DRAFT

UITF Operations Directives

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Jefferson Lab

Table of Contents

2

Configuration Management

3

Operations

4

Maintenance

Preface

This document, the Upgraded Injector Test Facility (UITF) Operations Directives (UOD), provides directives for all personnel who operate and maintain the Thomas Jefferson National Accelerator Facility (Jefferson Lab) UITF or are engaged in activities therein.

The UITF serves as a multi-purpose test facility, capable of electron beam production at beam energy up to ~10 MeV, with support for cyrogenic systems, and the flexibility to conduct small-scale research experiments, test new systems, and perform R&D activities. This directive is intended to provide the operational flexibility required to utilize the broad range of UITF capabilities in a safe and effective manner. Operations can be limited to a Gun Test Stand Mode, with no RF acceleration and reduced staffing requirements, or scaled up to accommodate tests and experiments of higher complexity and greater technical demands.

This document consists of the following sections. Each chapter describes the personnel and their responsibilities for each aspect of accelerator operations and the applicable directives.

Chapter 1: Program Control
Describes how safety is integrated into execution of the UITF program and establishes how the program is defined and executed.

Chapter 2: Configuration Management
Outlines how configuration management standards and work practices are applied as part of UITF operations.

Chapter 3: Operations
Specifies directives for how the UITF program is carried out, including the safety responsibilities of the control room staff and the role of safety organizations.

Chapter 4: Maintenance
Describes the planning, scheduling, and coordinating of maintenance activities.

Appendix A: UOD Release Memo
The memo used to release the UOD.

This document has been approved by:

_____ _____

Bernard Matthew Poelker, UITF Facility Manager Date

Acronyms & Abbreviations

ABIL	Accelerator Bypassed-Interlock Log
AOD	Accelerator Operations Directives
ARM	Assigned Radiation Monitor
ARR	Accelerator Readiness Review
ASE	Accelerator Safety Envelope
BLM	Beam Loss Monitor
BPM	Beam Position Monitor
CATS	Corrective Action Tracking System
CEBAF	Continuous Electron Beam Accelerator Facility
COO	Conduct of Operations document
DOE	Department of Energy
DSO	Division Safety Officer (Accelerator)
EPICS	Experimental Physics and Industrial Control System
ERR	Experiment Readiness Review
ES&H	Environment, Safety and Health
ESAD	Experiment Safety Assessment Document
FSAD	Final Safety Assessment Document
FSD	Fast Shutdown
ISM	Integrated Safety Management
JLab	Jefferson Lab
LERF	Low Energy Recirculator Facility
LOD	LERF Operations Directives
LOSP	Laser Operational Safety Procedure
LPSS	Laser Personnel Safety System
MPS	Machine Protection System
NPES	Nuclear Physics Experiment Scheduling Committee
ODH	Oxygen Deficiency Hazard
OSP	Operational Safety Procedure
OPS-PR	Operations Problem Report
PAC	Program Advisory Committee

PSS	Personnel Safety System
R&D	Research and Development
RF	Radio Frequency
RSAD	Radiation Safety Assessment Document
TAC	Technical Advisory Committee
TOSP	Temporary Operational Safety Procedure
UED	UITF Element Database
UITF	Upgraded Injector Test Facility
UOD	UITF Operations Directives
USI	Unreviewed Safety Issue

1 Program Control

The Accelerator Division develops, controls and manages the UITF program. This chapter describes how safety and work planning are integrated into UITF program development and execution, how the program is authorized, and the roles and responsibilities of personnel involved in defining, conducting, and scheduling the program.

1.1 Program Safety

All facets of UITF program planning and execution integrate safety as defined in the *JLab Integrated Safety Management System Program Description*.

The JLab safety program establishes integrated safety management (ISM) practices that guide worker actions, from the development of safety directives to work performance. Below are seven ISM guiding principles. Refer to the *JLab Integrated Safety Management System Program Description.*

1. Line management responsibility for safety
2. Clear roles and responsibilities
3. Competence commensurate with responsibilities
4. Balanced priorities
5. Identification of safety standards and requirements
6. Hazard controls tailored to work being performed
7. Operations authorization

An overarching component of the safety program—and also one of the seven guiding principles listed above—is the requirement to maintain balanced priorities. It is JLab policy that no activity—including the execution of the accelerator program—is so urgent or important that standards for environmental protection, safety, or health are compromised; in other words, *safety first*. In this spirit, all JLab employees, subcontractors, and users are empowered to—without reprisal—stop any work that endangers people, the environment, property, or quality. This “stop work” policy is an expectation and responsibility for all JLab employees, subcontractors, and users and is documented in the *ES&H Manual, Section 3330, Stop-Work and Re-Start for Safety Program.*

In addition to the seven guiding principles, there are five core safety management functions that are integrated into planning and performing all work activity that could

adversely affect workers, the public, or the environment. These core functions are as follows:

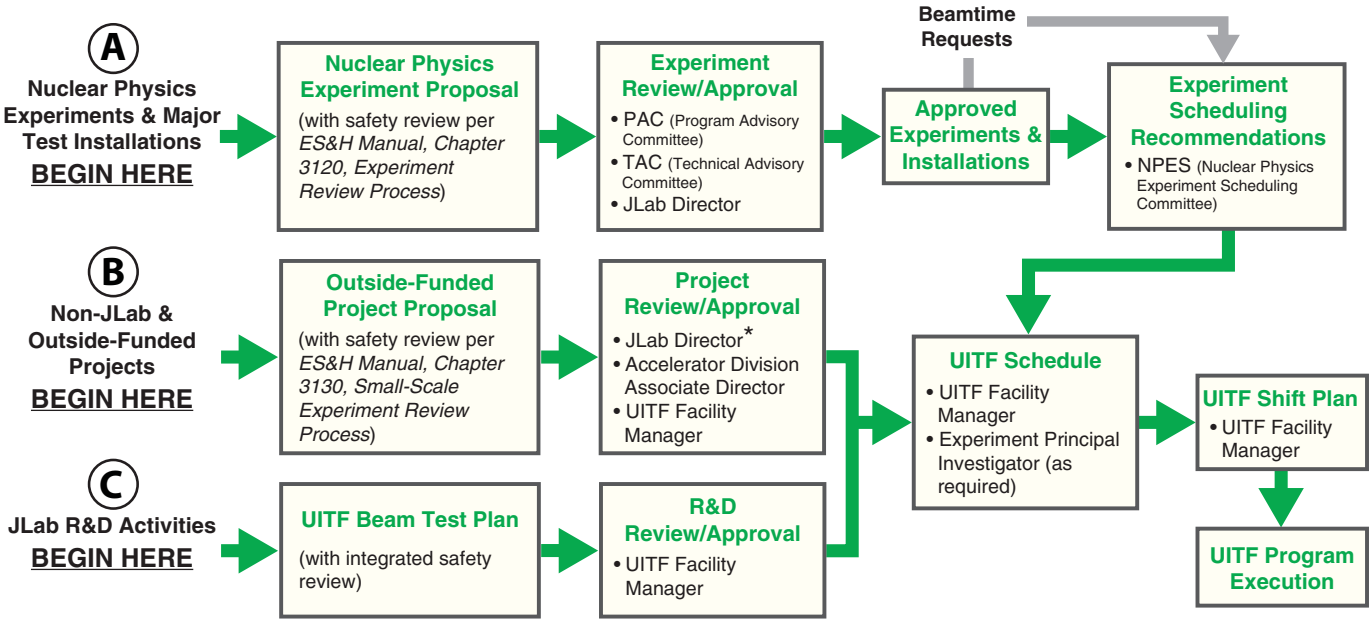
1. Define the scope of work
2. Analyze the hazards
3. Develop and implement controls
4. Perform work within controls
5. Provide feedback and continuous improvement

A structured framework of administrative tools, policies, and procedures guide the safety and consistency of UITF's program planning and execution. ISM principles and the policies established in the *ES&H Manual* guide scheduled and unscheduled maintenance activities at UITF as described in Section 4 on page 4-1 of this document.

