TABLE 3.1

REQUIRED SAFETY CHANNELS

Channel	Mode 1 Setpoint	Mode 2 Setpoint	Minimum No. Required	Function
Start up (cps)	2	2	1(a)	Minimum count rate permissive rod withdrawal interlock
Period trip (sec +)	≥10	≥20	2(c)	Scram
Power trip (MW)	1.25	5.5	2(c)	Scram
Low D_2O flow (gpm)	1000	1625	2(b)(c)	Scram
High D_2O temperature (^0F)	143	139	2(c)	Scram
Low D_2O level (inches below Overflow)	≤12	≤12	2(c)	Isolate reactor vessel Scram Initiate ECCS
No D_2O Overflow	-	-	1	Scram
Manual scram	-	-	1	Scram
Reflector drain	-	-	1	Backup Scram
Containment doors open	-	-	1 per airlock	Scram
Reactor isolation valves closed	-	-	2(c) per valve	Scram

(a)Required during startup and for operation with less than 1 decade overlap between the startup channel and the pico-ammeter channel.

(b)Not required for natural convection operation.

(c)One of the twelve required safety channel may be bypassed for a period not to exceed 8 hours for test, repair, or calibration.

The primary coolant flow rate scrams and provides redundant channels to assure, when the reactor is at power levels which require forced flow cooling, that an automatic shutdown of the reactor will occur to prevent exceeding a safety limit if sufficient flow is not maintained.

Two redundant D_2O temperature scrams provide automatic protection against exceeding the core inlet temperature safety limit in the event of a failure of the secondary coolant system to adequately dissipate the heat removed from the primary coolant system.

A loss-of-coolant accident is detected by two low D_2O level scrams which also isolate the reactor vessel to prevent coolant loss through the primary coolant piping and initiate the emergency core coolant system.

In addition to the automatic protective systems, the manual scram and the reflector drain provide backup methods to shut the reactor down by operator action. The reflector drain provides a shutdown capability of 2.75% $\Delta k/k$.

The containment doors open scram assures that the reactor is not made critical with both doors open on an airlock.

Two switches which sense the position of each of the reactor isolation valves initiate a reactor scram upon closure of these valves to prevent damage to the cladding due to a loss of coolant flow.

The pico ammeter channel provides a narrow range indication of reactor power level over all ranges of reactor operation above the range of the start up channel thereby assuring that the operator has an accurate monitoring channel available for comparison to the safety channels.

The building area radiation monitors assure that areas throughout the facility in which high radiation areas could occur due to improper sample handling, equipment or shielding movements, etc.

The gas monitor, filter assembly monitor, Kanne chamber and the particulate monitor provide diverse and redundant channels which monitor particulate and gaseous releases from the reactor building. These monitors provide readout and alarm functions in the control room and initiate a containment isolation in the event that their present alarm points are exceeded. In addition the D_2O leak

3.4 LIMITATIONS OF EXPERIMENTS

APPLICABILITY

These specifications apply to experiments performed at the GTRR.

OBJECTIVE

To prevent damage to the reactor and to limit radiation dose to facility personnel and the public in the event of experiment failure.

SPECIFICATIONS

a. The potential reactivity worth of each secured removable experiment shall be limited to 0.015 $\Delta k/k$.

b. The magnitude of the potential reactivity of each unsecured experiment shall be limited to 0.004 $\Delta k/k$.

c. The rate of change of reactivity of any unsecured experiment, any movable experiment, or any combination of such experiments have a total reactivity worth in excess of 0.0025 $\Delta k/k$ introduced by intentionally setting the experiment(s) in motion relative to the reactor shall not exceed 0.0025 $\Delta k/k$-sec.

d. The sum of the magnitudes of the static reactivity worths of all unsecured experiments which coexist shall not exceed 0.015 $\Delta k/k$.

e. The surface temperature of the material which bounds or supports any experiment shall not exceed the lowest of the following, where applicable:
   (1) The saturation temperature of liquid reactor coolant at any point of mutual contact.
   (2) A temperature conservatively below that at which the strength of the boundary material at any surface would lead to its failure, or,
   (3) A temperature conservatively below that at which the strength of the boundary material would be reduced to a point predictably leading to failure.

f. Materials of construction and fabrication and assembly techniques utilized in experiments shall be so specified and used that assurance is provided that no stress failure can occur at stresses twice those anticipated in the manipulation and conduct of the experiment or twice those which could occur as a result of unintended but credible changes of, or within, the experiment.

g. The radioactive material content, including fission products, of any singly encapsulated experiment shall be limited so that the complete release of all gaseous, particulate, or volatile components from the encapsulation will not result in doses in excess of 10% of the equivalent annual doses stated in 10 CFR Part 20. This dose limit applies to persons occupying (1) unrestricted areas continuously for two hours starting at time of release or (2) restricted areas during the length of time required to evacuate the restricted area.

