GENERAL ATOMICS

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VIA OVERNIGHT DELIVERY SERVICE

Document Control Desk
ATTN: Mr. Alexander Adams, Jr., Senior Project Manager
Non-Power Reactors & Decommissioning Projects Directorate
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: **Docket No. 50-89, Facility License R-38, and**
Docket No. 50-163, Facility License R-67;
Submittal of General Atomics' TRIGA® Mark I and Mark F Annual Reports for Calendar Year 2000
(3 Copies each)

Dear Mr. Adams:

Enclosed are the annual reports required by the applicable Technical Specifications of General Atomics' (GA's) Mark I (License R-38) and Mark F (License R-67) TRIGA® research reactors. These reports cover operations for the calendar year 2000. The sections of these reports are numbered consistent with the items of information referred to in Section 7.6d of the Technical Specifications for the Mark I TRIGA® reactor and in 8.6d of the Technical Specifications for the Mark F TRIGA reactor.

Should you desire additional information concerning the above, please contact me at (858) 455-2823, or Mr. John Greenwood at (858) 455-4526.

Very truly yours,

Keith E. Asmussen

Dr. Keith E. Asmussen, Director
Licensing, Safety and Nuclear Compliance

Enclosure: "TRIGA® Mark I Reactor / Annual Report / Calendar Year 2000," dated April 2001 (3 Copies)
"TRIGA® Mark F Reactor / Annual Report / Calendar Year 2000," dated April 2001 (3 Copies)

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TRIGA® Mark I Reactor

ANNUAL REPORT

CALENDAR YEAR 2000

prepared to satisfy the requirements of
U.S. Nuclear Regulatory Commission
Facility License R-38
Docket No. 50-89

APRIL 2001

TRIGA REACTORS FACILITY
TRIGA Mark I Reactor
ANNUAL REPORT
Calendar Year 2000

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Section **Page**

Introduction

This report documents operation of the General Atomics (GA) TRIGA® Mark I Non-Power Reactor for the period January 1, 2000 through December 31, 2000. The TRIGA Mark I Reactor, possessed by GA at its San Diego, California facilities, was not operated for the duration of the reporting period. The Reactor is possessed by GA under License No. R-38 (Amendment No. 36) granted by the U.S. Nuclear Regulatory Commission (Docket No. 50-89).

This report is being prepared and submitted to satisfy the requirements of Section 7.6(d) of the R-38 Technical Specifications, as amended. This report is presented in six parts, consistent with the information required by the applicable Technical Specifications.

1. Summary of Facility Activities

1.1 *Decommissioning Activities*

During Calendar Year 2000, the TRIGA Mark I has been in Decommissioning status. The following represents a summary of activities during this reporting period:

1.1.1 Radiological Survey

A radiological survey, to characterize the extent and nature of contamination/activation in the TRIGA Mark I Facility, has been completed.

1.1.2 Reactor Facility Outside of Pool

- Contaminated drain lines from Rms. 21/103 and 21/104 have been removed and dispositioned.
- All Facility heaters and air-conditioning units have been removed and dispositioned.
- All unnecessary items previously mounted on Facility walls have been removed and dispositioned.
- Radiological survey of the walls in Rms. 21/102, 105, and 106 indicated the presence of low levels of contamination in paint layers, probably a consequence of a fire that occurred in 1975. Mechanical removal of paint layers from the walls is in progress, with only a few walls in Rm. 21/102 needing to be completed.
- The pool water demineralizer and cooling systems have been removed and dispositioned.
- The detectors for the Criticality Warning System (CWS) and Radiation Area Monitors (RAMs) have been replaced in-kind, and relocated to the outside wall of Rm. 21/108.
- The five (5) Mark I below-ground Fuel Storage Wells were removed and dispositioned.
- The below-ground Subcritical Pit was exposed, cleared of abandoned equipment, then surveyed and found to be radiologically clean.
- The Mark I steel Storage Shed was surveyed, dismantled, removed, and dispositioned.

1.1.3 Reactor Components in Pool

- Survey, removal, and waste disposition of hardware items from inside the Mark I Reactor pool has been completed.

- The aluminum pool Liner has been removed, sectioned, and dispositioned, as was the gravel from the annulus between the pool Liner and the concrete Biological Shield. Analysis of coring samples taken through the concrete Biological Shield structure and the backing soil behind the concrete liner indicate the presence of low levels of neutron activation products in the bulk concrete and soil. In all probability, a portion of the concrete Biological Shield structure, and possibly significant amounts of soil, will have to be removed to complete remediation of the Mark I Reactor.

1.1.4 Reactor Pool Water

The Mark I pool water has been pumped out, containerized, analyzed, found to be radiologically clean, and subsequently discharged for disposition.

1.1.5 Radiologically-Controlled Yard (Cooling Tower/Storage)

All contaminated soil and asphalt have been removed from the Cooling Tower/StorageYard. A post-decontamination radiological survey is being conducted.

1.2 *Facility Status*

- Requalification tests were given to the Senior Reactor Operators (SROs) as part of their licensing requirements. All SROs passed.

- All TRIGA Mark I fuel remains situated in the Fuel Storage Canal portion of the Mark F Reactor pool, in Rm. 21/107.

- The NRC inspected the facility on March 13 - 16, 2000 and on August 1 - 3, 2000. No findings were reported.

- The below-ground Makeup Water Tank, associated piping, and various contaminated drain lines remain in the Mark I Controlled Yard.

1.3 *Decommissioning Schedule*

All major task items in the Decommissioning Plan schedule have been completed except for removal of the concrete Biological Shield, Makeup Water Tank and associated piping, removal of various contaminated drain lines,

remediation of walls in Rm. 21/102, and remediation of the surface of the Mark I Controlled Yard. These tasks have been temporarily deferred to allow work to start on the Mark F decommissioning, utilizing existing staff.

1.4 *Radioactive Material Shipments*

Listed below are the radioactive waste shipments, associated with the TRIGA Mark I Reactor decommissioning activities, made from General Atomics, San Diego, CA, to the U.S. Department of Energy Nevada Test Site (NTS), Mercury, NV, during the CY2000 reporting period. Each Low-Specific Activity Radioactive Waste Box (LSA Box) mentioned below represents a radioactive waste disposal volume of 123.2 ft^3.

- Twenty-two (22) LSA boxes (containing contaminated/activated equipment and materials) were shipped in February.
- Nine (9) LSA boxes were shipped in March.
- Five (5) LSA boxes were shipped in April.
- Five (5) LSA boxes were shipped in May.
- One (1) LSA box and five (5) Fuel Storage Wells were shipped in June.
- Nine (9) LSA boxes were shipped in July.
- Twelve (12) LSA boxes were shipped in August.
- One (1) LSA box was shipped in September.
- Two (2) LSA boxes were shipped in October.
- Forty-eight (48) LSA boxes (containing contaminated soil/asphalt from the Controlled Yard) were shipped in November.
- Four (4) LSA boxes (containing contaminated soil/asphalt from the Controlled Yard) were shipped in December.

A total volume of 14,602 ft^3 of radioactive waste was packaged, shipped, and dispositioned, as a result of TRIGA Mark I Reactor decommissioning activities, during the reporting period.

2. Maintenance Operations

All TRIGA Mark I maintenance activities, performed during the reporting period, generally fall into three categories: (i) routine preventive maintenance, (ii) routine calibration activities, and (iii) activities associated with replacement of older

components and systems due to age. All maintenance activities are recorded in the TRIGA Reactors Decommissioning Logbook. Facility Maintenance Checklists are completed on a regular schedule, at weekly, quarterly, and annual frequencies. All maintenance operations performed on the TRIGA Mark I were minor in nature. There were no major maintenance operations performed during the reporting period.

3. 10CFR50.59 Facility Modifications and Special Experiments

There were no applications for Facility Modifications to the TRIGA Mark I, under the provisions of 10CFR50.59, submitted during the CY2000 reporting period.

There were no new Special Experiments submitted for approval for the R-38 facility during CY2000.

4. Radioactive Effluents Released to the Environs

During CY2000, 0.00 millicuries of Argon-41 were discharged from the TRIGA Mark I Reactor facility stack to the atmosphere.

5. Environmental Surveys

During CY2000, the Environmental Monitoring Program (EMP) for the TRIGA Reactors Facility remained essentially unchanged from the prior year. The applicable EMP includes the following monitoring equipment and actions:

- Five (5) emergency air samplers, situated on the Facility roof and around the TRIGA Reactor Facility perimeter.
- Ten (10) environmental air samplers, situated adjacent to, and near the GA site perimeter, in accordance with the GA Material License (SNM-696).
- Daily liquid effluent monitoring from the GA Main Sewerage Outfall Pump House, for gross alpha and beta radioactivity concentrations.
- Annual soil and water sampling at ten (10) stations on the GA site, including stations around the perimeter of the TRIGA Reactor Facility.
- External radiation monitoring of the TRIGA Reactor Facility using five (5) passive area dosimeters, as well as radiation meter surveys conducted periodically.
- A Continuous Air Monitor (CAM), situated in the Mark I Reactor Room (Rm. 21/102) to continuously sample room air for airborne radioactivity. CAM air filters are collected each week and analyzed for radioactivity.

6. Summary of Radiation Exposures and Radiological Surveys

The following data summarizes measured personnel occupational radiation

exposures and radiological surveys of the TRIGA Reactor Facility during CY2000. Personnel who are listed on the TRIGA Reactor Facility Work Authorization (WA #3184) and specific Radiation Work Permits (RWPs) were monitored for radiation exposure; these individuals included twelve (12) General Atomics employees and three (3) sub-contractor employees.