1.1.1 Program Scope

The UITF program is intended to accommodate a broad range of activities such as testing and development of new systems and components intended for use in other JLab accelerators, performance of nuclear physics experiments and/or development of experiment components, and potentially hosting unique outside-funded activities with relevance.

The review, approval, and scheduling processes for the different types of UITF uses are tailored to match the scope of the activity and include the associated safety review processes. Figure 1-1, below, illustrates the three possible process paths (A/B/C) and the following paragraphs provide detail.



*JLab Director approval is required for experiments/projects/activities impacting critical JLab resources as determined by the Accelerator Division Associate Director and the UITF Facility Manager.

Figure 1-1: UITF Approval/Scheduling Process

1.1.1.1 Nuclear Physics Experiments and Installations (A)

Groups of collaborating experimenters submit experiment proposals to the Program Advisory Committee (PAC) (see (A) in Figure 1-1). The PAC, which

consists of distinguished members of the worldwide physics community who are not JLab employees, reviews all experiment proposals, judging the scientific merit, technical feasibility, and the manpower requirements before making a recommendation to the Jefferson Lab Director. Each experiment proposal is also reviewed for its effect on the environment, safety, and health using the review process defined in the *ES&H Manual, Section 3120, Experiment Review Process*. A second committee, the Technical Advisory Committee (TAC), also evaluates each experiment proposal and makes a recommendation to the Jefferson Lab Director based on the technical aspects of the proposal. The Jefferson Lab Director makes the decision to grant beam time.

Approved experiments can make formal beamtime requests using the standard *Beam Request* form and the *Radiation Budget* form. These forms are submitted to the Nuclear Physics Experiment Scheduling Committee (NPES) for consideration, along with a one-page summary of the scientific goals of the experiment. NPES, which consists of key JLab employees appointed by the Jefferson Lab Director, meets at least twice per year to consider beamtime requests and then subsequently makes recommendations to the UITF Facility Manager, who consults with the Experiment Principal Investigator (see Section 1.3.2 on page 1-10) as necessary. NPES takes into account a wide range of factors such as budget and manpower constraints, UITF performance capabilities, experiment staging space requirements, and radiation budgets required to meet program goals.

Major test installations to support approved experiments must follow the process defined in the *ES&H Manual, Section 3120, Experiment Review Process* and may include an ESAD, RSAD, COO, and ERR.

1.1.1.2 Non-JLab and Outside-Funded Projects Ⓑ

Experiments with outside funding will be considered for approval by the Jefferson Lab Director, the Accelerator Division Associate Director, and the UITF Facility Manager (see Ⓑ in Figure 1-1). Each experiment proposal is reviewed for its effect on the environment, safety, and health using the review process defined in the *ES&H Manual, Section 3130, Small-Scale Experiment Safety Review Process*. Each project must have an Experiment Principal Investigator (see Section 1.3.2 on page 1-10), who serves as a liaison between the outside entity and JLab personnel. The UITF Facility Manager schedules approved projects, consulting with the Experiment Principal Investigator as necessary.

1.1.1.3 JLab Research and Development Activities Ⓒ

As a low-energy test facility, the UITF provides a unique opportunity for JLab staff to perform valuable research and development activities, without impacting the higher-energy research accelerators. Each activity must have an Experiment Principal Investigator (see Section 1.3.2 on page 1-10), who completes a *UITF Test Plan* (see Section 3.6.4 on page 3-9) and submits it to the UITF Facility Manager for consideration (see Ⓒ in Figure 1-1). The *UITF Test Plan* provides an organized structure for documenting the planned activity, considering associated safety issues, and gaining the necessary sign-offs before proceeding. The UITF Facility Manager reviews each proposed test plan, granting approval as appropriate, and scheduling the activity. Depending on the complexity of the activity, the UITF Facility Manager may require completion of the review process

defined in the *ES&H Manual, Section 3130, Small-Scale Experiment Safety Review Process*.

1.1.1.4 Final Program Development

In consultation with the involved Experiment Principal Investigators and JLab management, the UITF Facility Manager develops and maintains the *UITF Schedule*, which shows the scheduled UITF program and upcoming maintenance and installation activities (see Section 1.4.1 on page 1-11. When the UITF is scheduled to operate, the UITF Facility Manager creates a *UITF Shift Plan* (see Section 1.4.2 on page 1-11), which defines the planned program for each shift and lists any associated *UITF Test Plans*.

1.1.2 Program Hazard Analysis

The potential hazards associated with executing the UITF program are analyzed as two distinct segments: 1.) the hazards associated with operating the UITF accelerator, and 2.) the hazards associated with each specific experiment/project/activity that will use the UITF beam or occupy space in the UITF. The UITF accelerator operates under blanket approval, within specific operating constraints as described in Section 1.1.2.1, below. Each approved experiment, however, must undergo a separate, thorough hazard analysis as described in Section 1.1.2.2 on page 1-5.

1.1.2.1 UITF Accelerator Hazard Analysis

As required by *DOE Order 420.2C, Safety of Accelerator Facilities,* two documents address the hazards associated with UITF operations: the *JLab Final Safety Assessment Document* (FSAD) and the *UITF Accelerator Safety Envelope* (ASE). Laser safety is addressed by the *ES&H Manual, Section 6410, Laser Safety Program.*

JLab Final Safety Assessment Document (FSAD) – The FSAD analyzes and identifies hazards and associated on-site and off-site impact to workers, the public, and the environment from normal accelerator operations and credible accidents. The FSAD provides descriptions of engineered controls (e.g., interlocks and physical barriers) and administrative measures (e.g., training and documentation) used to eliminate, control, or mitigate the hazards from accelerator operation.

The Department of Energy (DOE) has designated JLab as a “Low-hazard, Non-Nuclear Accelerator Facility.” This designation means that the hazards at Jefferson Lab have the potential for no more than minor on-site and negligible off-site impacts to people or the environment.

UITF Accelerator Safety Envelope (ASE) – The UITF ASE defines the physical and administrative bounding conditions for safe operations based on the safety analysis documented in the FSAD. When operations are performed within the boundaries of the ASE, the facility staff, facility users, general public, and environment are protected. Variations beyond the boundaries of the UITF ASE are treated as reportable occurrences and are reported using the process defined in the *ES&H Manual, Section 5200, Event Investigation and Causal Analysis Process.* Planned and authorized variations beyond the boundaries of the UITF ASE must be reviewed and approved by the DOE Site Office using the same process as for unreviewed safety issues (USIs) (see Section 1.1.3 on page 1-5).

Laser Safety – The *ES&H Manual, Section 6410, Laser Safety Program* addresses mitigation of the hazards associated with operating lasers within the UITF.