h. The radioactive material content, including fission products, of any doubly encapsulated or vented experiment shall be limited so that the complete release of all gaseous, particulate, or volatile components from the encapsulation or confining boundary of the experiment could not result in (1) a dose to any person occupying an unrestricted area continuously for a period of two hours starting at the time of release in excess of 0.5 rem to the whole-body or 1.5 rem to the thyroid or (2) a dose to any person occupying a restricted area during the length of time required to evacuate the restricted area in excess of five rem to the whole-body or 30 rem to the thyroid.

i. Explosive materials in excess of 25 milligrams of TNT equivalent shall not be irradiated or stored within the reactor containment building.

j. Explosive materials in amounts up to 25 milligrams TNT equivalent may be irradiated and stored within the containment only if they are encapsulated in such a manner to assure compliance with Specification 3.4.f in the event of detonation of the explosive material.

k. Experiments which could increase reactivity by flooding, shall not remain in or adjacent to the core unless measurements are made to assure that the shut down margin required in Specification 3.1.a would be satisfied after flooding.

BASIS

Limiting the potential reactivity worth of secured removable experiments to 0.015 $\Delta k/k$ assures that any transient arising from the instantaneous removal of such experiments will not result in cladding failure and concomitant release of radioactive material which could lead to doses in excess of the limits set forth in 10 CFR Part 20.

A positive step change caused by the ejection or insertion of unsecured experiments worth less than 0.004 Δ k/k would not result in a transient behaviour exceeding the Safety Limits established in Section 2.1 of these Specifications.

Manipulations of movable experiments within the limits established in Specification 3.4.c will result in asymptotic periods longer than 20 seconds. Periods of this magnitude are easily accommodated by automatic response of the reactor safety system or by operator action. Prior to the manipulation of movable experiment the reactor power level will be reduced as required to accommodate the calculated prompt jump associated with the step insertion of the potential reactivity worth of the experiment.

Conformance with Specification 3.4.d assures that common mode failures resulting in the insertion of the total reactivity worth of all unsecured experiments will not result in accident consequences more severe than those evaluated for the failure of a single secured experiment.

Specifications 3.4.e and 3.4.f provide assurance that experiments will not fail due to the pressure or temperature effects of operation under anticipated operating conditions. For the purposes of this specification the reactor shall be assumed to be operating at the Limiting Safety System Settings established in Section 2 of these Technical Specifications.

Specifications 3.4.g and 3.4.h will assure that the quantities of radioactive materials contained in experiments will be limited such that their failure will not result in restricted or unrestricted area doses which exceed the maximum annual exposures stated in 10 CFR 20.

Adherence to Specification 3.4.i will prevent large quantities of explosives from being present within the reactor containment building and thereby preclude damage to the safety system and safety related equipment. Small quantities of explosive material may be safely used and stored as long as the encapsulation used has been shown to withstand the detonation of twice the quantity of explosive to be used.

Specification 3.4.k assures that the shutdown margin required by Specification 3.1.a will be met in the event of a positive reactivity insertion caused by the flooding of an experiment.

An analysis was made to determine the time-fuel temperature relationship that occurs following removal of a fuel element from the core into the fuel transfer cask. These results, detailed in the basis for specification of 3.3 indicate that the maximum fuel plate temperature reached following 12 hours of cooling before removal into the cask will be 361°C. This provides a sufficient margin to assure that no fuel plate melting will occur.

REFERENCES

(1) Final Safeguards Report for the GTRR, February 1963, Section 7.7, pp. 96-97.
(2) See correspondence relative to Change No. 10 to the Technical Specification of Operating License No. R-97, Docket 50-160
(3) Safety Analysis Report for the 5 Mw GTRR, GT-NE-7, December 1967, Section 4.4.10.

