



DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
BOLLING AFB, D.C. 20332

05834

REPLY TO AFMSC/ SGPA
ATTN OF: BROOKS AFB TEXAS 78235

12 APR 1985

SUBJECT: Air Force Single Broad Scope License

TO: Radioisotopes Licensing Branch
Division of Fuel Cycle and Material Safety
U.S. Nuclear Regulatory Commission
Washington DC 20555

1. Attached for your approval is the US Air Force application for the single broad scope license. We request that this license become effective on 1 July 1985.
2. Request any correspondence pursuant to this license be forwarded to this office.

John G. Burr

JOHN G. BURR, Lt Colonel, USAF, BSC
Secretary, USAF Radioisotope Committee
Office of the Surgeon General

1 Atch
License Application

EXEMPT

APR 18 11:14

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NMSS LIC30
42-23539-01AF PDR

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AIR FORCE MASTER MATERIALS LICENSE APPLICATION

1. APPLICATION FOR:

Type A Specific License Of Broad Scope

2. NAME AND MAILING ADDRESS OF APPLICATION:

Department of the Air Force
USAF Radioisotope Committee
HQ AFOMS/SGPA
Brooks AFB, TX 78235-5000

3. ADDRESS WHERE LICENSED MATERIAL WILL BE USED:

Except as noted in Item 10E, radioactive material shall be used only by Air Force (AF) units at locations authorized by the United States Air Force (USAF) Radioisotope Committee. Authorizations will be in the form of a USAF Radioactive Material Permit valid for three years. Any entity that holds a permit will be called a permitter.

4. PERSON TO BE CONTACTED REGARDING THIS APPLICATION:

Executive Secretary, USAF Radioisotope Committee
HQ AFOMS/SGPA
Brooks AFB, TX 78235-5000

5. RADIOACTIVE MATERIAL:

<u>Isotope</u>	<u>Form</u>	<u>Maximum Quantity</u>
Any byproduct, source, or special nuclear material	Any	As needed to meet operational requirements, however, Special Nuclear Material in any room or area shall not exceed the critical mass quantities as determined by the procedures specified in 10 CFR 150.11(a).

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6. PURPOSE FOR WHICH LICENSED MATERIAL WILL BE USED:

Licensed material will be used for purposes approved by the USAF Radioisotope Committee and will include medical, research and development, and industrial activities. This license will not cover materials possessed or used under the USAF "reactor program" or the USAF's nuclear weapons programs.

7. INDIVIDUALS RESPONSIBLE FOR RADIATION SAFETY, INCLUDING TRAINING AND EXPERIENCE:

The USAF Radioisotope Committee is responsible for radiation safety and the use of radioactive materials in the USAF. It shall consist of the HQ USAF Director of Professional Services or his designated representative (Chairman), the Executive Secretary, a fully qualified health physicist (AFSC 9176), and representatives who are expert or have professional knowledge of law, medicine, medical physics, radiobiology and radiopharmacy. Other professional areas may be included as necessary to support the Committee's responsibilities. A list of the Committee's current membership and the professional qualifications of the members is provided as Attachment One.

The Executive Secretary will be responsible for conducting day-to-day operations and approving day-to-day uses of licensed material. The Committee will review the activities of the

Executive Secretary on at least a quarterly basis. It will also review proposals for nonroutine uses of licensed material when necessary.

Additionally, each Air Force organization using licensed material will be required to appoint a Radiological Protection Officer (RPO) to direct and provide professional oversight in the management and control of hazards associated with the use of radioactive material at the authorized location. This individual will be the installation's "assigned" or "attending" health physicist or bioenvironmental engineer. He or she will have training and experience adequate to manage the use of the licensed material; the Committee may determine that another individual is more qualified by virtue of professional experience or military training and of education to assure safe and proper use of the licensed material. Users of licensed material will be chosen in accordance with NRC regulations.

When required by NRC regulations, or as deemed appropriate by the USAF Radioisotope Committee, permittees shall maintain a local radiation safety committee (Local Committee). The title, Radiation Safety Committee, identifies a function. The actual title of the local committees may vary. Local committees shall be composed in accordance with NRC regulations and Air Force directives. The USAF Radioisotope Committee will maintain records on the membership of the local committees upon initial application or renewal.

8. TRAINING FOR INDIVIDUALS WORKING IN OR FREQUENTING RESTRICTED AREAS:

Anyone working in or frequenting restricted areas will receive initial and annual refresher training in accordance with the requirements of 10 CFR Part 19 or other parts of NRC's regulations that may apply. The extent of these instructions shall be commensurate with the potential radiological health protection problems in the restricted area.

9. FACILITIES, EQUIPMENT, AND PROCEDURES:

The USAF Radioisotope Committee will issue permits to USAF applicants which want to use licensed materials. Before granting a permit, the USAF Radioisotope Committee will ensure that users have adequate facilities, equipment and procedures for the proposed use of licensed material and that they possess adequate radiation detection and monitoring equipment. The USAF Radioisotope Committee may take into account the capabilities of specialized contingency teams when considering an applicant's emergency response capability.

Radiation detection survey instruments used in an activity involving licensed material will be calibrated at least annually or after servicing in accordance with applicable end item AF Technical Orders or the manufacturer's instructions. Instrument calibration standards shall be traceable to the National Bureau of Standards (NBS). More frequent calibrations will be performed when required by NRC regulations.

THIS PAGE REPLACES PP 4 OF APPLICATION
4JUN85 Myers

TELEFAX MEMO

TO: <i>NUCLEAR REGULATORY Comm</i>		Date: <i>30 MAY 85</i>
ATTENTION: <i>MR Jim MYERS</i>		Control Nr:
PHONE: <i>301-427-4002</i>	FAX Nr: <i>301-</i> (Other than HQ USAF/SC) <i>427-4403</i>	

VERIFICATION # *427-4287*

FROM: <i>SGPA (RAKES)</i>	
ORGN & OFFICE SYMBOL: <i>HQ AFMSC/SGPA, BROOKS AFB TX</i>	
PHONE: <i>512-536-3331</i>	Nr of Pages in Pkg: <i>2</i> (Including this Memo)

AFMSC FORM 3
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8. TRAINING FOR INDIVIDUALS WORKING IN OR FREQUENTING RESTRICTED AREAS:

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Radiation detection survey instruments used in an activity involving licensed material will be calibrated at least annually or after servicing in accordance with applicable end item AF Technical Orders or the manufacturer's instructions. Instrument calibration

REPLACED 4 JUN 85 JAM

10. RADIATION SAFETY PROGRAM:

a. General:

The USAF Regulations, Standards and Policies governing the use of radioactive materials in the USAF and the operations of the USAF Radioisotope Committee are submitted with the application. A list of these documents is provided in Attachment Two.

The use of radioactive material in the USAF will be in accordance with the NRC's regulations unless NRC grants an exemption or special authorization. The USAF Radioisotope Committee will use, where possible, NRC's regulatory guides. It may accept methods or solutions other than those described in these regulatory guides if these provide a basis for maintaining an adequate level of safety.

The USAF Radioisotope Committee will maintain a current list of locations where licensed material is received, acquired, possessed, used, or stored. Copies of USAF Radioactive Material Permits will be provided to the Nuclear Regulatory Commission (NRC) Regional Office specified by NRC headquarters. Permits submitted to the NRC will be limited to those locations and materials over which the NRC has jurisdiction.

The Committee will be responsible for maintaining records under its license. Permittees will be required by the Committee to maintain records about their operations.

b. The USAF ALARA program:

It is a USAF policy that exposures to ionizing radiation shall be as low as reasonable achievable (ALARA). The USAF ALARA program is provided in Attachment Three.

c. Sealed sources or devices containing licensed material:

All sealed sources or devices authorized for use by the USAF Radioisotope Committee will be listed in the NRC catalog of approved sources and devices. Sources or devices not listed will be submitted to the NRC for evaluation and approval before use except as specified in NRC policy directives.

d. Licensed material authorizations:

When practical, the wording, style, and content of permits will approximate that of licenses issued by the NRC; however, conditions of use on permits will not be less restrictive than those required by the NRC. The USAF Radioisotope Committee will authorize the acquisition, receipt, use, possession, storage, transfer and disposal of licensed material at USAF facilities, organizations, or units. A permit will specify the isotopes, their chemical or

physical form, possession limits, authorized use and disposal methods. The Committee may grant permits of "broad scope." Under these permits of broad scope a local committee may be authorized to approve internal operational procedures, provided they satisfy the requirements of 10 CFR 33.13. At the Committee's discretion, it may issue permits for the consolidation of byproduct, source, and special nuclear materials programs. Permittees will conduct their activities as if they were under the NRC's regulations.

e. Licensed material not requiring a permit:

The USAF Radioisotope Committee, at its discretion, may issue a permit to organizations or units possessing items distributed under a general license issued by the NRC or by an Agreement State, or an exempt distribution license issued by the NRC. However, for items widely distributed to AF organizations or units presenting a minimal radiation hazard, as evaluated by the USAF Radioisotope Committee, a permit will not be issued for each location of use, but rather, a permit shall be issued to the control and accountability unit (item manager).

f. Contingency plans:

Where required and prior to authorization, the USAF Radioisotope Committee will submit radiological contingency plans to NRC in accordance with the guidelines established in NUREG-0767, "Criteria

For Selection of Fuel Cycle and Major Materials Licenses Needing Radiological Contingency Plans," July 1981, and in NUREG-0762, "Standard Format and Content, Radiological Contingency Plans for Fuel Cycle and Material Facilities," July 1981. It may modify existing emergency plans developed for other purposes.

g. Field studies:

The USAF Radioisotope Committee will not authorize without prior NRC concurrence activities involving the intentional release of licensed material to the environment not otherwise specified in 10 CFR 20. The intent is to obtain NRC concurrence on experiments involving release of materials at offsite locations.

h. Termination of permits:

USAF Radioisotope Committee's standards for termination of permits and release of equipment for unrestricted use will be in accordance with NRC's regulations, policy, and guidance.

i. Dosimetry program:

The USAF Committee will require dosimetry if an individual is likely to receive a radiation dose in excess of 10% of the annual maximum permissible occupational exposure limit. Dosimetry service will normally be provided by the USAF Occupational and

Environmental Health Laboratory (OEHL). Additionally, the Committee may incorporate into permits bioassay guidelines for those common isotopes identified in Regulatory Guide 8.20, "Applications of Bioassay for I¹²⁵ and I¹³¹," September 1979, and in Regulatory Guide 8.23, "Radiation Safety Surveys at Medical Institutions," January 1981.

j. Inspection:

It will be the responsibility of the Air Force Inspection and Safety Center (AFISC/SGMS) to conduct inspections to assess compliance with the provisions of the NRC license, NRC regulations and of the permits. Inspections will be performed as an integral part of the Health Services Management Inspection (HSMI). Inspection criteria will be in accordance with NRC's inspection policy.