1.1.2.2 UITF Experiment/Project/Activity Hazard Analysis

The UITF uses a graded approach to hazard analysis, matching the process to the complexity of the task. Each UITF experiment/project/activity must follow the appropriate review process as shown in Figure 1-1 on page 1-2 and discussed below. The associated Experiment Principal Investigator (see Section 1.3.2 on page 1-10) is responsible for completing the steps required to fulfill the review process. The UITF Facility Manager may exercise discretion and require additional hazard analysis.

Complex nuclear physics experiments follow the *ES&H Manual, Section 3120, Experiment Review Process*, which includes an *Experiment Safety Assessment Document* (ESAD) and a *Conduct of Operations* document (COO). The ESAD addresses safety issues and activities for the experiment, while the COO describes the operational parameters for the experiment (e.g., duration, beam energy, beam current) and any required configuration changes to hardware or software. These two documents work together to address and communicate safety and operational information unique to each specific experiment.

Smaller, less-complex experiments and projects follow the *ES&H Manual, Section 3130, Small-Scale Experiment Safety Review Process*. JLab research and development activities utilize the *UITF Test Plan*, which provides an organized structure for documenting the planned activity, considering associated safety issues, and gaining the necessary sign-offs before proceeding.

1.1.3 Unreviewed Safety Issues

An unreviewed safety issue (USI) is an accelerator safety issue that presents a significant safety risk and was not previously identified, analyzed, and already mitigated as documented in the FSAD (see Section 1.1.2 on page 1-4). The word "unreviewed" in the term USI does *not necessarily* mean that hazards and controls were not properly reviewed; rather, it refers to hazards associated with a particular configuration or activity that may be new or different than those previously identified, analyzed, and mitigated as documented in the FSAD. A USI can result from either of the following:

- Discovery of a potential hazard that may not have been fully addressed in the development of the FSAD and UITF ASE, including the discovery of errors or omissions in the hazard analysis.
- A proposed accelerator configuration or operational change that is beyond the scope of the hazard analysis in the FSAD.

It is important to note that the USI process does NOT apply to standard industrial hazards, unless the hazard could directly impact accelerator safety.

If a USI is suspected, either as the result of a proposed modification or due to unexpected circumstances, then the JLab *Unreviewed Safety Issue (USI) Procedure* (https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-16644/USI%20Procedure.doc) is followed. If an activity is *potentially* outside of either the analysis or the set of controls documented in the FSAD or UITF ASE, then the review process is performed. All personnel must immediately report any potential

USI to their supervisor, the owner of the affected system, and the Accelerator Division Safety Officer. If a significant safety hazard is suspected, the supervisor ensures the immediate termination of the suspect activity and follows the notification sequence described in the *Unreviewed Safety Issue (USI) Procedure*.

1.1.4 Program Hazard Controls

1.1.4.1 Credited Controls

The UITF program is conducted using credited controls to eliminate, control, or mitigate the accelerator-specific identified hazards. The credited controls identified in the UITF ASE (see Section 1.1.2 on page 1-4) must be in place and functional before beam is delivered in the UITF and must remain functional during beam delivery. Credited controls are described in brief in the following paragraphs. A credited control is determined through hazard evaluation to be essential for safe operation directly related to the protection of personnel or the environment. Credited controls are assigned a higher degree of operational assurance than other controls. If a credited control is altered in any way, the *Unreviewed Safety Issue (USI) Procedure* must be followed (see Section 1.1.3 on page 1-5).

Credited controls used during UITF operation fall into two categories: engineered controls and administrative controls. Engineered controls are identified as either active or passive controls. The UITF ASE lists the credited controls for UITF operations are as follows:

NOTE: The UITF ASE specifies credited controls; the following list is for reference only.

- **Credited Passive Engineered Controls**
  - Permanent shielding
  - Movable shielding
  - Nitrogen gas supply orifices
  - ODH vents, lintels, and facility configuration
- **Credited Active Engineered Controls**
  - Personnel Safety System (PSS) access controls
  - PSS beam containment controls
  - ODH systems controls
- **Credited Administrative Controls**
  - Doors, gates, fences, and other barriers
  - JLab experimental review process
  - UITF staffing – sweep
  - UITF staffing – operations

The Safety and Operations Envelopes – The UITF ASE specifies the credited controls, which ensure that the accelerator safety risks are within acceptable limits. These controls are collectively referred to as the Safety Envelope. A second set of more stringent controls known as the Operations Envelope is used to provide assurance that the Safety Envelope is not exceeded. Variations of operating parameters outside the Operations Envelope, but within the Safety Envelope, are not treated as a DOE reportable occurrence but can cause administrative actions to be taken by JLab management. Operations Envelope

limits are specified by the UITF Facility Manager and are listed in the *UITF Operational Restrictions* (see Section 3.6.5.4 on page 3-10).

1.1.4.2 Additional Safety Controls

While the credited controls specified by the FSAD address worker safety, public safety, and environmental safety, UITF Operations uses other additional safety controls to provide an added safety margin and to help protect against property damage (i.e., damage to accelerator components) arising from accelerator operations. These controls provide additional layers of protection to mitigate potential problems before the credited controls even come into play. Examples of these additional safety controls are as follows:

- **Machine Protection System (MPS)** – An active engineered system designed to turn off the beam whenever an off-normal condition is detected and before significant damage to the accelerator can occur or a credited-control threshold is reached. There are a variety of inputs to this fast shutdown system such as vacuum valves, RF systems, beam loss monitors, beam current monitors, beam dumps, and target motion devices.
- **Rapid Access System** – Two gamma radiation probes and a neutron probe inside the UITF enclosure monitor the presence of ionizing radiation, with the control chassis located inside the UITF Control Room (see Section 3.3 on page 3-4). The control chassis emits a visible warning when ionizing radiation is detected. This system provides assurance that it is safe to enter the UITF enclosure after operating the UITF as an accelerator. These probes are not part of the UITF PSS.
- **Laser Operational Safety Procedures (LOSPs)** – As specified by the *ES&H Manual, Section 6410, Laser Safety Program*, each Class 3B or Class 4 laser must have an associated LOSP that covers the piece of equipment and the area where it is located.
- **Channel Access Security** – An active engineered system that establishes a security protocol limiting the ability of individuals to access electronic process variables used to control the accelerator (see Section 3.6.1.1 on page 3-7).
- **UITF Operational Restrictions** – A listing of administrative limits and operating parameters for specific UITF systems or areas (see Section 3.6.5.4 on page 3-10).
- **UITF-Specific Operational Safety Procedures (OSPs) and Temporary Operational Safety Procedures (TOSPs)** – OSPs and TOSPs are developed when a task involves unusual safety hazards that are not fully addressed in the *ES&H Manual* or where the hazard has unique operational features such as tasks involving multiple work groups (see *ES&H Manual, Section 3310, Standard Operating Procedures and Operational Safety Procedures*). Copies of specific OSPs and TOSPs that pertain to UITF operations are maintained in a binder in the UITF Control Room and on the UITF wiki web page (https://wiki.jlab.org/ciswiki/index.php/UITF_Safety_Documents). These documents are reviewed by all UITF Operators.
- **UITF Test Plans** – Procedures written by system experts to perform specific tests of UITF systems or execute tests using the UITF beam (Section 3.6.4 on page 3-9). Each test plan incorporates a review of

potential safety issues, and when submitted, is electronically routed for review/approval by key personnel. Scheduled UITF test plans are listed in the *UITF Shift Plan* (see Section 1.4.2 on page 1-11).