6.1 *General Atomics Staff Whole Body Exposures*[1]

Number of individuals monitored:	12
High Exposure:	0.175 Rem
Low Exposure:	0.000 Rem
Average Exposure:	0.050 Rem

6.2 *Non General Atomics Staff Whole Body Exposures*[2]

Number of individuals monitored:	3
High Exposure:	0.180 Rem
Low Exposure:	0.000 Rem
Average Exposure:	0.060 Rem

6.3 *Routine Wipe Surveys of Mark I Reactor Facility*

High Wipe:	7.4 β dpm/100 cm^2
Low Wipe:	< 1.0 β dpm/100 cm^2
Average Wipe:	< 1.0 β dpm/100 cm^2

6.4 *Routine Radiation Measurements of Mark I Reactor Facility*

High Measurement:	0.2 mRem/hr @ 1 foot
Low Measurement:	<0.2 mRem/hr @ 1 foot
Average Level:	<0.2 mRem/hr @ 1 foot

(1) Includes reactor facility staff and facility support staff authorized to work at the TRIGA Reactor Facility. These personnel may also work routinely at other GA radiation facilities; therefore, this dose represents *cumulative* exposure at all GA facilities.

(2) Includes non-GA sub-contractor personnel who were granted periodic access to the TRIGA Reactor Facility for the performance of work. These personnel may also work routinely at other GA radiation facilities; therefore, this dose represents *cumulative* exposure at all GA facilities.

TRIGA® Mark F Reactor

ANNUAL REPORT

CALENDAR YEAR 2000

prepared to satisfy the requirements of
U.S. Nuclear Regulatory Commission
Facility License R-67
Docket No. 50-163

APRIL 2001

TRIGA REACTORS FACILITY
TRIGA Mark F Reactor
ANNUAL REPORT
Calendar Year 2000

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Introduction

This report documents operation of the General Atomics (GA) TRIGA® Mark F Nonpower Reactor for the period January 1, 2000 through December 31, 2000. The TRIGA Mark F Reactor, possessed by GA at its San Diego, California facilities, was not operated for the duration of the reporting period. The Reactor is possessed by GA under License No. R-67 (Amendment No. 45) granted by the U.S. Nuclear Regulatory Commission (Docket No. 50-163).

This report is being prepared and submitted to satisfy the requirements of Section 8.6(d) of the R-67 Technical Specifications, as amended. This report is presented in six parts, consistent with the information required by the applicable Technical Specifications.

TRIGA is a registered trademark of General Atomics

1. Summary of Facility Activities

1.1 *Decommissioning Activities*

During Calendar Year 2000, the TRIGA Mark F has been in Decommissioning status. The following represents a summary of activities during this reporting period:

1.1.1 Radiological Survey

A radiological survey, to characterize the extent and nature of contamination/activation in the TRIGA Mark F facility, has been completed.

1.1.2 Reactor Facility Components Outside of Pool

- All hardware and equipment items from Rm. M2 (Mezzanine above Rm. 21/110) have been removed and dispositioned.
- Unnecessary equipment from the Mark F Reactor Room (Rm. 21/107) has been removed and dispositioned.
- Unnecessary equipment from the Mark F Control Room (Rm. 21/108) has been removed and dispositioned.

The only items remaining above the Mark F pool in Rm. 21/107 are the two Radioactive Materials Storage Caves, and tools and hardware necessary for the maintenance of the facility and the shipment of fuel.

1.1.3 Reactor Facility Components in Pool

- Several in-pool neutron-irradiation Beam Tubes were surveyed, removed, sectioned, and dispositioned as radioactive waste.
- All in-pool power channel neutron and gamma detectors, with associated hardware, were surveyed, removed, sectioned, and dispositioned as radioactive waste.

Items remaining in the Mark F Reactor pool are the Reactor Shroud Assembly (including empty core support hardware), fuel handling tools, and dummy fuel elements and their associated storage racks necessary for the continuing qualification of Senior Reactor Operators (SRO). In addition, both the TRIGA Mark F and Mark I fuel elements are stored in the Fuel Storage Canal portion of the Mark F Reactor pool.

1.2 *Facility Status*

- Requalification tests were given to the Senior Reactor Operators (SROs)

as part of their licensing requirements. All SROs passed.

- o All TRIGA Mark F and Mark I fuel remains in the Fuel Storage Canal.
- o The NRC inspected the facility on March 13 - 16, 2000 and on August 1 - 3, 2000. No findings were reported.