AFISC inspectors will have training and experience in the fundamentals of radiation safety. Under the license, inspection of activities under permits will be conducted as frequently as presently done under the NRC's inspection system. When required, the USAF Committee will request NRC inspection assistance to assure that the NRC's inspection frequency is maintained for field radiography and irradiation programs.

11. WASTE MANAGEMENT:

Radioactive materials may be disposed of only by using alternatives in 10 CFR Part 20. The Committee shall approve specific procedures for each permit.

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1. Membership List
2. Document List
3. ALARA Program

USAF RADIOISOTOPE COMMITTEE

Brigadier General Gerald W. Parker, HQ USAF/SGP (Chairman)

Lt Colonel John Burr, HQ AFOMS/SGPA (Secretary)

Lt Colonel David Case, USAF OEHL

Lt Colonel Kenneth Vanek, WHMC

Major Ronald Borchert, WHMC

Captain Dana Lindsay, 6570 ABG

Dr Jerome Krupp, USAF SAM



Biography

United States Air Force

Secretary of the Air Force, Office of Public Affairs, Washington, D.C. 20330

BRIGADIER GENERAL (DR.) GERALD W. PARKER

Brigadier General (Dr.) Gerald W. Parker is commander of the Air Force Medical Service Center; deputy surgeon general for operations; and director, Professional Services, Brooks Air Force Base, Texas.

General Parker was born Oct. 22, 1929, in Susquehanna, Pa. Following graduation from Nott Terrace High School, Schenectady, N. Y., in 1946, he entered Union College, also in Schenectady, and earned a bachelor of science degree in 1951. General Parker received his medical degree from New York Medical College in 1955 and completed his internship at Ellis Hospital, Schenectady in 1956.

He began his Air Force career as a captain in September 1956 by attending the Basic Orientation Course for Medical Officers at Gunter Air Force Base, Ala., and the Primary Course in Aviation Medicine at Randolph Air Force Base, Texas. From December 1956 to June 1958, he was assigned as flight surgeon and dispensary commander at Hondo Air Base, Texas.

In 1961 General Parker completed his residency in internal medicine at Wilford Hall USAF Hospital, Lackland Air Force Base, Texas. He remained at Wilford Hall until 1965 where he served as staff internist and chief of the gastroenterology service. He completed his residency in gastroenterology at Walter Reed Army Medical Center, Washington, D.C., in 1966.

The general then transferred to the 388th Tactical Dispensary, Korat Royal Thai Air Force Base, Thailand, where he was chief of professional services until August 1967. His next assignment was at Clark Air Base, Philippines, where he was chairman of the Department of Medicine. He returned to Andrews Air Force Base, Md., in July 1969 to serve as chief, internal medicine services at Malcolm Grow USAF Medical Center. In September 1970 he was named chairman of the Department of Medicine at Malcolm Grow. General Parker was assigned to Wilford Hall USAF Medical Center in 1972 as chairman of the Department of Medicine. In 1975 he became director of hospital services at that center.

From August 1977 to September 1978, he was commander of the Air Force hospital at Torrejon Air Base, Spain. He then returned to the United States and served as deputy director, medical plans and resources, Office of the Surgeon General, Headquarters U.S. Air Force, Washington, D.C. In May 1980 he became its director. General Parker was director of medical inspection, Headquarters U.S. Air Force Inspection and Safety Center, Norton Air Force Base, Calif., from June 1981 to February 1983. He assumed his present duties in March 1983.



His military decorations and awards include the Distinguished Service Medal, Legion of Merit with one oak leaf cluster, Bronze Star Medal, Meritorious Service Medal with two oak leaf clusters, Air Medal with one oak leaf cluster, Air Force Commendation Medal with two oak leaf clusters and Army Certificate of Merit.

General Parker is a fellow of the American College of Physicians, a diplomate of the American Board of Medical Examiners and the American Board of Internal Medicine. He is a life member of the American College of Physicians and a member of the Society of Air Force Physicians, Association of Military Surgeons of the U.S., Aerospace Medical Association and the Air Force Association.

He was promoted to brigadier general Feb. 4, 1980, with date of rank Feb. 3, 1980.

BIOGRAPHICAL INFORMATION

PERSONAL INFORMATION:

Name: John Gregory Burr
Rank: Major, USAF, BSC (Regular)
SSAN: 021-36-4103
Current Address: 6402 Thoreau's Way
San Antonio TX 78239
Telephone: Home (512) 650-4342 Work (512) 536-2452 (Comm)
240-2452 (Autovon)
Current Occupation: Staff, Bioenvironmental Engineer
Air Force Medical Service Center
Brooks AFB TX 78235
AFSC 9116

EDUCATION AND TRAINING:

Undergraduate:

B.S. Mechanical Engineering - 1968, Lowell Technological Institute,
Lowell MA

Graduate:

MSCE Sanitary Engineering - 1972, University of Arizona, Tucson AZ

M.S. in Hygiene - Health Physics, 1976, University of Pittsburgh,
Pittsburgh PA

D.Sc. in Hygiene - Radiobiology (Major) - Computer Science (Minor), 1978,
University of Pittsburgh, Pittsburgh PA

PROFESSIONAL MILITARY EDUCATION:

ROTC - Lowell Technological Institute (1964-1968)

Squadron Officers School - 1975

Air Command and Staff College - 1982

SHORT COURSES:

OBY 9121 Bioenvironmental Engineering Course, USAFSAM, 1969

Medical X-Ray Protection, USPHS, 1969

OZY 9300-2 Medical Aspects of Advanced Warfare, USAFSAM, 1970

50AD9124 Nuclear Hazards Training Course, Sandia Base NM, 1971

Control of Oil and Other Hazardous Materials Training Course, EPA, 1973

Environmental Protection Course, AFIT, 1973

Microwave Hazards Detection and Evaluation, USAF Radiological Health Lab, 1974

CORRESPONDENCE COURSES:

Basic Electronics, Bell and Howell Schools, DeVry Institute of Technology,
Chicago IL

Master Course in Microcomputers, National Technical Schools, Los Angeles CA

ASSIGNMENTS:

1983 - present	Staff, Bioenvironmental Engineer Air Force Medical Service Center Brooks AFB TX
1980 - 1983	Biomedical Inspector, Air Force Inspection and Safety Center Norton AFB CA
1978 - 1980	Radiation Bioeffects Scientist, Brooks AFB TX
1975 - 1978	Doctoral Program, University of Pittsburgh, Pittsburgh PA
1972 - 1975	Chief, Environmental Health Services Griffiss AFB NY
1971 - 1972	Master of Science, University of Arizona Tucson AZ
1968 - 1971	Chief, Military Public Health and Occupational Medicine, Charleston AFB SC

AWARDS

AF Commendation Medal for 1972-1975 Griffiss AFB NY
AF Commendation Medal for 1968-1971 Charleston AFB SC
AF Commendation Medal for 1978-1980 USAF School of Aerospace Medicine,
Brooks AFB TX

PROFESSIONAL ORGANIZATIONS

Health Physics Society
Bioelectromagnetics Society

PUBLICATIONS

Burr, J.G.; Wald, N.; Pan, S. and Preston, K., "The Synergistic Effects of Ultrasound and Ionizing Radiation on Human Lymphocytes" in Mutagen-induced Chromosome Damage in Man, Ed., Evans, H.J. and Lloyd, D.C. Edinburgh University Press. (1978) pg 120-128.

Burr, J.G.; Cohoon, D.K.; Bell, E.L.; and Penn, J.M., "Thermal Response Model of a Simulated Cranial Structure Exposed to Radiofrequency Radiation", IEEE Transactions on Biomedical Engineering, Vol. BME-27, 8, pp 452-460 (1980).

Burr, J.G.; Krupp, J.H.; Hamill, D.A.; and Donahue, M.F., "Evaluation of Simulated Radiofrequency Heating Procedures", SAM IR-80-30, USAF School of Aerospace Medicine, Brooks AFB TX (1980).

Burr, J.G.; Erwin, D.N.; Donahue, M.; Hanson, J.; and Ganser, D., "Development and Testing of an In-Vitro Sample Holder for Radiofrequency Radiation Bioeffects Research", SAM IR-80-34, USAF School of Aerospace Medicine, Brooks AFB TX (1980).

- Burr, J.G. and Krupp, J.H., "Real Time Measurement of RFR Energy Distribution in the Macaca Mulatta Head", Bioelectromagnetics, Vol 1, (1980)

RESEARCH THESIS

- "Effect of Molecular Weight on Polymer Filter Aids", M.S. Thesis, University of Arizona, Tucson AZ, 1972
- "A Study of the Synergistic Effects of Ultrasound and Ionizing Radiation", M.S. Thesis, University of Pittsburgh, Pittsburgh PA, 1976
- "The Synergistic Effect of Ultrasound and Ionizing Radiation on Human Lymphocytes", D.Sc. Thesis, University of Pittsburgh, Pittsburgh PA, 1978

PRESENTATIONS

- Bukovitz, A.G.; Gur, D.; Burr, J.G.; Serago, C. and Pan, S., "Comparison of the Damage to Genetic Material of Human Cells Exposed to Continuous and Pulsed Radiation", Presented at ASTS Annual Meeting, Los Angeles CA, Oct 78
- Burr, J.G. and Krupp, J.H., "Real Time Measurement of RFR Energy Distribution in Macaca Mulatta Head", Presented at Bioelectromagnetics Society Symposium, University of Washington, Seattle Washington, Jun 79
- Burr, J.G. and Krupp, J.H., "Real Time Temperature Measurements in the Macaca Mulatta Exposed to 2.08 GHz Radiofrequency Radiation", Second Annual Meeting of the Bioelectromagnetic Society, San Antonio TX, 14-18 Sep 80
- Burr, J.G., "RF Radiation Standards" 13th Bioenvironmental Engineering Symposium, Brooks AFB TX, 13-15 May 80

TEACHING EXPERIENCE

- "Health Hazards from Non-Ionizing Radiation", University of Pittsburgh, Pittsburgh, Pittsburgh PA, Spring Session, 1977 (course included laser, microwave, RF and ultrasound).