1.1.5 Program Execution Within Controls

The UITF program is executed by the UITF Operator and other control room staff as authorized by the UITF Facility Manager (see Section 1.3.1 on page 1-10)) within the controls established in Section 1.1.4 on page 1-6 and in accordance with the program details specified in the *UITF Shift Plan* (see Section 1.4.2 on page 1-11).

Prior to executing the program, the UITF Operator achieves a state of readiness as follows.

- **Training and Qualification** – UITF Operators are trained to a level of proficiency established by the UITF Facility Manager and their names appear on the list of qualified UITF Operators maintained by the UITF Facility Manager in the UITF Control Room.
- **Preshift Reading** – The oncoming UITF Operator reads and understands the following before assuming responsibility for UITF operations:
  - *UITF Shift Plan* (see Section 1.4.2 on page 1-11)
  - *UITFLog* entries since last on shift (see Section 3.6.5.1 on page 3-9)
  - UITF-specific OSPs/TOSPs (see Section 1.1.4.2 on page 1-7)
  - Experiment-specific binders (see Section 1.3.2 on page 1-10)
- **Shift-Turnover Meetings** – Between consecutive shifts of UITF running, the oncoming and outgoing UITF Operators hold a brief shift-turnover meeting to discuss the ongoing program and any off-normal conditions that might exist. When shifts do not overlap, the preshift reading described above takes the place of the shift-turnover meeting.

1.1.6 Program Feedback and Continuous Improvement

Feedback and continuous improvement are integrated throughout the process of developing and then executing the UITF program. A variety of communication tools provide opportunities for specific lessons learned and general feedback to flow back into the system, resulting in improvements based on experience. Some feedback channels provide information that can be used immediately, while others gather data that can be used later for trend analysis and future planning.

Examples of feedback and continuous improvement tools used during program development and execution are as follows:

- **UITFLog** – As a time-based repository for information associated with program execution, the *UITFLog* (https://logbooks.jlab.org) (see Section 3.6.5.1 on page 3-9) provides a way to document events and can also be searched and sorted for useful information by system experts and other JLab employees with password privileges.
- **Operations Problem Reports (OPS-PR)** – The OPS-PR system (see Section 3.6.5.3 on page 3-10) provides systems support groups with specific information about system failures and a mechanism for communicating when the problems are fixed and how they were repaired. The resulting data can be used for trend analysis.

- **Corrective Action Tracking System (CATS)** – The lab-wide CATS system (https://mis.jlab.org/ehs/) tracks action items that arise from the various inspections, assessments, and audits.
- **DOE/JLab Hotlines/Web Sites** – Telephone hotline numbers for addressing issues such as waste, fraud, abuse, management, and safety concerns are posted on the DOE information bulletin board in the MCC. Such issues shall always be addressed first through the normal supervisory chain, but if results are unsatisfactory or there is fear of retribution, the hotlines provide other avenues of recourse.

1.2 Program Authorization (pending)

The DOE Site Office has authorized JLab to perform routine operations of the UITF within the safety envelopes listed in the *UITF Accelerator Safety Envelope* (ASE) (see Section 1.1.2 on page 1-4). Before granting operations authorization, the DOE carried out a rigorous review process (see Figure 1-2, below) as specified in *DOE Order 420.2C, Safety of Accelerator Facilities*. To meet the review requirements, JLab prepared a

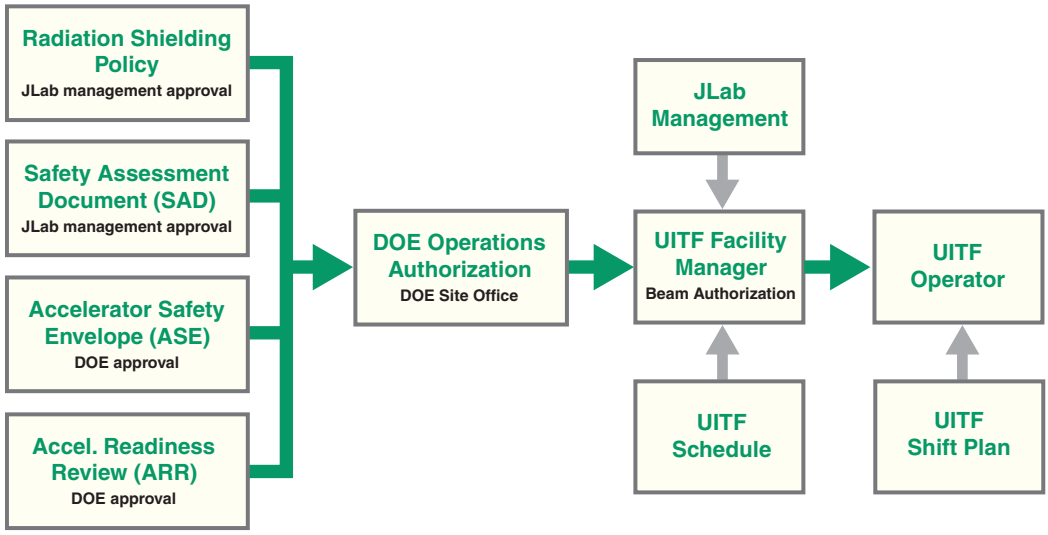


Figure 1-2: UITF Program Authorization

Radiation Shielding Policy and a *Safety Assessment Document* that conformed to DOE standards; these documents were approved by JLab management. JLab also prepared an *Accelerator Safety Envelope* document, which was approved by the DOE. With these required documents in place, an Accelerator Readiness Review (ARR) verified that all conditions for safe operations had been met, and the DOE subsequently authorized UITF operations. A copy of the DOE letter authorizing UITF operations is posted in the UITF Control Room.

The UITF program is developed by the UITF Facility Manager in consultation with JLab senior management. The UITF Facility Manager authorizes the UITF Operator to carry out the UITF program as specified in the *UITF Shift Plan* (see Section 1.4.2 on page 1-11). Before beam is run in the UITF, the UITF Facility Manager makes a *Beam Authorization* entry in the *UITFLog*, authorizing beam in the UITF.

1.3 Personnel and Responsibilities

The key personnel involved in defining, scheduling, authorizing the UITF program and planning for safe operations are described in the following section. Responsibilities of the other personnel are described in the appropriate committee charters and elsewhere. Responsibilities may be delegated to other responsible parties as appropriate.

1.3.1 UITF Facility Manager

The UITF Facility Manager provides UITF operations oversight, including participating in program development, scheduling, and authorizing beam operations. UITF responsibilities include the following:

- Develop the *UITF Schedule* in consultation with JLab management and the Experiment Principal Investigators (see Section 1.2 on page 1-9).
- Approve deviations from the *UITF Schedule.*
- Provide a *UITF Shift Plan* (see Section 1.4.2 on page 1-11) before the beginning of each shift of scheduled UITF operations.
- Verify that all experiments/projects/activities have completed the required safety reviews before authorizing operations.
- Maintain the *UITF Operational Restrictions*, a list of administrative limits and restrictions specific to UITF operations (see Section 3.6.5.4 on page 3-10).
- Authorize UITF operations by making appropriate *UITF Beam Authorization* entries in the *UITFLog* (see Section 1.2 on page 1-9). These entries define acceptable beam destinations and describe any operating constraints for a predetermined time frame.
- Authorize, in consultation with JLab management, resumption of beam operations as appropriate following critical events such as Safety Envelope violations, Operations Envelope and Operational Restrictions violations, Personnel Safety System malfunctions, Machine Protection System malfunctions, and beam-strike events (see Section 3.5 on page 3-5).
- Train all UITF Operators to a level that supports safe UITF operation.
- Post a list of qualified UITF Operators in the UITF Control Room.
- Schedule staffing for all shifts of UITF operations consistent with staffing requirements (see Section 3.6.2 on page 3-8).
- Review and consider for approval all *UITF Test Plans* and UITF ATLis tasks.
- Maintain a listing of all safety documentation applicable to the UITF and make such documentation accessible to UITF staff.
- Serve as the UITF Work Coordinator (see Section 4.1.1 on page 4-1) to coordinate all UITF maintenance, installation, and upgrade activities.

1.3.2 UITF Experiment Principal Investigator

Each proposed UITF experiment/project/activity is required to have an associated Experiment Principal Investigator, who supplies all activity-specific information necessary for the design and safety review process and helps coordinate all aspects of installation and operation, working closely with the UITF Facility Manager. The level of involvement can vary greatly, depending on the scope and type of activity as described in Section 1.1.1 on page 1-2 and also below. The Experiment

Principal Investigator is generally a JLab employee but can be a non-JLab person. Experiment Principal Investigator responsibilities are as follows:

- Work with the UITF Facility Manager to conduct a design and safety analysis of all experiment equipment and proposed operating conditions.
- Work with the UITF Facility Manager to guide the experiment through all phases of the readiness and safety review process, including primary responsibility for completion of the steps defined in *ES&H Manual, 3120 Experiment Review Process* (for nuclear physics experiments and major test installations), *ES&H Manual, Section 3130, Small-Scale Experiment Safety Review Process* (for non-JLab projects), or in the UITF Test Plan (for JLab research and development activities). This includes preparing and submitting the final ESAD and COO for the experiment as appropriate.
- Present the appropriate safety documents for potential experiments to the Accelerator Division Safety Officer (DSO) prior to the Experiment Review Process.
- Work with the UITF Work Coordinator to safely install any new experiment equipment.
- At the conclusion of the activity, organize the decommissioning of any equipment that is to be removed and arrange for removal.
- Meet with representatives of potential outside-funded experiments to determine if their requirements are in line with the capabilities of the facility and help move appropriate experiments through the approval and scheduling process.
- Work with the UITF Facility Manager to refer to the Radiation Control Department for special review any potential outside-funded experiment with requirements that fall outside the normal facility operating envelope.
- Compile an experiment-specific binder before the start of the experiment and make it available in the UITF Control Room for use by control room staff.

1.4 Program Schedules

1.4.1 UITF Schedule

The *UITF Schedule* is developed by the UITF Facility Manager in consultation with JLab management and the Experiment Principal Investigator for any experiments/projects/activities being considered.

1.4.2 Shift-by-Shift Schedule (the *UITF Shift Plan*)

The UITF Facility Manager provides the written program for each shift of operations to the UITF Operator no later than the start of the shift. The intended program must be described in enough detail for the UITF Operator to execute the plan and may include specific test plans for execution (see Section 3.6.4 on page 3-9).

2 Configuration Management

According to DOE-STD-1073, *DOE Standard, Configuration Management*, the basic objectives of a configuration management system are to

- establish consistency among design requirements, physical configuration, and documentation, and
- maintain this consistency for the life of the facility, especially when changes are made.

Configuration management standards and work practices are already in place for the systems and equipment that make up the UITF facility. These standards, which are maintained by the specific organizations, also apply to new systems that are designed, fabricated, and then installed in the accelerator. Successful operation of the accelerator, however, requires a single, definitive, up-to-date source of operating information for beamline elements. This central repository for the accelerator is the UITF Element Database (UED) (https://ued.acc.jlab.org/), which serves as the information source for such tools as model-driven accelerator setup, on-demand control screens, and element-by-element hot checkout. Consistency between the installed equipment configuration and the information contained in the UED is critical, making appropriate application of configuration management principles of paramount importance for accelerator operations.

2.1 The UITF Element Database (UED)

The UED is the central element-specific information repository used to operate UITF. All beamline elements that affect beam operations are included in the database, with the information for each type of element tailored to match the specific function. Operations-critical tools pull element information from the database, relying on the UED as the single, authoritative source for operating information. With the UED as the central information repository, changes are immediately available to all tools whenever an element in the UED is updated or a new element is added. From a configuration management perspective, the UED is key for establishing and maintaining consistency between the physical accelerator configuration and the tools used to operate it.

Some specific tools that rely on the UED are as follows:

- **On-the-fly Control Screens** – On-the-fly screens pull information directly from the UED, replacing most hand-generated screens and ensuring that the screens always match the installed operational configuration.

- **System Readiness Tool** – Following a scheduled accelerator shutdown, element readiness is verified by system support groups before beam operations can commence. A web-based interface pulls element information directly from the UED.

The UED also automatically creates a change history whenever element data is revised. Read-only historical save points provide snapshots of machine operating conditions for later reference.

2.1.1 The UED Revision Process

A well-defined revision control process is critical for maintaining the integrity of the UED. This includes defining roles and responsibilities and providing appropriate communication tools. Figure 2-1, below, provides an overview of the process.

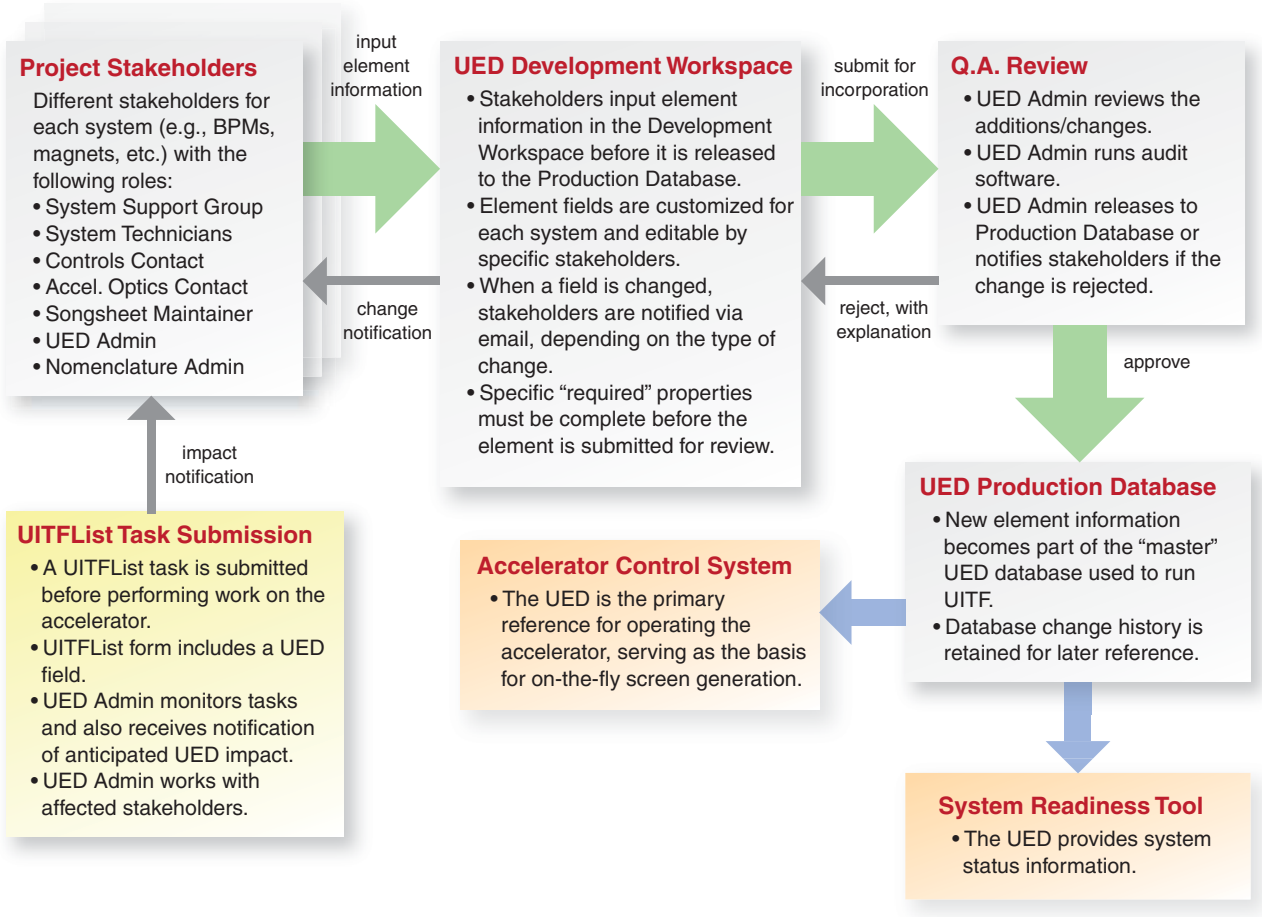


Figure 2-1: The UED Revision Process

2.1.2 Timely UED Updates

To accommodate the hot checkout process and accelerator operating requirements, UED updates must be incorporated in the production database in order to support hot checkout activities and the scheduled program. This means that the changes must have already passed the quality review and been incorporated in the production database by UED Administration before hot checkout begins. Populating a UED Development Workspace during the early

stages of any project is a good practice that facilitates consistent nomenclature assignment and makes timely final approval/incorporation much easier.

2.1.3 Project Stakeholders

Elements in the UED are organized by system (e.g., BPMs, magnets, RF, vacuum), and each system has a different group of stakeholders. The various stakeholders are listed in Figure 2-1 on page 2-2. Each UED element has a set of associated fields, and each field has assigned write privileges, so that stakeholders can contribute their portion of the information. The Nomenclature Administrator has the final say with regard to element names. Others may contribute information, depending on the type of system and element. A UED Administrator helps facilitate the process and maintain UED standards (see Section 2.1.6 on page 2-3).

An important by-product of the UED revision process is improved communication between stakeholders. As element changes are made, the various stakeholders are notified, providing them with information that can be used in their planning process.

2.1.4 UITFList as Part of the UED Process

The *UITFList* work-planning tool (see Section 4.2.2 on page 4-3) provides a mechanism to help identify potential UED implications associated with planned work. The *UITFList* form includes a checkbox to indicate that the work will impact the information in the UED. If so, the UED Administrator is informed via email and works with the appropriate stakeholders to make sure that consistency between the installed equipment and the UED is maintained.

2.1.5 The UED Development Workspace

System Stakeholders prepare updates or new elements in a development workspace; they do not directly edit the production UED production database (see Section 2.1.7 on page 2-4). Within that workspace, each element can have a variety of fields that are editable by specific stakeholders. Each element has “required” fields that must be completed before the element is submitted for incorporation in the production database. However, during the development phase, the workspace can be quite freeform, allowing stakeholders to add and remove fields and even proceed without a final element designator. As element field changes are made, automatic notifications can be sent, depending on the type of change. After the information in the development workspace is complete, a request to merge the information with the production database is made, and the request is considered by a UED Administrator (see Section 2.1.6 on page 2-3).

2.1.6 UED Quality Assurance Review

Before changes are merged from the development workspace into the production database, the UED Administrator reviews the proposed changes to verify that they are valid and also runs audit software that determines if the information meets UED requirements. If problems are identified, the UED Administrator notifies the person who submitted the proposed changes and discusses how to correct the issues. After all criteria are met, the UED Administrator releases the changes to the UED production database and stakeholders are notified. This review process

ensures the integrity of the element data contained in the UED production database.

2.1.7 The UED Production Database

The production version of the UED database is the official repository for UITF element information, storing the present accelerator configuration and serving as the primary reference for the software tools that operate the UITF. This includes element nomenclature designations, where the UED is considered the authoritative reference, with the final designations being approved by the Nomenclature Administrator.

The configuration management process described in Figure 2-1 on page 2-2 maintains consistency between the installed equipment and the information contained in the UED. It is critical that all System Stakeholders contribute their portion of the element information when a new element is added and continue to update the information as they make changes in the field. Additionally, the UED automatically creates a series of read-only historical snapshots as element changes are made. This feature provides a means for understanding past configurations should the need arise.

3 Operations

UITF operations refers to the activities associated with operating the UITF or any other activity associated with carrying out the scheduled program. This chapter describes the roles and responsibilities of the control room staff and others involved with UITF program execution, provides protocol for critical event response, and lists directives that govern specific aspects of the conduct of operations.

3.1 UITF Operations Overview

UITF operations are conducted from the UITF Control Room by authorized staff who, regardless of group or institutional affiliation, must comply with the directives specified herein. The UITF Operator (see Section 3.2.1 on page 3-1) has primary responsibility for immediate oversight of other control room staff and the safe and efficient execution of the scheduled program. Others qualified as UITF Operators may freely interact with the control system from within the control room but must do so as a Secondary UITF Operator (see Section 3.2.2 on page 3-3), under the direction of the UITF Operator. Other individuals not qualified as UITF Operators but with sufficient technical knowledge can be granted access to the control system (i.e., “channel access”) but must be in the presence of the UITF Operator when making control system changes that will affect the electron beam. Staffing requirements for a variety of operating conditions are described in Section 3.6.2 on page 3-8.

UITF critical event response protocols are described in Section 3.5 on page 3-5.

3.2 Personnel and Responsibilities

The personnel involved in UITF operations include the control room staff and support staff described in the following sections. The UITF Facility Manager posts the list of qualified UITF Operators in the UITF Control Room.

3.2.1 UITF Operator

NOTE: Unless otherwise specified, the term UITF Operator is used throughout this document to refer to the *on-duty* UITF Operator.

The UITF Operator has immediate responsibility for the safe and efficient operation of the UITF and its subsystems. This includes immediate oversight of program execution, control room staff, and all control room activities, including

accelerator operation. The UITF Operator must ensure that the UITF is operated in compliance with the *UITF Safety Envelope* and other applicable JLab policies/ procedures (including this document) and is responsible for understanding all workplace hazards, safety procedures, and the rules and requirements governing day-to-day UITF operations. A summary of the UITF Operator's responsibilities follows:

Safety:

- Be aware at all times of the UITF Personnel Safety System (PSS) status.
- Ensure that the UITF is operated in accordance with the requirements outlined in the UITF ASE.
- Coordinate UITF critical event response as described in Section 3.5 on page 3-5.
- Read and understand all approved UITF-specific OSPs and TOSPs.
- Know the intended delivery points for the UITF beam and the approximate average beam current and beam energy.
- Verify, before running beam in the UITF, that a valid *Beam Operations Authorization* entry (see Section 1.2 on page 1-9) has been made in the *UITFLog*.
- Operate the UITF PSS.
- Using the procedures specified in the *UITF Sweep Procedure*, search and secure the UITF beam enclosure before electron beam operation.
- Ensure that UITF operations are conducted in accordance with all current information in the *UITFLog* (see Section 3.6.5.1 on page 3-9), *UITF Shift Plan* (see Section 1.4.2 on page 1-11), and *UITF Operational Restrictions* (see Section 3.6.5.4 on page 3-10).
- Control or directly supervise the operation of devices that interface to the UITF PSS such as gun high-voltage controls and high power RF systems.
- Ensure that the appropriate Machine Protection Systems (MPS) are used during beam operations and that FSD masking is properly configured to protect UITF accelerator and experiment-specific components.
- Ensure that the minimum staffing levels for UITF operations specified in Section 3.6.2 on page 3-8 are met.
- Understand and respond appropriately to all PSS, LPSS, and MPS faults.
- Request that the Radiation Control Department conduct a radiation survey of the UITF beamline after operating the UITF accelerator under new conditions (i.e., at higher beam energy and/or beam current) as specified by the *UITF Operational Restrictions*, and verify that the survey results are added to the *UITFLog* and *RADLog*.
- Verify that, before leaving the UITF in the Beam OFF state, the PSS state for the UITF is changed to the OPEN state and the Rapid Access System indicates no radiation.

Program coordination:

- Coordinate the activities of all other control room staff, including non-JLab personnel.
- Understand all responsibilities specified in this document, the *UITF Operations Directives*.

- Read and understand the *UITF Shift Plan* before assuming responsibility as the UITF Operator.
- Complete all information fields in the *UITF Operator Stamp* and stamp in as the UITF Operator at the beginning of each on-duty shift.
- Read and understand experiment-specific information supplied by Experiment Principal Investigator whose experiment/project/activity is part of the scheduled program for the shift.

Program execution:

- Open channel access as needed for qualified individuals.
- Read all *UITF Test Plans* listed in the *UITF Shift Plan*.
- Monitor beam quality to ensure that the beam specifications meet the program goals.
- Monitor and optimize the performance of operating accelerator systems.
- Make *UITFLog* entries that clearly and accurately describe shift activities.
- Generate UITF-related Operations Problem Reports (OPS-PRs) as appropriate.

3.2.2 Secondary UITF Operator

At times, it may be useful to have other qualified staff assist with UITF operations. Those qualified as UITF Operators may assist as a Secondary UITF Operator, under the direct supervision of the UITF Operator. A summary of a Secondary UITF Operator's responsibilities follows:

Safety:

- Be aware at all times of the UITF PSS status.
- Ensure that the UITF is operated in accordance with the requirements outlined in the UITF ASE.
- Read and understand all approved UITF-specific OSPs and TOSPs.
- Know the intended delivery points for the UITF beam and the approximate average beam current and beam energy.
- Verify, before running beam in the UITF, that a valid *Beam Operations Authorization* entry (see Section 1.2 on page 1-9) has been made in the *UITFLog*.
- Ensure that UITF operations are conducted in accordance with all current information in the *UITFLog* (see Section 3.6.5.1 on page 3-9), *UITF Shift Plan* (see Section 1.4.2 on page 1-11), and *UITF Operational Restrictions* (see Section 3.6.5.4 on page 3-10).
- Ensure that the appropriate Machine Protection Systems (MPS) are used during beam operations and that FSD masking is properly configured to protect UITF accelerator and experiment-specific components.
- Understand and respond appropriately to all PSS, LPSS, and MPS faults.
- Verify that, before leaving the UITF in the Beam OFF state, the PSS state for the UITF is changed to the OPEN state and the Rapid Access System indicates no radiation.

Program coordination:

- Understand all responsibilities specified in this document, the *UITF Operations Directives*.
- Read and understand experiment-specific information supplied by Experiment Principal Investigator whose experiment/project/activity is part of the scheduled program for the shift.

Program execution:

- Comply with program direction from the UITF Operator.
- Read all *UITF Test Plans* listed in the *UITF Shift Plan*.
- Make *UITFLog* entries that clearly and accurately describe shift activities.

3.2.3 Non-UITF Control Room Staff

Other non-UITF and non-JLab staff may, from time to time, require access to the UITF control system to either participate in the UITF program or support system maintenance, installation, or commissioning. Approval to interact with the control system must come directly from the UITF Operator and meet the requirements established in Section 3.6.1.3 on page 3-7. All of these people, regardless of group or institutional affiliation, must comply with the directives specified in this document as well as any direct instruction from the UITF Operator or UITF Facility Manager.

3.2.4 Assigned Radiation Monitor (ARM) Responsibilities

Radiation Control Department personnel perform all ARM responsibilities, including radiation surveys as requested by the UITF Operator. In general, UITF Operators are not qualified ARMs.

3.3 UITF Rapid Access System

The UITF includes a “rapid access” radiation monitoring system that uses two gamma radiation probes and a neutron probe. These devices produce a visible alarm inside the UITF control room if above-threshold ionizing radiation is detected. The absence of an alarm indicates it is safe to enter the UITF enclosure when the PSS state is set to OPEN; a Test button verifies the system is working. These devices are not part of the Personnel Safety System. The UITF Operator must contact the Radiation Control Department if the system alarms.

3.4 Training

UITF Operators are trained to a level of competence that allows for safe UITF operations. The UITF Facility Manager establishes the UITF Operator training requirements, determines when those requirements have been met, and can suspend or terminate UITF Operator qualifications at his/her discretion. The UITF Facility Manager posts a list of qualified UITF Operators in the UITF Control Room. If some portion of a UITF Operator’s training expires, his/her control room staff qualifications are not nullified, but task assignments may be impacted until the training is retaken.

3.5 Critical Event Response

The nature of critical events specific to the UITF can vary widely. The basic responses to the most common critical events are described or referenced in the following sections.

3.5.1 Safety Envelope Violations

If the *UITF Accelerator Safety Envelope* is violated during UITF operations, beam must be terminated and the investigation process followed as specified in the *ES&H Manual, Section 5200, Event Investigation and Causal Analysis Process*. The Accelerator Division Associate Director, UITF Facility Manager, Safety System Group Leader, Accelerator Division Safety Officer, and Jefferson Lab Reporting Officer must be notified as soon as possible. Section 3.6.2 on page 3-8 in this document establishes the required staffing levels for various operating conditions. Violation of these staffing limits is considered to be a *UITF Accelerator Safety Envelope* violation.

Beam operations shall not resume until the Accelerator Division Associate Director gives direct approval.

3.5.2 Operational Restriction Violations

The *UITF Operational Restrictions* establish thresholds for UITF operation, including beam current maximums, beam dump power limitations, and experiment target limits (see (http://opsweb.acc.jlab.org/internal/ops/ops_webpage/restrictions/ops_restrictions.html). Variations outside of these limits require specific administrative action as described below.

If an Operational Restriction violation occurs, beam must be terminated and the Accelerator Division Associate Director, UITF Facility Manager, Accelerator Division Safety Officer, and Safety System Group Leader (for PSS-related violations) must be notified immediately. Beam operations shall not resume until the Accelerator Division Associate Director gives direct approval.

3.5.3 Personnel Safety System (PSS) Malfunctions

The PSS is designed to protect personnel during UITF operations. If, during operations, a malfunction of the PSS is perceived, beam delivery shall be immediately terminated. The UITF Operator shall report the perceived malfunction to the Safety System Group Leader for resolution.