1.3 *Decommissioning Schedule*

Cleanout, dismantlement, and disposition of materials associated with the two Storage Caves in Rm. 21/107 are scheduled to be completed by April, 2001. The survey, removal, sectioning, and disposition of the Mark F Reactor Shroud and Core Support Assembly are also scheduled to be completed by May, 2001. Below-ground cooling pipes, previously serving the Mark F Reactor pool, are scheduled to be surveyed, removed, and dispositioned during remediation of the TRIGA Mark I Controlled Yard, currently underway. The performance of all other remaining Mark F decommissioning tasks are contingent upon the removal and off-site shipment of the of irradiated TRIGA fuel, currently stored in the Facility.

1.4 *Radioactive Material Shipments*

No shipments of radioactive waste resulting from Mark F decommissioning activities were made during the reporting period; however, several Low-Specific Activity (LSA) radioactive waste boxes have been loaded, characterized and staged for shipment to the Nevada Test Site in early CY2001.

2. Maintenance Operations

All TRIGA Mark F maintenance activities, performed during the reporting period, generally fall into three categories: (i) routine preventive maintenance, (ii) routine calibration activities, and (iii) activities associated with replacement of older components and systems due to age. All maintenance activities are recorded in the TRIGA Reactors Decommissioning Logbook. Facility Maintenance Checklists are completed on a regular schedule, at weekly, quarterly, and annual frequencies. All maintenance operations performed on the TRIGA Mark F were minor in nature. There were no major maintenance operations performed during the reporting period.

3. 10CFR50.59 Facility Modifications and Special Experiments

There was one (1) new application for Facility Modification under the provisions of 10CFR50.59 that was approved for the R-67 facility during the CY2000 reporting period. This approved facility modification concerned specific physical security improvements for the Mark F Reactor Pool Fuel Storage Canal. This application for Facility Modification was reviewed and approved, and the modifications were implemented, in May, 2000.

There were no Special Experiments submitted for the R-67 facility during CY2000.

4. Radioactive Effluents Released to the Environs

During CY2000, 0.00 millicuries of Argon-41 were discharged from the TRIGA Mark F Reactor facility stack to the atmosphere.

5. Environmental Surveys

During CY2000, the Environmental Monitoring Program (EMP) for the TRIGA Reactors Facility remained essentially unchanged from the prior year. The applicable EMP includes the following monitoring equipment and actions:

- Five (5) emergency air samplers, situated on the Facility roof and around the TRIGA Reactor Facility perimeter.
- Ten (10) environmental air samplers, situated adjacent to, and near the GA site perimeter, in accordance with the GA Special Nuclear Material License (SNM-696).
- Daily liquid effluent monitoring from the GA Main Sewerage Outfall Pump House, for gross alpha and beta radioactivity concentrations.
- Annual soil and water sampling at ten (10) stations on the GA site, including stations around the perimeter of the TRIGA Reactors Facility.
- External radiation monitoring of the TRIGA Reactor Facility using five (5) passive area dosimeters, as well as radiation meter surveys conducted periodically.
- A Continuous Air Monitor (CAM), situated in the Mark F Reactor Room (Rm. 21/107), to continuously sample room air for airborne radioactivity. CAM air filters are collected each week and analyzed for radioactivity.

6. Summary of Radiation Exposures and Radiological Surveys

The following data summarizes measured personnel occupational radiation exposures and radiological surveys of the TRIGA Reactors Facility during CY 2000. Personnel who are listed on the TRIGA Reactors Facility Work Authorization (WA #3184) and specific Radiological Work Permits (RWPs) were monitored for radiation exposure; these individuals included twelve (12) General Atomics employees and three (3) sub-contractor employees.

6.1 *General Atomics Staff Whole Body Exposures*[1]

Number of individuals monitored:	12
High Exposure:	0.175 Rem
Low Exposure:	0.000 Rem
Average Exposure:	0.050 Rem

6.2 *Non General Atomics Staff Whole Body Exposures*[2]

Number of individuals monitored:	3
High Exposure:	0.180 Rem
Low Exposure:	0.000 Rem
Average Exposure:	0.060 Rem

6.3 *Routine Wipe Surveys of Mark F Reactor Facility*

High Wipe:	108.7 β dpm/100 cm^2
Low Wipe:	< 1.0 β dpm/100 cm^2
Average Wipe:	< 2.5 β dpm/100 cm^2

6.4 *Routine Radiation Measurements of Mark F Reactor Facility*

High Measurement:	220.0 mRem/hr @ 1 foot
Low Measurement:	<0.2 mRem/hr @ 1 foot
Average Level:	5.2 mRem/hr @ 1 foot

(1) Includes reactor facility staff and facility support staff authorized to work at the TRIGA Reactor Facility. These personnel may also work routinely at other GA radiation facilities; therefore, this dose represents *cumulative* exposure at all GA facilities.

(2) Includes non-GA personnel who were granted periodic access to the facility for the performance of work. These personnel may also work routinely at other GA radiation facilities; therefore, this dose represents *cumulative* exposure at all GA facilities.