PERSONAL HISTORY DATA

NAME: Case, David Russell

DATE OF BIRTH: 4 April 1942

PLACE OF BIRTH: Hartford, CT

RESIDENCE: 5047 Round Table
San Antonio TX 78218

SPOUSE'S NAME: Betty Jean Modesitt

CHILDREN: Katherine, Lisa, Deborah,
Robert

EDUCATION: B.S. (Chemistry), 1964, Trinity College, Hartford, CT; PhD
(Chemistry), 1969, Purdue University, W Lafayette IN

DATE ASSIGNED USAF OEHL: 29 June 1981

TITLE, GRADE, PRESENT POSITION: Health Physicist; Lt Col; Chief, Radiation
Services Division.

SPECIALIZED TRAINING: Senior Officer's Nuclear Accident Course; Nuclear
Weapons Orientation Advanced; Medical-Effects of Nuclear Weapons; Air Force
Nuclear Weapons Refresher Training.

HONORS AND AWARDS: Air Force Meritorious Service Medal; Air Force
Commendation Medal, First Oak Leaf Cluster; Outstanding Unit Award, First Oak
Leaf Cluster.

MEMBERSHIP IN PROFESSIONAL & TECHNICAL SOCIETIES: American Chemical Society;
Air Force Association.

APPOINTMENTS: Member, USAF Radioisotope Committee; Military Consultant to the
Surgeon General Health Physics; Associate Chief for Health Physics.

PREVIOUS ASSIGNMENTS & DATES (YEAR): Dec 1983-Present - Chief, Radiation
Services Division; 1981-1983 - Chief, Radioanalytical Services Branch, USAF
OEHL, Brooks AFB TX; 1981-1981 - Resident Student, Armed Forces Staff College,
Norfolk VA; 1979-1981 - Chief, Radioanalytical Services Branch, USAF OEHL,
Brooks AFB TX; 1978-1979 - Chief, Plans and Programs, USAF OEHL; 1977-1978 -
Chief, Technical Services Division, USAF OEHL; 1976-1977 - Staff Health
Physicist, USAF OEHL; 1973-1976 - Chief, Analytical Services Division, USAF
Radiological Health Laboratory, Wright-Patterson AFB OH; 1970-1973 - Chief,
Chemistry Branch, USAF Radiological Health Laboratory, Wright-Patterson AFB
OH; 1969-1970 - Chief, Dosimetry Branch, Air Force Nuclear Engineering Center,
Wright-Patterson AFB OH.

PERTINENT EXPERIENCE: 2 years experience in reactor operations, health
physics, and radiation environmental measurement, prediction and
characterization in an engineering and research environment. Included all
aspects of reactor radiological safety, monitoring, use of large radioactive
sources, and management of radioactive waste.

12 years experience managing operation of a radioanalytical laboratory
including design, selection of equipment, implementation of automation

techniques, computerization, and operation. Consulted with Air Force users regarding capabilities, applications, and limitations of radioisotope measurement techniques.

12 years experience in evaluating the impact of radionuclides in the environment. Accomplished at least two evaluations per year of decommissioned nuclear reactor sites, contained nuclear weapons accident sites, and inactive radioactive waste burial sites. Extensive experience and participation in nuclear weapons accident training, response, and exercises.

7 years experience as member of Air Force wide radioisotope committee to evaluate all radiological safety aspects of radioactive material usage. Participated in radiation protection policy review, for evaluation, and recommendation. Participated in review and revision of Air Force directive on radiation protection.

15 years experience in comprehensive evaluation of radiation operations, safety, facility design, and modification.

Lecturer in Air Force training programs in radioisotopes, radioanalysis, dosimetry, accident response, and radioactive material licensing, transportation, and disposal for 10 years.

PUBLICATIONS: None pertinent to this speciality. 15 years spent in consultative assignments; produce various consultation, survey, and analytical reports.

CURRICULUM VITAE

NAME: KENNETH NORMAN VANEK, Ph.D.

ADDRESS:

Business: Wilford Hall USAF Medical Center
SGHQRP
Lackland AFB, Texas 78236-5300

Phone: (512) 670-5287

Residence: 2530 Lovetree
San Antonio, Texas 78232-4608

Phone: (512) 491-0358

PERSONAL:

Date of Birth: October 22, 1945

Place of Birth: Chicago, Illinois, USA

Citizenship: USA

Marital Status: Married - Sheila Ann Curry - June 15, 1968
Children - Adam Wayne - Born, June 5, 1970
Tiffany Dawn - Born June 19, 1975

MILITARY STATUS: Active duty - U.S. Air Force
Current rank - Lt. Col.
Date Entered Active Duty - 1 September 1968

SECURITY CLEARANCE: Top Secret, United States Air Force

BOARD CERTIFICATION: American Board of Radiology - Therapeutic
Radiological Physics - 1982

CV - Vanek, K.N.

EDUCATION:

1967	B.S. (Zoology) Texas A & M University College Station, Texas
1969	M.S. (Biophysics/Health Physics) Texas A & M University College Station, Texas <u>Thesis:</u> The Effect of Various Atmospheric Oxygen Concentrations Upon Peripheral Lymphocytes During Whole Body Gamma Irradiation
1976	Ph.D. (Nuclear Engineering Sciences/ Medical Radiation Physics) University of Florida Gainesville, Florida <u>Dissertation:</u> Radiation Dose to Humans from ^{99m}Tc Labeled Dihydrothioctic Acid (DHTA)

CV.- Vanek, K.N.

SUPPLEMENTAL TRAINING:

*Military:

1969	Officer Basic Military Training Medical OBM 0104-1 USAF Medical Service School Sheppard AFB, Texas
1970	Management for Project Engineers & Scientists Air Force Special Weapons Center Kirtland AFB, New Mexico
1972	Space Orientation Course Air University for Professional Development Patrick AFB, Florida
1979-1980	Squadron Officers School (SOS) Correspondence Course Keesler AFB, Mississippi
1981	Air Command and Staff Seminar Program Keesler AFB, Mississippi
1985	Air War College Seminar Program Lackland AFB, Texas

*Short Training Sessions are not listed.

SUPPLEMENTAL TRAINING:

*Professional:

- 1977 External Beam, Interstitial, and Intracavitary Dosimetry-Principles, M.D. Anderson Hospital and Tumor Institute, Houston, Texas, January 3-14
- External Beam, Interstitial, and Intracavitary Dosimetry-Manual and Computer Methods of Calculation, M.D. Anderson Hospital and Tumor Institute, Houston, Texas, January 17-28
- 1978 Electron Linear Accelerators in Radiation Therapy, AAPM Workshop, Denver, March 27-29
- 1979 High Energy Electron, X-Ray, and Neutron Dosimetry, M.D. Anderson Hospital and Tumor Institute, Houston, Texas, January 29 - February 3
- 1980 Packaging and Transportation of Radioactive Materials, Nuclear Energy Waste Management Consultants, Ft. Meyers, Florida, January 3-4
- Medical Physics of CT and Ultrasound - Tissue Imaging and Characterization
AAPM Summer School
La Crosse, Wisconsin, July 20-25
- 1981 Physical Aspects of Hyperthermia
AAPM Summer School
Hanover, New Hampshire, August 3-7
- 1982 Advances in Radiation Therapy Treatment Planning
AAPM Summer School
Hammond, Louisiana, July 26-30
- 1983 Radiotherapy Treatment Planning Anatomy
The University of Texas Health Science Center at San Antonio
San Antonio, Texas, April 11-15
- An Update in Physics of Nuclear Medicine
AAPM Summer School
Madison, New Jersey, July 24-29

*Short refresher courses such as those at RSNA, ASTRO, and AAPM meetings are not listed.

CV - Vanek, K.N.

PROFESSIONAL EXPERIENCE:

1967 (Summer)	Radiology Assistant, Maxfield Clinic, Dallas, Texas
1967-68	Graduate Research Assistant, Department of Nuclear Engineering, Texas A & M University, College Station, Texas
1968-69	Graduate Student, Air Force Institute of Technology, United States Air Force, Texas A & M University, College Station, Texas
1969-70	Health Physicist, Biophysics Division Air Force Weapons Laboratory, Kirtland AFB, New Mexico
1970-71	Program Management Officer and Laser Safety Officer, Laser Division Air Force Weapons Laboratory, Kirtland AFB, New Mexico
1971-73	Health Physicist and Radiation Protection Officer, Air Force Eastern Test Range, Patrick AFB, Florida
1973-76	Doctoral Student, Air Force Institute of Technology, University of Florida, Gainesville, Florida
1976-84	Chief, Radiological Physics, Department of Radiology, USAF Medical Center, Keesler AFB, Mississippi
1984-	Chief, Medical Physics Service, Department of Radiology, Wilford Hall USAF Medical Center, Lackland AFB, Texas

PROFESSIONAL APPOINTMENTS AND ACTIVITIES:

1972	Member, Ad Hoc Committee on Laser Safety, Department of Defense Range Commanders Council
1972-73	Member, Interagency Nuclear Safety Review Panel (Atomic Energy Commission, National Aeronautics and Space Administration, Department of Defense)
1975-81	Member, Society of Nuclear Medicine Computer Committee
1976	Session Co-Chairman, Radiopharmaceutical Dosimetry Symposium, Oak Ridge, Tennessee, April 26-29
1976-Present	Member, Committee on Experimental Verification of Internal Dosimetry Calculations, National Council on Radiation Protection and Measurements (NCRP Scientific Committee 55)
1980	Local Arrangements Chairman, Health Physics Society Deep South Chapter 1980 Annual Meeting
1980-82	Local Arrangements Chairman, 1982 AAPM Summer School "Advances in Radiation Therapy: Tumor Localization, Simulation, Treatment Planning, and Treatment." Southeastern Louisiana University Hammond, Louisiana
1980-83	Member, Continuing Education Committee, American Association of Physicists in Medicine (AAPM)
1982	President-elect Deep South Chapter Health Physics Society Consultant in Medical Physics to USAF Surgeon Surgeon General
1983	President - Deep South Chapter Health Physics Society
1983	American Medical Association, Ad Hoc Committee, "Guide to the Hospital Management of Injuries Arising from Exposure to or Involving Ionizing Radiation"

CV - Vanek, K.N.

PROFESSIONAL AND SCIENTIFIC ORGANIZATIONS:

American Association of Physicists in Medicine
American Society of Therapeutic Radiologists
American College of Radiology
Health Physics Society
National Council of Radiation Protection and Measurements
(Adjunct Member)
Texas Regional Medical Physicists
American Conference of Governmental Industrial Hygienists

HONOR SOCIETIES: TAU BETA PI

AWARDS AND HONORS:

Military

1971	Air Force Systems Command Certificate of Merit
1973	Air Force Commendation Medal
1975	Senior Biomedical Scientist U.S. Air Force, Biomedical Science Corps
1982	Air Force Meritorious Service Medal Chief, Biomedical Scientist U.S. Air Force, Biomedical Science Corps Consultant to USAF Surgeon General
1984	Air Force Meritorious Service Medal (First Oak Leaf Cluster)

PROFESSIONAL AND RESEARCH RESPONSIBILITIES, INTERESTS AND ACTIVITIES:

1967 (Summer)	<u>Radiology Assistant, Maxfield Clinic, Dallas, Texas.</u> Assisted in patient positioning and treatment with x-ray and Cobalt therapy units, diagnostic x-ray procedures, pharmacy, and routine physicals.
1967-68	<u>Graduate Research Assistant, Department of Nuclear Engineering, Texas A & M University, College Station, Texas.</u> Performed research of rat lymphocytes utilizing 800 Ci of ⁶⁰ Co. Received additional health physics experience at one Megawatt TRIGA reactor and a variable energy cyclotron.
1968-69	<u>Graduate Student, Air Force Institute of Technology, duty station at Texas A & M University, College Station, Texas.</u> Completed M.S. degree in Biophysics (Health Physics). Performed laboratory surveys and radioactive waste disposal.
1969-70	<u>Health Physicist, Air Force Weapons Laboratory, Biophysics Division, Kirtland AFB, New Mexico.</u> Provided neutron dosimetry support to a biological effects research program. Member, Special Weapons Center Radioisotope Committee. Directed phase-down of neutron dosimetry program.
1970-71	<u>Program Management Officer and Laser Safety Officer, Air Force Weapons Laboratory, Laser Division, Kirtland AFB, New Mexico.</u> Management Assistant to the Director, Laser Division. Supervised financial and property resources for a multimillion dollar program. Established a laser safety program and conducted division correspondence in designated areas. Member Air Force Special Weapons Center Radioisotope Committee.
1971-73	Health Physicist and Radiation Protection Officer, Air Force Eastern Test Range (AFETR), Patrick AFB, Florida. Responsible for the initiation, supervision, and execution of a command health physics program. Reviewed and approved all procedures performed on the AFETR that involved ionizing or non-ionizing radiation hazards and assured the proper licensing of the appropriate materials.

(1971-73)

This involved interfacing with other DoD agencies, NASA, AEC and private industry. Extensively revised the AFETR radiation control program. Monitored two health physics support contracts which included identifying specific work requirements to be performed by the contractor, establishing any necessary priorities, and evaluating their technical performance. Reviewed the nuclear safety and design concepts of Viking (90,000 Ci ^{238}Pu) and the multihundred watt (MHW) nuclear generators (270,000 Ci ^{238}Pu). Responsible for the handling and contingency plans for the prelaunch and launch aspects of nuclear generators from the AFETR, co-directed the Radiation Control Center during the launches of Pioneer F and G (SNAP-19 nuclear generators). Served as the Air Force representative in the NASA Radiation Control Center during the launches of Apollo 16 and 17 (SNAP-27 nuclear generators). Represented the AFETR on the ad hoc Committee for Laser Safety (DoD Range Commanders Council). Served as the secretary to the AFETR Radioisotopes Committee. Performed surveys of industrial and medical x-ray units, laser and microwave systems, and radioactive material storage and use areas. Member of the following committees or teams: Ground or explosive accident investigation board, bomb damage assessment team, Headquarters AFETR disaster response force, and AFETR commander's alert staff.

1973-76

Doctoral Student, Air Force Institute of Technology, duty station at the University of Florida, Gainesville, Florida. Majored in medical radiation physics with an emphasis in nuclear medicine. Experience with Searle HP scintillation camera, Ohio-Nuclear dual 5 rectilinear scanner, Pho-Dot, RADX dose calibrator, 1.57 x 2.0 well-type scintillation counter, and a PDP 8/I computer. Additional experience with Picker teletherapy units and an IBM 360. Guest lecturer in a graduate level nuclear medicine course. Assisted the VA Hospital, Gainesville, Florida, in obtaining their NRC radioactive material license of broad scope.

1976-84

Chief, Radiological Physics, Department of Radiation Therapy, USAF Medical Center Keesler, Keesler AFB, Mississippi. Responsible for the overall direction of the radiation physics program at this 385 bed medical center. Provided physics support and served as technical director to the department of radiation therapy. Acted as a consultant and provided physics support to diagnostic radiology, nuclear medicine, clinical research laboratory, dental services, and environmental health. Participated in the professional training of various medical residents, staff members, and support personnel. Keesler Medical Center had an AECL Theratron 80, a 250 kVp orthovoltage unit, a treatment simulator, a TP-11 treatment planning system, state-of-the-art physics support equipment, 15 diagnostic radiology suites, cystology, ultrasound suites, a GE 8800 CT scanner, two Picker gamma cameras, plus other nuclear medicine laboratory equipment. Brachytherapy sources included Ra-226, Cs-137, Au-198, Ir-192, and I-125.

Served as a consultant to the nuclear medicine departments at Maxwell AFB, Alabama and Eglin AFB, Florida.

1984-Present

Chief, Medical Physics Service, Department of Radiology, Wilford Hall USAF Medical Center, Lackland AFB, Texas. Responsible for the overall supervision and direction of the radiological physics program at the Air Force's largest medical center. The medical physics service supports radiation therapy, nuclear medicine, diagnostic radiology, clinical investigation facility, clinical laboratory, dental service, environmental health, and Lackland AFB. The radiation therapy service has a Siemen's Mevatron 77 linear accelerator, Cobalt-60 teletherapy, orthovoltage, a treatment simulator, a TP-11 treatment planning system and other support equipment. This service treats over 700 new patients per year. Nuclear Medicine Service has over six imaging cameras, two MDS data acquisition and analysis systems, and performs over 34,000 procedures per year. Diagnostic Radiology Service has over 24 radiology suites, including two CT scanners, ultrasound, cystology, and cardiac catheterization suites. Serves as director of physics training for radiology residents, and nuclear medicine student technologists. Serves as a Consultant in Medical Physics to the USAF Surgeon General. Serves as a member of the USAF Radioisotope Committee, as well as Chairman of the Wilford Hall Medical Center's Radiation Safety Committee.

CV - Vanek, K.N.

PUBLICATIONS - ABSTRACTS:

1. Butler PF, Fitzgerald LT, Vanek KN, et al: A computer program to determine radiation absorbed dose. Health Physics 31:542, 1976.
2. Vanek KN, Brookeman VA: Methodology of absorbed dose determinations for a new hepatobiliary imaging agent (Sup ^{99m}Tc-DHTA)). Information zur Kernforschung and Kerntechnik C45 5118 (NR 11) 1976.
3. Brookeman VA, Vanek KN, Butler PH, et al: Radiation dose to humans from ^{99m}Tc-dihydrothioctic acid (DHTA) Phys Med Biol 22:119, 1977

PUBLICATIONS - JOURNAL:

Butler PF, Fitzgerald LT, Brookeman VA, and Vanek KN: Determination of internal radiation absorbed dose: a computer method. Health Physics 33:459-463, 1977.

PUBLICATIONS - PROCEEDINGS:

1. Butler PF, Fitzgerald LT, Vanek KN, Brookeman VA: Automatic determination of cumulated activity. In Proceedings of Conference on Sharing of Computer Programs and Technology in Nuclear Medicine, (January) 1976.
2. Butler PF, Fitzgerald LT, Vanek KN, Brookeman VA: A computer program to determine cumulated activity and absorbed radiation dose. In Proceedings of Oak Ridge Radio-pharmaceutical Dosimetry Symposium, (April) 1976.
3. Vanek KN, Brookeman VA: Methodology of absorbed dose determinations for a new hepatobiliary imaging agent (^{99m}Tc-DHTA). In Proceedings of Oak Ridge Radio-pharmaceutical Dosimetry Symposium, (April) 1976.
4. Vanek KN, Brookeman VA, Butler PF, Fitzgerald LT: Radiation dose to humans from ^{99m}Tc-dihydrothioctic acid (DHTA). In Proceedings of IV International Conference of Medical Physics, (July) 1976.

INVITED PRESENTATIONS:

1. "^{99m}Tc-DHTA. A New Hepatobiliary Imaging Agent." Florida Chapter Health Physics Society. Winter, 1975.
2. "Quality Assurance in Diagnostic Radiology." Gulf Coast Society of Radiologic Technologists. April, 1978.
3. "The Role of Physics in Medicine." American Association of Medical Assistants, Mississippi Coast Counties Chapter. April, 1978.
4. "Radiation and Its Biological Implication." Gulf Coast Research Laboratory, Ocean Springs, Mississippi. Seminar 11 September 1979.
5. "Medical Physics and Health Physics - A Radiological Team in the Medical Environment." American Association of Medical Assistants, Mississippi Coast Counties Chapter. April, 1980.

PRESENTATIONS - OTHER:

1. "Film Processor Quality Assurance." United States Air Force Biomedical Engineering Symposium. May, 1978.
2. "Quality Assurance in Diagnostic Radiology - Myth or Miracle." Deep South Chapter Health Physics Society. August, 1978.
3. "Implementation of an X-Ray Quality Assurance Program." Deep South Chapter Health Physics Society. March, 1979.
4. "Implementation of the Presidential Directive for Control of X-Ray Exposure." Deep South Chapter Health Physics Society. March, 1979.

CV - Vanek, K.N.

SUPPLEMENT FOR LICENSE INFORMATION:

<u>ISOTOPE</u>	<u>AMOUNT</u>	<u>WHERE</u>	<u>YEARS EXPERIENCE</u>	<u>USE</u>
^{60}Co	6000 Ci	Over 10 medical installations	11	teletherapy
^{60}Co	5000 Ci	Air Force Weapons Lab Kirtland, NM	1	animal research
^{60}Co	500 Ci	Texas A&M University College Station, TX	2	animal research
^{137}Cs	125 Ci	Air Force Weapons Lab Kirtland AFB, NM	1	calibration
^{238}Pu	90,000 Ci	A.F. Eastern Test Range Patrick AFB, FL	2	Nuclear Power Generators for Space
Pu-Be	10 Ci	Air Force Weapons Lab Kirtland AFB, NM		Calibrations, experiments

In addition to the above, Dr. Vanek has had extensive experience with mg and mCi amounts of ^{137}Cs , ^{226}Ra , ^{192}Ir , ^{125}I , and ^{198}Au for interstitial and intracavitary implants. He also has used mCi quantities of ^{99}Mo , ^{131}I , ^{125}I , ^{67}Ga , ^{51}Cr , $^{99\text{m}}\text{Tc}$, ^{133}Xe , ^{57}Co , ^{22}Na , ^{133}Ba , ^{54}Mn , ^3H , ^{14}C , ^{32}P , ^{67}Ci , ^{90}Sr , ^{185}K , ^{210}Bi , and others in research, nuclear medicine, and cancer treatment.