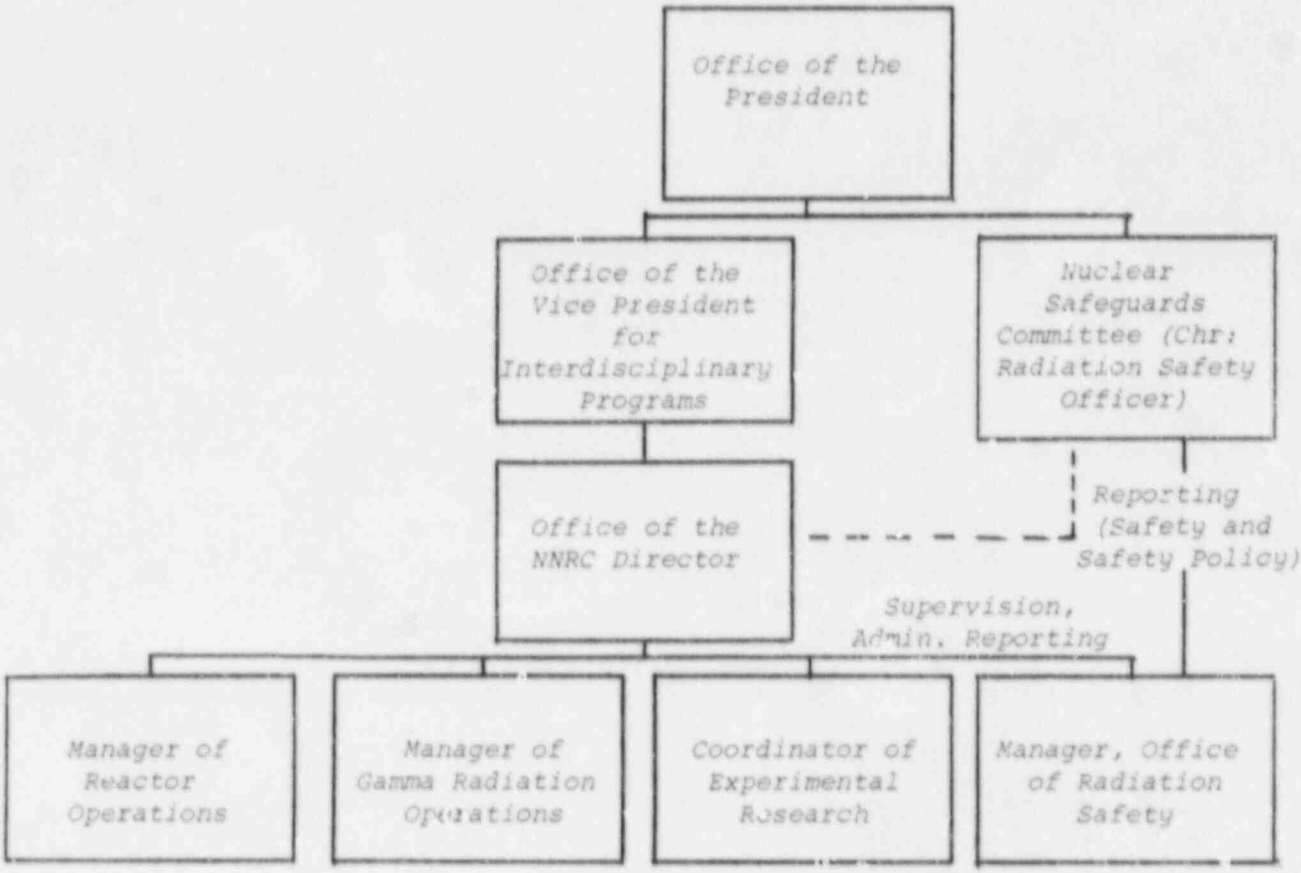

Figure 6.1 Georgia Tech Organization for Manager and Operation of GTRR

(2) The Licensed Operator at the console shall be notified just prior to moving any experiment within the reactor area and should authorize such movement.
(3) Each experiment removed from the reactor or reactor system shall be subject to a radiation monitoring procedure which anticipates exposure rates greater than those predicted. The results of such monitoring should be documented.

d. Procedures Relating to Personnel Access to Experiments

(1) There shall be a documented procedure for the control of visitor access to the reactor area to minimize the likelihood of unnecessary exposure to radiation as a result of experimental activities and to minimize the possibility of intentional or unintentional obstruction of safety.
(2) There shall be a written training procedure for the purpose of qualifying experimenters in the reactor and safety related aspects of their activities, including their expected responses to alarms.

e. Quality Assurance Program

There shall be a Quality Assurance Program covering the design, fabrication, and testing of experiments, including procedures for verification of kinds and amounts of their material contents to assure compliance with the technical specifications in Section 3.4.

6.4 PROCEDURES

a. All procedures and major changes thereto shall be reviewed and approved by the Nuclear Safeguards Committee prior to being effective. Changes which do not alter the original intent of a procedure may be approved by the director of the facility. Such changes shall be recorded and submitted periodically to the Nuclear Safeguards Committee for routine review.
b. Written procedures shall be provided and utilized for the following:

(1) Normal startup, operation and shutdown of the reactor and of all systems and components involving nuclear safety of the system.
(2) Installation and removal of fuel elements, control blades, experiments and experimental facilities.

6.6 ACTION TO BE TAKEN IN THE EVENT OF A REPORTABLE OCCURRENCE

In the event of a reportable occurrence, as defined in these Technical Specifications, the following action shall be taken:

a. All reportable occurrences shall be promptly reported to the director of the facility.
b. All reportable occurrences shall be reported to the Nuclear Regulatory Commission in accordance with Section 6.7 of these specifications.
c. All reportable occurrences shall be reviewed by the Nuclear Safeguards Committee.

6.7 REPORTING REQUIREMENTS

The following information shall be submitted to the U.S.N.R.C. in addition to the reports required by Title 10, Code of Federal Regulations.

a. Annual Operating Reports

A report covering the previous year shall be submitted to the office of the Regional Administrator, Region II, with a copy to the Director, Office of Nuclear Reactor Regulation, by March 1 of each year. It shall include the following:

(1) Operations Summary

A summary of operating experience occurring during the reporting period incuding:

(a) changes in facility design,
(b) performance characteristics (e.g., equipment and fuel performance),
(c) changes in operating procedures which relate to the safety of facility operations,
(d) results of surveillance tests and inspections required by these technical specifications,
(e) a brief summary of these changes, tests, and experiments which required authorization from the Commission pursuant to 10 CFR 50.59(a), and
(f) changes in the plant operating staff serving in the following positions: