies of the exposed Marshallese are closely related to the Radiation Effects Research Foundation studies in Japan and to the studies of the 23 Japanese fisherman exposed at the same time as the Marshallese to fallout. Acute and long-term, low-level radiation ranks as one of the most important hazards that must be considered in the DOE medical programs. The effects of fallout exposure in the Marshallese provides valuable information, particularly with regard to thyroid effects from radioiodine exposure, that may relate to future reactor accidents. The longitudinal Marshallese data have been used in the analysis of such accidents. The data are also quoted in other reports such as those of the NCRP, ICRP, BIER, and the United Nations.

The Safety and Environmental Protection Division of this Laboratory conducts radiological personnel and environmental surveys of contaminated Marshall Islands and their inhabitants. These studies are closely coordinated with the medical surveys.

i. Environmental Assessment.

Work done under this task proposal has either no environmental impact or has impacts similar to those described in and covered by BNL's Environmental Impact Statement (ERDA 1540).

1. Other.

Capital Equipment Requirements for FY 1983.

A thyroid scanning system for combined x-ray fluorescence and radionuclide imaging studies is necessary to identify nodules of interest. The system employs a large germanium detector (6 cm diameter, 2 cm thick) in a vertical mount; the isotope-exciting source is ^{170}Tm ($t_{1/2} = 134\text{d}$; 51, 52 + 59 keV x rays) which is produced and available at BNL in high purity and in large amounts. The system uses

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1. Other. cont.

Capital Equipment Requirements for FY 1983. cont.

pulse-stepping motors driving a precision machine tool scanning table, under computer control, acquiring counts from characteristic x and gamma rays in CAMAC scalers and storing these in an LSI-11 in the CAMAC controller. Data can be archived on floppy discs for analysis and image production. A monitor display will be included, but final high quality images will be produced in the nuclear medicine general purpose image analysis computer (PDP 11/34 with a high-performance display).

This system will provide high quality diagnostic images that scale precisely to the anatomical size of the neck. Nodules can then be marked on the image to compare precisely what is felt by the physician and what is detected by the imaging procedure. The x-ray fluorescence scan provides information on the iodine content of the thyroid that can be differentiated from findings on solid tumors by ultrasound imaging.

The x-ray fluorescence method yields data with low false negative rate; conveys very low radiation dose to the subject (< 100 mrem/study--thyroid dose, essentially 0 whole body dose); and should be used in populations in which the risk of thyroid cancer is high and where there is reason to minimize radiation exposure. One-half the cost of the system (\$20,000) is requested for studies of Marshallese patients. The balance of the cost will be requested in the Nuclear Medicine Program budget area (HB-02-01).

A portable x-ray unit (\$7,000) is required to replace a device that is expected to be beyond economical repair. The unit currently in use by Medical Team surveyors is exposed to salt air and water. It is essential that the survey team have equipment that is reliable and as maintenance free as possible.

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