CURRICULUM VITAE

DATE PREPARED: 24 April 1984

RANK/NAME: Major Borchert, Ronald D.

SPECIALTY: Radiopharmacist

AFSC: W9246

CURRENT ASSIGNMENT:

Chief, Radiopharmacy Services, Wilford Hall USAF Medical Center,
Lackland AFB, Texas

Military Consultant to the Surgeon General of the Air Force,
for Radiopharmacy

EDUCATION AND TRAINING:

B.S. in Pharmacy, South Dakota State University, Brookings,
South Dakota, 1969

Residency in Hospital Pharmacy, St. Lukes Hospital, Duluth,
Minnesota, 1970

Courses in Computer Application and Computer Programming,
Riverside City College, Riverside, California, 1973

M.S. in Radiopharmacy, University of Southern California,
Los Angeles, California, 1977

Residency in Radiopharmacy, Veterans Administration Hospital,
San Diego, California, 1977

15th Annual Midyear Clinical Meeting, American Society of Hospital
Pharmacists, San Francisco, California, 1980

5th Clinical Congress, American Society of Parenteral and Enteral
Nutrition, New Orleans, Louisiana, 1981

USAF Pharmacy Seminar, USAF School of Aerospace Medicine,
Brooks AFB, Texas, 1981

Fourth Annual Pharmacy Symposium on Cancer Chemotherapy,
University of Texas M.D. Anderson Hospital and Tumor Institute,
Houston, Texas, 1982

Institute on Planning and Operating Drug Use Review and Pharmacy
Quality Assurance Programs, American Society of Hospital
Pharmacists, Cleveland, Ohio, 1982

Symposium on Expanding Directions in Cardiology, Central Texas
Society of Hospital Pharmacists, San Antonio, Texas, 1982

30th Annual Meeting, Society of Nuclear Medicine, St. Louis,
Missouri, 1983 (Presented Scientific Paper)

BOARD CERTIFICATIONS:

Board Certified Pharmacist, Minnesota State Board of Pharmacy,
Certificate No. 11290, 1970 - Present

Doctor of Pharmacy, South Dakota State Board of Pharmacy,
Certificate No. 3885, 1975 - Present

IMPORTANT MILITARY ASSIGNMENTS:

Chief Pharmacy Services, USAF Hospital Wurtsmith, Wurtsmith AFB,
Michigan, 1970

Chief Pharmacy Services, USAF Hospital Osan, Osan AB, Republic of
Korea, 1970 - 1971

Chief Pharmacy Services, USAF Regional Hospital March, March AFB,
California, 1971 - 1976

Chief Inpatient Pharmacy Services, USAF Medical Center, Keesler,
Keesler AFB, Mississippi, 1977 - 1981

ACADEMIC APPOINTMENTS:

Adjunct Clinical Instructor, School of Medicine, Department of
Radiology, University of Texas Health Science Center, San
Antonio, Texas, 1982 - Present

Clinical Instructor, Division of Science, Nuclear Medicine
Technology Program, Incarnate Word College, San Antonio, Texas,
1982 - Present

PREVIOUS CONSULTING ACTIVITIES:

Consultant for Pharmacy Services, Office of the Surgeon, U.S. Air Forces Korea, Headquarters 314th Air Division, Osan AB, Republic of Korea, 1970 - 1971

Special Advisor to the Commander for Drug Abuse Education, Office of the Commander, U.S. Air Forces Korea, Headquarters 314th Air Division, Osan AB, Republic of Korea, 1970 - 1971

Consultant and Evaluator, Joint Disaster Preparedness Committee, Pomona Valley Area Hospital Association, Pomona, California, 1975

Consultant on Parenteral Nutrition, Nutrition Support Service, USAF Medical Center, Keesler AFB, Mississippi, 1980 - 1981

RESEARCH CONTRIBUTIONS:

Research Advisor - Tracer Methodology, Radiochemical Laboratory Procedures and Radiopharmaceutical Preparation, Clinical Research Laboratory, USAF Medical Center, Keesler AFB, Mississippi, 1977 - 1981

Research Advisor - Tracer Methodology, Radiochemical Laboratory Procedures and Radiopharmaceutical Preparation, Clinical Research Facility, Wilford Hall USAF Medical Center, Lackland AFB, Texas, 1981 - Present

OTHER MAJOR PROFESSIONAL ACTIVITIES:

Member Radiopharmaceutical Science Council, Society of Nuclear Medicine, 1979 - Present

Member USAF Radioisotope Committee, Office of the Surgeon General, HQ USAF, AFMSC/SGPZ, Brooks AFB, Texas, 1982 - Present

MEMBERSHIPS IN PROFESSIONAL ORGANIZATIONS:

South Dakota State Pharmaceutical Association

American Pharmaceutical Association

American Society of Hospital Pharmacists

Society of Nuclear Medicine

Central Texas Society of Hospital Pharmacists

PUBLISHED ARTICLES, SPEECHES, LECTURES:

Guest Lecturer - Parenteral Alimentation Techniques, Regional Nurses Conference, USAF Regional Hospital, March AFB, California, 1975

Guest Lecturer - Pharmacology & Toxicology, Riverside City College Nursing Program, Riverside, California, 1973 - 1976

Invited Paper - In Vitro & In Vivo Nuclear Pharmacy:
R.D. Borchert, M.L. Brown. USAF Pharmacy Seminar, USAF School of Aerospace Medicine, Brooks AFB, Texas, 1979

Organizer and Lecturer - Workshop "Total Parenteral Nutrition, A Team Approach", USAF Medical Center, Keesler AFB, Mississippi, 1981

Scientific Exhibit - Bilateral Emission Scintislice Tomography (BEST): Performance Characteristics of a New Single Photon Rotating Bilateral Slant-hole Collimator: J.C. Lasher, F.L. Weiland, D.T. Kopp, P.R. Rosen, R.D. Borchert. 68th Assembly and Annual Meeting of the Radiological Society of North America, Chicago, Illinois, 1982

Scientific Paper - Use of I-123 Capsules in Establishing Normal Esophageal Transit Time and Patterns: D.E. Kotun, R.D. Borchert, P.R. Rosen, J.L. Floyd, F.L. Weiland, 30th Annual Meeting Society of Nuclear Medicine, St. Louis, Missouri, 1983

Scientific Publication - Demonstration of Occult Abdominal Infection with Indium-111 Leukocytes and Gallium-67 Scintigraphy: F. Ahmed, F.L. Weiland, P.R. Rosen, R.D. Borchert. Clinical Nuclear Medicine, 46:1390, June 1984

CURRICULUM VITAE

DANA CLAIRE LINDSAY

TRAINING & EDUCATION:

June 1979	B.A. Political Science Mercer University, Macon, Georgia
June 1982	J.D. Walter F. George School of Law Mercer University, Macon, Georgia
Mar - Apr 1983	Judge Advocate Staff Officers' Course Maxwell AFB, Alabama Distinguished Graduate
Oct 1983	Practical Environmental Law Course University of Denver School of Law held at Williamsburg, Virginia
Mar 1984	Environmental Law Course Maxwell AFB, Alabama

EXPERIENCE:

July - Dec 1982	Kaplan & Thomason, P.A. Macon, Georgia
Jan 1983 - Present	United States Air Force Judge Advocate General's Corps Chief of Civil & Environmental Law Brooks AFB, Texas

PROFESSIONAL AFFILIATIONS:

	Member of American Bar Association Member of Georgia Bar Association
Admitted to practice:	Supreme Court of Georgia Georgia Court of Appeals Federal District Court for the Middle District of Georgia

PERSONAL RESUME

NAME: Jerome H. Krupp

ADDRESS: Route 3, Box 1217, San Antonio, TX 78218

EDUCATION:

a. Academic

<u>Institution</u>	<u>Degree</u>	<u>Year</u>	<u>Major Area</u>
University of Illinois	BS	1947	English, Naval Science
University of California	DVM	1958	Veterinary Medicine
University of Arkansas Medical Center	MS	1972	Radiation Biology, Physiology

b. Other major courses by date:

Officer Basic Course, Medical Service Corps, Medical Field Service School, Ft. Sam Houston, TX, 1964.

Officer Career Course, Medical Service Corps, Medical Field Service School, Ft. Sam Houston, TX, 1965.

Air Command and Staff School, Air University, Maxwell AFB, AL, 1968

Academic Instructor Course, Air University, Maxwell AFB, AL, 1973.

Veterinary Officer Career Course, Sheppard AFB, TX, 1974.

Air War College (Seminar Course), Brooks AFB, TX, 1980.

Management Development Seminar, Federal Executive Seminar Center, Denver, CO, 1982.

c. Significant short courses by date:

Communications Officer Short Course, US Naval Post-graduate School, Monterey, CA, 1951.

OJT Supervisor Course, Hunter AFB, GA, 1966.

Statistical Quality Control, WPAFB, OH, 1969.

Pathology of Laboratory Animals, AFIP, Washington, DC, 1969.

Managing Untapped Human Resources Course, Brooks AFB, TX, 1973.

Human Relations Education Phases, I, II, and III, 1975-1977.

Director of Laboratories Procurement Management Seminar, Brooks AFB, TX, 1976.

Laboratory Contract Managers' Training Program,, USAFSAM, 1978.

Continuing Education Program, American Veterinary Medical Association, 1978, 1979, 1981.

Medical Symposium on the Effect of the Environment on Humans, 804th Army Hospital Center, Boston, MA, March 1979.

SAMSTAT Course, USAFSAM, 1979.

RSXIIM User Course, USAFSAM, 1979.

Executive Development Seminar - Managing People, Texas Tech University, San Antonio, TX, Oct 1984.

PROFESSIONAL EXPERIENCE:

February 1976 to present:

Veterinary Medical Officer, GM-14, Chief, Bioeffects Function, Radiation Physics Branch, Radiation Sciences Division, USAFSAM/AMD, Brooks AFB, TX

February 1972 to July 1975:

Major, Veterinary Corps, USAF. Chief, Radiation Biology Branch, Radiation Sciences Division, USAFSAM, AMD, Brooks AFB, TX.

Project Officer for ESP Project 1921E18, JSC, NASA, Houston, TX.

Division Recall Officer, Division Security Officer.

August 1970 to January 1972:

Post-doctoral student, AFIT, University of Arkansas Medical Center, Little Rock, AR.

MS DISSERTATION: The Effect of ⁶⁰Cobalt Gamma Radiation on the Metabolism of ⁶⁷Gallium by L5178Y Cells. Master's Thesis, 1972.

September 1968 to August 1970:

Captain, Veterinary Corps, USAF. Research Veterinarian, Aerobiology Division, Biological Warfare Center, Ft. Detrick, MD.

August 1965 to August 1968:

Assistant Professor and Director of the Animal Care Center, University of Louisville School of Medicine, Louisville, KY.

School of Medicine, Louisville, KY.

USAF Medical Liaison Officer.

July 1960 to August 1965:

Instructor, Assistant Professor, Dept. of Surgery, University of Colorado School of Medicine, Denver, CO.

Director, Animal Care Facilities and Personnel.

July 1959 to June 1960:

General practice of Veterinary Medicine, Flora, IL.

June 1958 to June 1959:

County Veterinarian, Clinton County, Carlyle, IL.

September 1953 to June 1958:

Student, School of Veterinary Medicine, University of California, Davis, CA.

CERTIFICATION:

Accredited Federal Veterinarian, 1958.

HONORS AND FELLOWSHIPS:

USAFSAM Civilian of the Year - Professional Category, 1983.

Air Force Systems Command Certificate for Management Excellence, 1982-1983.

Invited lecturer for NATO RSG-2 RFR Workshop, Farnborough, UK, April 1981; Bonn, FRG, 1984; AGARD lecture series, France, Portugal and Turkey, 1985.

Sustained Superior Performance Award, 1982, 1984.

Outstanding graduate, Air War College Seminar, Brooks AFB, TX, June 1980.

Outstanding Performance Rating, May 1980, 1982, 1984.

President, Garden Ridge-Bracken Lions Club, 1980-1981.

President, Alzafar Shrine Drum and Bugle Corps, 1983.

Mayor Pro-tem, Garden Ridge, TX, 1979-1982.

USAF representative, Interagency Task Force on the Biological Effects of Non-ionizing Electromagnetic Radiation, Washington, D.C., September 1979.

Invited lecturer, Third Medical Symposium, USAR 804th Hospital Center, Boston, MA, March 1979.

Air Force Commendation Medal, July 1975.

U.S. Army Certificate of Achievement, Ft. Detrick, MD, August 1970.

Project Officer Letter of Commendation for veterinary support during classified field trials, U.S. Army Biological Warfare Center, Ft. Detrick, MD, Sept-Oct 1968.

Phi Zeta National Veterinary Scholastic Honorary Society, University of California, Davis, CA, 1957.

Milton Philips Scholarship, University of California, Davis, CA, 1954.

Commanding Officer's Letter of Commendation, CTF95, USNAVFE, May, 1953.

Republic of Korea Presidential Unit Citation, 1952.

Salutorian, Vandalia Community High School, Vandalia, IL, 1944.

PROFESSIONAL SOCIETY MEMBERSHIPS:

American Veterinary Medical Association

Texas Branch, American Association for Laboratory Animal Science

National member, American Association for Laboratory Animal Science

Radiation Research Society

Bioelectromagnetics Society

Air Force Association

ACADEMIC APPOINTMENTS:

Instructor, Dept. of Surgery, University of Colorado School of Medicine, Denver, CO, 1 July 1960 - 30 June 1962.

Assistant Professor of Surgery, University of Colorado School of Medicine, Denver, CO, 1 July 1962 - 1 Sep 1965.

Director, Carolyn Verhoeff Animal Care Center, University of Louisville School of Medicine, 1965-1968.

Assistant Professor of Microbiology, University of Louisville School of Medicine, 1 Sep 1965 - 1 July 1969.

Associate lecturer in comparative anatomy, biology, and zoology, Indiana University Regional Campus, Jeffersonville, IN, 1 Sep 1966 - 30 Aug 1968.

COMMITTEES:

Animal Care Panel, National Ad Hoc Committee on Animal Care in Disasters and National Emergencies, 1962.

US Interagency Task Force on the Biological Effects of Non-Ionizing Electromagnetic Radiation, 1979.

Advisory Panel on Chronic Exposure to Nonionizing Radiation, U.S. Navy Aerospace Medical Laboratory, Pensacola, FL, Jan 1984.

Isotope and Radiation Safety Committee, USAFSAM, Brooks AFB, TX, 1976 - 1984.

USAFSAM Representative, USAF Radioisotope Committee, July 1984 to date.

CONSULTATION-NATIONAL/OTHER AGENCIES:

Lecturer, AGARD Aerospace Medical Panel Lecture Series No. 138 (NATO).

Research Study Group 2, NATO Panel VIII

Tri-Service Electromagnetic Radiation Panel

Reviewer, Bioelectromagnetics, Health Physics, Radiation Research, IEEE, Journal of Microwave Power.

LICENSES:

Veterinary Medicine and Surgery. Texas, Kentucky, Illinois, California, and Colorado.

PUBLICATIONS:

Krupp, J.H. Treatment of Physaloptera Infections in the Opossum, J.A.V.M.A., 1. 141:3, 1 August 1962, pp. 369-370.

Krupp, J.H. A Facility Designed to House Farm Animals Used in Medical Research, Laboratory Animal Care, Vol. 13:4, August 1963, pp. 512-516.

Krupp, J.H. A Review of the Opossum in Research--Husbandry, Experimental Techniques and Routine Health Measures, Laboratory Animal Care, Vol. 14:1, June, 1964, pp. 189-194.

Krupp, J.H. and Robinette, C.D. Biological Effects of Cobalt Radiation in Small Animals. Final Report, AF Contract 29-601-6219. Weapons Effects Laboratory, SWC, Kirtland AFB, NM. Dr. Thomas Mobley, Project Officer, 1965.

Krupp, J.H. Parasitic Diseases of the Opossum, Laboratory Animal Digest, Vol 2:4, October 1966, pp. 12-13.

Morgan, W.W., Morlan, S.L. Krupp, J.H., and Rosenkrantz, J.G. Prolonged Anesthesia in the Rabbit, Am. J. of Vet. Research, Vol. 27, pp. 1133-1134, 1966.

The USAFSAM Facility for Studies Utilizing Low Dose, Low Dose Rate Ionizing Radiation, SAM-TR-74-16, June 1974.

Krupp, J.H. The Influence of Sedative Drugs on Certain Hematologic Parameters in Rhesus Monkeys. Annual Meeting, Texas Branch, American Association for Laboratory Animal Science, Arlington, TX, June 1975.

Hunter, D.M., Bonney, C.J., Pickering, J.E., and Krupp, J.H. Retinal Changes Induced by Heavy Particles: A New Therapy Modality. SAM-TR-6-75, November 1975.

Krupp, J.H. Nine-Year Mortality Experience in Proton-Exposed Macaca mulatta. Radiation Research, Vol. 67, 1976, pp. 244-251.

Allen, S.J., Hurt, W.D., Krupp, J.H., Ratliff, J.A., Durney, C.W., and Johnson, C.C. Measurement of Radiofrequency Power Absorption in Monkeys, Monkey Phantoms and Human Phantoms Exposed to 10-50 MHz Fields. SAM-TR-76-5, February 1976.

Krupp, J.H. Radar and Migrating Birds. Aeromedical Review. SAM-TR-3-76, July 1976.

Krupp, J.H. Particulate Radiation-Related Neoplasia and Endometriosis in Rhesus monkeys. N.C.I. Workshop on Primates and Human Cancer, San Antonio, TX, April 1977.

Gralla, E.J., Krupp, J.H., Yochmowitz, M., and Mattson, J.L. Drug Inhibition of First-Stage Radioemesis. SAM-TR-77-12, June 1977.

Krupp, J.H. Thermal Response in Macaca mulatta Exposed to 15 and 20 MHz Radiofrequency Radiation. SAM-TR-77-16, September 1977.

Krupp, J.H. Long-Term Follow-Up of Macaca mulatta Exposed to High Power Levels of 15, 20, and 26 MHz Radiofrequency Radiation. International Symposium on the Biological Effects of Electromagnetic Waves, Airlie, VA, November 1977. Later published as SAM-TR-78-3, January 1978.

Krupp, J.H. The Relationship of Thermal Stress to Immune System Response in Mice Exposed to 2.6 GHz Radiofrequency Radiation. International Symposium on the Biological Effects of Electromagnetic Waves, Airlie, VA, November 1977.

Burr, J.G. and Krupp, J.H. Real-Time Measurement of Radiofrequency Energy Distribution in the Head of Macaca mulatta. International Symposium on the Biological Effects of Electromagnetic Waves, Seattle, WA, June 1979.

Krupp, J.H. Bioeffects of Non-Ionizing Radiation. Presented to 804th Hospital Center, USAR, Medical Symposium, Boston, MA, 1979.

Burr, J.G. and Krupp, J.H. Real-Time Measurement of Radiofrequency Energy Distribution in the Head of Macaca mulatta. Bioelectromagnetics, Vol. 1, No. 1, 1980, pp. 21-34.

Burr, J.G. and Krupp, J.H. Real-Time Temperature Measurements in the Macaca mulatta Exposed to 2.08 GHz Radiofrequency Radiation. 2nd Annual Meeting, Bioelectromagnetics Society, San Antonio, TX, September 1980.

Biologic Judgements in Support of PAVE PAWS Environmental Assessment (preliminary environmental assessment). Provided to ESD PAVE PAWS SPO, AFSC/SG, USAF/SG, USAF/PA, USAF/JA, 1980. (No authors cited.)

Burr, J.G., Krupp, J.H., Hammil, D.A., and Donahue, M.D. Evaluation of Simulated RFR Heating Procedures. SAM-TR-8030, September 1980.

Krupp, J.H. In vivo measurement of radiofrequency radiation absorption. In Proceedings of a Workshop on the Protection of Personnel Against Radiofrequency Electromagnetic Radiation. Mitchell, J.C., Ed. USAFSAM Aeromedical Review 3-81, 1981, pp. 155-169.

Krupp, J.H. Chronic low-level radiofrequency radiation exposure studies. Ibid. pp. 197-219.

Krupp, J.H. In vivo temperature measurements during whole-body exposure of Macaca mulatta to resonant and non-resonant frequencies. In Microwaves and Thermoregulation, E. Adair, Ed. Academic Press, New York, NY, 1983.

Krupp, J.H., Hanson, J.S., and Carpenter, R.H. Large animal model to assess radiofrequency effects on pregnancy. Abs. 4th Annual Meeting, Bioelectromagnetics Society, Los Angeles, CA, June 1982.

Krupp, J.H., Carpenter, R.H., and Hanson, J.S. Temperature measurements in pregnant ewes exposed to radiofrequency radiation. Abs., 5th Annual Meeting, Bioelectromagnetics Society, Boulder, CO, June 1983.

Krupp, J.H., L. Heynick. Critical review of selected topics on biological effects of radiofrequency radiation (RFR). NATO Radiofrequency Radiation Workshop, Werthhoven, Germany, September 1984

Krupp, J.H. The cumulative effects of long-term exposure to low levels of radiofrequency radiation (RFR). NATO Radiofrequency Radiation Workshop, Werthhoven, Germany, September 1984.

Krupp, J.H. The cumulative effects of long-term exposure to low levels of radiofrequency radiation (RFR). AGARD Aerospace Medical Panel No. 138, Rome Italy, Lisbon, Portugal, and Paris, France, April 1985.

Krupp, J.H., Hanson, J.S., and Carpenter, R.H. Temperature response of the ovine fetus and mother to whole body maternal hyperthermia from radiofrequency radiation exposure. Submitted to Radiation Research.

Krupp, J.H., Carpenter, R.H., Fanton, J., and Fisher, D. Circulatory system response of the ovine fetus to maternal whole-body hyperthermia from radiofrequency radiation. Abs submitted to Radiation Research Society Annual Meeting, Los Angeles, CA, May 1985.

U.S. AIR FORCE REGULATIONS

AFR 20-68	Inspector General (IG) Activities
AFR 23-15	Air Force Inspection and Safety Center (AFISC)
AFR 67-8	Radioactive Commodities in the DoD Supply System
AFR 71-4	Preparation of Hazardous Materials for Military Air Shipment (Chapter 12 - Radioactive Materials)
AFR 123-1	The Inspector System
AFR 127-4	Investigating and Reporting U.S. Air Force Mishaps (Chapter 10 - Nuclear Accident, Incident, and Deficiency (AID) Reporting)
AFR 160-132	Control of Radiological Health Hazards
AFR 161-8	Control and Recording Procedures Occupational Exposure to Ionizing Radiation
AFR 161-16	Control of Radioactive Material
AFR 161-17	USAF Occupational and Environmental Health Laboratory (OEHL) Services
AFR 169-3	Use of Human Subjects in Research, Development, Test, and Evaluation
AFR 169-6	Clinical Investigation and Human Test Subjects in the Medical Service
AFISC Regulation 23-1	Mission Directive
AFISC Regulation 120-1	Operations and Procedures



DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
BOLLING AFB, D.C. 20332

17 OCT 1984

REPLY TO: AFMBC: SGPA
ATTN OF: BROOKS AFB TEXAS 78235

SUBJECT: Implementation of the ALARA Concept in the Air Force Radiation Protection Program

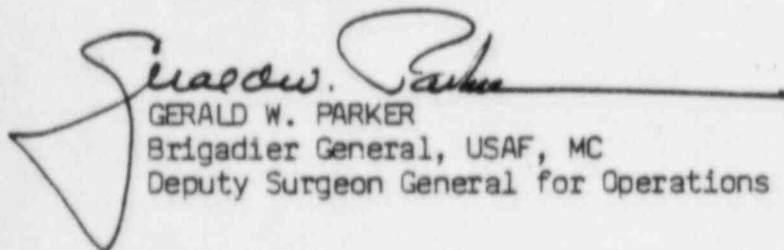
TO: ALMAJCOM-SOA/SG

(Bioenvironmental Engineering, Environmental Health and Radiation Protection Officers)

1. Department of Defense Instruction 6055.8, Occupational Radiation Protection Program, dated 3 January 1983, directs each of the Service Components to implement formal ALARA (As Low As Reasonably Achievable) programs. This policy letter provides implementing guidance (Atch 1) for the establishment of formal ALARA programs in the Air Force. This guidance applies to all Air Force operations involving the use of radioactive materials or ionizing radiation producing devices and is effective immediately. This guidance will remain in effect until publication of AFOSH Standard 161-15, Exposure to Ionizing Radiation.

2. Questions concerning this guidance should be referred to Lt Col John Burr, AUTOVON 240-2452.

FOR THE CHIEF OF STAFF


GERALD W. PARKER
Brigadier General, USAF, MC
Deputy Surgeon General for Operations

1 Atch
Guidance on Establishment of ALARA
Programs

ATCH 3

Guidance on Implementation of the ALARA Concepts
in the Air Force Radiation Protection Program

A. APPLICATION AND SCOPE.

1. Application. This guidance applies to all Air Force military and civilian personnel (including foreign nationals) working at Air Force facilities within the CONUS and overseas whose duties require they supervise work with sources of ionizing radiation or that they work in areas where exposure to ionizing radiation may occur. It also applies to persons not occupationally exposed (general public) to the extent that it addresses controls to protect the public from potential hazards from sources of ionizing radiation owned or operated by the Air Force. This guidance is not intended to apply to the exposure of patients by the Medical Service during diagnostic or therapeutic procedures, nor does it apply to exposures of personnel to radiation resulting from the employment of nuclear or thermo-nuclear weapons in combat. This guidance implements paragraph F.2. of Department of Defense Instruction (DODI) 6055.8, Occupational Radiation Protection Program, 3 Jan 83.

2. Scope. This guidance tells how to implement the ALARA (As Low As Reasonably Achievable) concept in the Air Force radiation protection program. Minimum requirements are established for conducting the radiation protection program and new quality assurance requirements are outlined to ensure that exposures are kept ALARA.

B. POLICY. It is Air Force policy that all exposures to ionizing radiation be ALARA. There should be no exposure to ionizing radiation without an expected benefit and the dose received should be the lowest possible, consistent with the state of technology, costs, and operational requirements. Radiation exposures should be kept as far below existing standards as possible.

C. DEFINITIONS.

1. ALARA Concept. The ALARA (As Low As Reasonably Achievable) concept is defined as that set of management and administrative actions taken to reduce personnel radiation dose to as low a level as possible consistent with existing technology, costs, and operational requirements. The ALARA concept was developed in response to scientific evidence that suggests that no level of radiation exposure is totally risk free (linear, no threshold dose-effect relationship). While the established maximum permissible doses are conservative and offer a low risk of adverse health effects compared to other hazards of life and occupation, it is prudent that every effort be made to reduce exposures to the lowest level that is reasonably achievable and thereby lower the health risk associated with that exposure.

2. Radiation Protection Officer (RPO). An individual designated by the commander to manage radiation protection programs. The RPO provides

consultation and advice on the hazards associated with radiation and effectiveness of measures to control these hazards. This individual shall be the most technically qualified person available and should have specific education, training, and professional experience to assure a capability commensurate with the assignment. The term "Radiation Protection Officer" is a functional title and is not intended to denote a commissioned status or a job classification within the Air Force. There are four distinct categories of RPO in the Air Force:

a. Unit RPO. An individual designated by the unit commander to act as the single focal point for the unit on radiation protection matters. Each operational unit which operates radiation producing devices or uses radioactive materials will appoint a unit RPO. This individual coordinates radiation survey or hazard evaluation activities with the base RPO or Permit or License RPO; assists in investigations of suspected or actual over-exposures; and performs those radiation protection duties at the unit level which are commensurate with their training and experience.

b. Permit or License RPO. An individual designated by the unit commander and approved by the USAF Radioisotope Committee or Nuclear Regulatory Commission (NRC) to manage the radiation protection aspects associated with the use of radioactive materials for which a specific USAF Radioactive Material Permit or an NRC License has been issued.

c. Medical Facility RPO. An individual designated by the medical facility commander to manage the medical facility's radiation protection program. This individual will usually be a health physicist or medical physicist who has specialized training and experience in medical radiation protection programs. In the absence of a physicist, the base bioenvironmental engineer may be designated as RPO provided no nuclear medicine services exist. In such circumstances, a physician will be identified as RPO for nuclear medicine.

d. Base RPO. An individual designated by the installation commander to manage the base radiation protection program. This individual will usually be the base bioenvironmental engineer or health physicist, if assigned, but may be a Bioenvironmental Engineering Technician (AFSC 907X0) with special experience identifier SEI 492. This individual conducts the base-wide radiation protection program which includes surveillance of all radioactive materials and radiation producing devices. The base RPO coordinates with and assists the unit, permit or license and medical facility RPOs as necessary to ensure a comprehensive, coordinated radiation protection program.

D. REQUIREMENTS.

1. Overview:

a. The ALARA concept incorporates all of the current radiation protection program requirements of AFR 161-8, Control and Recording

Procedures-Occupational Exposure to Ionizing Radiation, AFR 160-132, Control of Radiological Health Hazards, AFR 161-28, Personnel Dosimetry Program and the USAF Master Radiation Exposure Registry, AFR 161-16, Radioactive Material Licenses and Permits, and the OO-110N series of technical orders as well as certain additional management concepts and controls specifically designed to maintain exposures to personnel ALARA. It includes the philosophy found in current national and international radiation protection reports and consensus standards.

b. The requirements contained herein apply to each functional area where radioactive materials or radiation producing devices are used and to each respective RPO. Whenever the generic term of RPO is used in this guidance, it refers to any or all of the categories of RPO defined above. It is the intent of this guidance that each RPO perform the required tasks for their specific area of responsibility. The base RPO should coordinate with the respective functional area RPOs to ensure a comprehensive, coordinated base-wide radiation protection program.

2. Minimum Radiation Protection Program Requirements:

a. The RPO will develop a formal radiation protection program which includes specific plans and procedures for keeping radiation exposures ALARA. Unique local radiation protection program requirements should be documented using local regulations and operating instructions. Functional areas which should be addressed include: personnel dosimetry program, performance of radiation surveys, leak testing procedures, inventory procedures, receiving and shipping of radioactive materials, permit or license procedures, quality assurance procedures, ALARA program, review of plans for new construction and modification of facilities, training, etc.

b. All plans for modification of facilities or design of new facilities which involve the use of radioactive material or radiation producing devices must be reviewed by the RPO to ensure that ALARA is considered. Formal procedures must be established to ensure these reviews are conducted. The USAF Occupational and Environmental Health Laboratory, Radiation Services Division (USAF OEHL/RZ), should be contacted for design reviews which are beyond the technical capabilities of the local RPOs. Design reviews in USAFE should be referred to USAF Regional Medical Center/SGB, APO New York 09220.

c. The RPO will conduct routine surveillance of all areas where radioactive materials or radiation producing devices are used or stored. The specific survey and monitoring requirements of USAF Radioactive Material Permits and Nuclear Regulatory Commission (NRC) licenses will be complied with where applicable. Other sources of radiation exposure will be surveyed, monitored, and documented in accordance with existing Air Force directives or permit or license conditions, but will be performed not less than annually. For those areas where specific Air Force or NRC documentation requirements do not exist, recommend that AF Form 2758, Industrial Hygiene Survey Data Sheet--General (AFR 161-17, Standardized Occupational Health Program) be

used. Radiation protection survey documentation will be maintained locally by the respective RPO with a copy of pertinent documents forwarded to the base RPO for inclusion in the facility case file.

d. The RPO (normally the base RPO) will conduct personnel dosimetry and bioassay programs for personnel who are likely to exceed 10 percent of the occupational exposure guides stated in AFR 161-8. The personnel dosimetry program will be conducted in accordance with AFR 161-28 and the most recent USAF Personnel Dosimetry Program Instruction Manual published by the USAF Occupational and Environmental Health Laboratory (USAF OEHL). Copies of personnel dosimetry results will be distributed to the respective functional area RPOs for review and appropriate action.

e. The RPO, with the assistance of the Environmental Health Section (EHS), will conduct radiation safety training for all individuals working in or frequenting any portion of an area where radioactive material or radiation producing devices are used. Initial training will be conducted before, or as soon as possible after, assignment to work areas involving radiation exposure. Annual refresher training will be conducted to reemphasize and reinforce training objectives. The level of training should be tailored to the specific category of personnel and the hazard presented. Documentation of training will be maintained locally by the respective functional area RPO and a copy will be forwarded to the EHS for inclusion in Tab F of the facility case file (AF Form 2767, Occupational Health Training and Protective Equipment Fit Testing). Such training shall, as a minimum, include instruction in the following areas:

- (1) Risk from radiation exposure (Appendix A).
- (2) Health risks to children of women who are occupationally exposed to radiation during pregnancy (Appendix B).
- (3) Maximum permissible dose limits.
- (4) Protective measures required (tailored to specific radiation work).
- (5) ALARA philosophy and practice.

Note: Slide-on-sound training aid available through Audiovisual Services, 600296DF, Ionizing Radiation.

f. The RPO will establish procedures to ensure that all new requests for use of radioactive materials or radiation producing devices are reviewed for consistency with the ALARA concept and that personnel involved with the use of these materials and devices are qualified (by virtue of training, education, experience, etc.) to use them.

3. Minimum Quality Assurance Requirements:

a. The RPO will establish personnel dosimetry action levels which are utilized as a guide in determining surveillance and control requirements. Action levels will include:

(1) Overexposure Action Level. A personnel dosimetry result which exceeds the maximum permissible dose. Formal investigation and documentation of the incident is required IAW AFR 161-28.

(2) Abnormal Exposure Action Level. Personnel dosimetry result which, if continued on an annual basis, would result in an overexposure. This equates to 417 mrem on a monthly badge or 1250 mrem on a quarterly badge. A formal investigation to determine the cause of the exposure must be made IAW AFR 161-28.

(3) Investigation Action Level. Personnel dosimetry result above which, action should be taken to determine the reason for the exposure. The investigation level is locally determined and is usually set well below the maximum permissible dose and the abnormal exposure action level. It is usually set near the average exposure level for the particular occupational category of worker. Table 5 of Appendix A shows the average annual exposure levels by occupational category as recorded in the USAF Master Radiation Exposure Registry for 1982 which can serve as guidelines. Personnel dosimetry results above the investigation action level should be investigated and the results of investigation reported to the local radiation safety committee and Aerospace Medicine Council.

(4) Pregnant Female Action Level. Personnel dosimetry result which, if continued for the term of pregnancy, would exceed the 500 mrem exposure limit for the fetus (reference HQ AFMSC/SGPA policy letters, Occupational Exposure of Fertile Women to Ionizing Radiation, 4 August 1983 and 21 Nov 1983). This equates to approximately 50 mrem on a monthly badge. Personnel dosimetry results above this level must be investigated and the results of investigation reported to the local radiation safety committee and Aerospace Medicine Council.

b. Personnel dosimetry results for pregnant female workers will be reviewed by the RPO monthly and documentation maintained on actions taken to ensure that the total dose to the fetus does not exceed 500 mrem during the term of pregnancy. Positive efforts should be made to limit the dose to no more than 50 mrem per month.

c. Quarterly radiation protection program reviews will be accomplished by the RPO and documented. These reviews will be presented to the radiation safety committee, if one exists, and to the Aerospace Medicine Council. The reviews will include:

(1) A review of all personnel dosimetry results for the previous quarter to ensure that adverse trends are noted and that all personnel dosimetry results which exceed action levels are acted upon.

(2) A review of all radiation survey results for the previous quarter to ensure that all required surveys have been performed and documented properly, and that corrective action, if necessary, has been accomplished.

d. Annual radiation protection program reviews will be accomplished by the RPO and documented. These reviews will be presented to the radiation safety committee, if one exists, and to the Aerospace Medicine Council. The reviews will include:

(1) A review of all local implementing directives (regulations and operating instructions) to ensure they are current.

(2) A review of all radiation survey results for the past year to ensure that all required surveys have been performed and documented properly and that corrective action, if necessary, has been accomplished.

(3) A review of all personnel dosimetry results for the past year to ensure that adverse trends are noted and appropriate action has been taken on results that exceed standards or action levels.

(4) An update of the radiation source and radioactive material inventory.

(5) A review of all USAF Radioactive Material Permits and NRC licenses to ensure currency and compliance with requirements.

E. REFERENCES.

1. U.S. Nuclear Regulatory Commission (NRC) Regulatory Guide 8.10, "Operating Philosophy for Maintaining Occupational Radiation Exposures As Low As Reasonably Achievable."

2. U.S. Nuclear Regulatory Commission (NRC) Regulatory Guide 8.18, "Information Relevant to Ensuring That Occupational Radiation Exposures at Medical Institutions Will Be As Low As Reasonably Achievable."

3. "A Guide to Reducing Radiation Exposure To As Low As Reasonably Achievable (ALARA)," Department of Energy Report DOE/EV/1830-T5, Apr 1984.

2 Appendices

A. Instruction Concerning Risks From Occupational Radiation Exposure

B. Possible Health Risks to Children of Women Who Are Exposed to Radiation During Pregnancy

TABLE 5

Air Force Occupational Exposure Data

<u>Occupational Series</u>	<u>Average Whole-Body Badge Dose (millirems/year)</u>	<u>Average Collar Badge Dose (millirems/year)</u>
6 Medical Maintenance	10	17
10 X-ray Technician	17	47
11 Physician: Radiologist	28	162
12 Physician: Urologist	71	43
13 Physician: Orthopedist	17	1
14 Physician: Anesthesiologist	8	16
15 Physician: Other	15	125
16 Nurse & Nurse Anesthetist	6	22
17 Technician: Other	8	26
18 Student (Med X-ray)	1	47
20 Dental Technician	6	3
21 Dentist: General	6	0
22 Dentist: Oral Surgeon	11	-
23 Student: (Dental & Veterinary)	3	-
26 Veterinarian	9	17
27 Veterinary Technician	9	10
29 Military Working Dog Handlers	8	0
30 Physician: Pathologist	-	-
31 Physician: Radiologist	24	419
32 Physician: Other	4	2

<u>Occupational Series</u>	<u>Average Whole- Body Badge Dose (millirems/year)</u>	<u>Average Collar Badge Dose (millirems/year)</u>
33 Technician: X-ray & Isotopes	68	60
34 Technician: Laboratory	17	-
35 Technician: Other	13	21
36 Nurse (all categories)	6	139
37 Technician: Radioisotope Lab	73	43
40 Co-60 Instrument Calibration (PME Lab)	20	-
41 Radium Dial Painting	-	-
42 Industrial Radiography (Isotopes)	10	-
43 Cs-137 Instrument Calibration (PME Lab)	5	0
45 Electron Tubes	-	-
46 Mag-thorium Operations	-	-
47 Isotopes Other than Above (Specify)	8	-
48 Training Sources	0	-
50 Portable Field Units	10	20
52 Super-Voltage Units	11	-
55 Postal Inspection Units	4	-
56 OSI Inspection Units	9	3
57 Baggage Inspection	6	-
58 X-ray Diffraction	11	-
60 Radar Operators	-	-
61 Radar Maintenance Personnel	16	20
62 Radar Admin/Supply Personnel	0	-
66 All Airborne Radar Personnel	-	-

<u>Occupational Series</u>	<u>Average Whole- Body Badge Dose (millirems/year)</u>	<u>Average Collar Badge Dose (millirems/year)</u>
67 BMEWS Personnel	14	-
68 Space-Track Facility Personnel	-	-
70 Weapons Maintenance	19	-
71 Weapons Inspections	21	-
72 Weapons Personnel	11	-
73 High Altitude Sampling	6	-
74 Kr-85 (Batteries)	20	-
75 Fission-Product Contamination	16	-
76 Electron Microscope	0	-
80 Reactor Operators	-	-
81 Nuclear Engineers	61	-
82 SNAP Projects	-	-
83 Nuclear-Powered Missiles	-	-
85 Waste Processing	-	-
87 Scientists	5	0
88 Engineers	7	-
89 Physicists	6	-
90 AF Contractors	11	-
91 Radioactive Waste Disposal	-	-
92 Maintenance Personnel	5	0
93 Administrative & Supply Personnel	5	-
94 Disaster Control	10	16
95 EOD Personnel	5	0

<u>Occupational Series</u>	<u>Average Whole- Body Badge Dose (millirems/year)</u>	<u>Average Collar Badge Dose (millirems/year)</u>
96 Health Physics & Environmental Health Technicians	8	11
97 Health Physicist & Bioenvironmental Engineer	6	17
98 Visitors	3	22
99 None of the Others	7	0

*Note - Average badge results in this table do not include administratively assessed doses due to lost or missing badges.