If, on investigation, the Safety System Group Leader determines that the PSS operated as designed and such operation does not pose a previously undetected personnel hazard, then beam operations may resume after direct approval is given by the UITF Facility Manager.

If the Safety System Group Leader determines that a previously unidentified hazard exists, the USI process must be followed (see Section 1.1.3 on page 1-5).

If the Safety System Group Leader determines that the PSS did not function correctly, the occurrence reporting process described in Section 3.5.1 on page 3-5 shall be followed.

3.5.4 Machine Protection System (MPS) Malfunctions

The Machine Protection System (MPS) is a hardware-based system used to shut off the electron beam in cases where sustained beam, or energy directly related to the electron beam, could damage components. MPS inputs include variables such as beam loss and superconducting cavity arcs or quenches. The backbone of the MPS system is the Fast Shutdown system (FSD), which has the ability to shut off the beam from anywhere in the UITF in less than 40 μs. MPS subsystems include beam loss monitors (BLMs), pressure monitoring along the beamline via ion pump power supplies, and cooling waterflow meters.

If, during accelerator operations, a malfunction of the MPS is observed or perceived, beam delivery in the affected segment shall cease immediately, and the UITF Operator must report the observed or perceived malfunction for resolution to the Safety System Group on-call contact for resolution. Beam operations shall not resume until the system is repaired and verified and direct approval is given by the UITF Facility Manager.

3.5.5 Electron-Beam-Strike Events

Although the MPS is designed to minimize the potential for beam-related and laser-related equipment damage, such events can still occur and include the following.

- An acute loss of beamline vacuum caused by an electron beam strike. Vacuum loss is considered to be acute whenever supplemental vacuum pumping equipment is required to restore beamline vacuum.
- Physical damage to beamline components has been caused by a beam strike. This includes physical damage to components such as beam pipe, beam dumps, magnets, BPMs, targets, and insertable devices like harps and viewers. Radiation damage to components such as viewer cameras is not considered to be caused by beam strike.

If a beam strike event occurs, the beam shall immediately be turned off (if not already off) and the appropriate staff notified. Beam operations shall not resume until direct approval is given by the UITF Facility Manager.

3.6 Directives

This section specifies directives that shall be followed by all UITF personnel and others engaged in the operation or oversight of components that are part of the UITF.

3.6.1 Control System Interaction

The UITF is operated using EPICS (Experimental Physics and Industrial Control System), an open-source computer interface that reads and writes to process variables, which remotely control accelerator system components. All UITF beam operations are conducted from computer terminals inside the UITF Control Room. A computer terminal above the control room, near the electronics racks, can be used for system commissioning and troubleshooting, via temporary channel access granted to system experts by the UITF Operator.

3.6.1.1 UITF Control System Access

The UITF Facility Manager provides authorization to manipulate UITF accelerator system process variables via EPICS to approved individuals (i.e., UITF Operators) through the use of the channel access security protocol.

During beam operations, channel access is generally closed to everybody except control room staff. The UITF Operator can use discretion to temporarily grant channel access to others so long as the activity will not affect ongoing electron beam transport.

During maintenance periods, channel access is generally opened to anyone with a valid operations computer system account.

3.6.1.2 UITF Operator Control System Interaction

Only qualified UITF Operators have unlimited channel access to all UITF process variables at all times; however, these personnel must observe the following restrictions.

- Be approved by the UITF Facility Manager and added to the list of qualified UITF Operators.
- Be physically present in the UITF Control Room and working from a UITF computer console when making control system changes during beam operations.
- When acting as a Secondary UITF Operator, obtain authorization from the UITF Operator before changing any accelerator system process variable during beam operations.

3.6.1.3 Control System Interaction Affecting Beam Transport by Others

Personnel other than UITF Operators who, when beam is present in the UITF accelerator, need to make control system changes that will affect beam transport, must meet the following requirements.

NOTE: On occasion, those who are solving specific problems at the request of the UITF Operator may need access to the control system but may not meet the following criteria. They can be granted access for a limited time period under the direct supervision of the UITF Operator because they are solving a specific problem and not executing the UITF program.

- Have explained to the UITF Operator, in advance, the anticipated changes and been given UITF Operator approval. The UITF Operator will open channel access as appropriate for the task.
- Be physically present in the same control room as the UITF Operator and working from a UITF computer console when making control system changes. A computer terminal above the control room, near the electronics racks, can be used for system commissioning and troubleshooting, via temporary channel access granted to system experts.

3.6.2 Staffing Requirements for Operations

Table 3-1, below, and the paragraphs that follow describe minimum staffing requirements for the UITF. Minimum staffing requirement violations are considered to be UITF Accelerator Safety Envelope (ASE) violations and must be addressed as described in Section 3.5.1 on page 3-5.

Table 3-1: Minimum Staffing Requirements for UITF Operations

NOTE: The paragraphs following this table provide information required to understand these staffing requirements.

UITF Operating Condition	UITF PSS State*	Minimum Required Staffing
• **Beam OFF**	• *OPEN*	• None
• **Beam OFF**	• *SWEEP*	• UITF Operator (within the UITF)
• **Beam ON**		
Gun Test Stand Mode • Vacuum valve VBVM101 CLOSED and locked in beamline (prevents beam acceleration)	• *RUN*	• UITF Operator (may leave the UITF, without restriction)
Accelerator Mode • Vacuum valve VBVM101 OPEN (allows beam acceleration)	• *RUN*	• UITF Operator (within the UITF)

*The UITF has three PSS states: OPEN, SWEEP, and RUN.

The staffing requirements shown in Table 3-1, above, address the possible UITF operating conditions; other constraints and conventions are as follows:

- Beam ON is defined as the UITF PSS being in the RUN State.
- Beam OFF is defined as the UITF PSS being in the OPEN or SWEEP state (a safe condition where the UITF is incapable of delivering beam of any type).
- The UITF accelerator is operated solely from the UITF Control Room.
- The UITF Operator must be stamped in.
- For staffing purposes, the “UITF” includes only the UITF Control Room (Room 1126), the laser room adjacent to the control room (Rooms 1126A&B), the UITF enclosure (Room 1127), the Rooftop areas of Cave 1 & Cave 2 (Rooms 2127/2126), the rest rooms (Rooms 1204/1205 & 1132/1133), and the walkways connecting those areas, all located in Building 58.
- Whenever a UITF Operator change occurs during a shift or when transitioning between shifts, the oncoming UITF Operator must receive a summary of the shift activities and task assignments from the off-going UITF Operator and stamp in as the UITF Operator.

3.6.3 Shift-Turnover Meeting

Between consecutive shifts of UITF running, the oncoming and outgoing UITF Operators hold a brief shift-turnover meeting to discuss the ongoing program and transfer any important operating information. Shift-turnover meetings are held in the UITF Control Room and usually last less than fifteen minutes. When shifts do

not overlap, the preshift reading described in Section 1.1.5 on page 1-8 takes the place of the shift-turnover meeting.

3.6.4 Test Plans

Test plans are procedures written by system experts to perform specific tests of UITF systems or execute tests using the UITF beam. Test plans are written and submitted using an on-line form that is a part of the web-based *UITFList* work planning system (see Section 4.2.2 on page 4-3). The form is used to provide the specific test steps, along with a variety of other critical information such as a backout plan, any safety considerations, test conditions required, and contact persons. Once submitted by the author, each beam test plan is electronically routed for review by key personnel. The test plan can either be approved for execution or rejected for revision.

The UITF Facility Manager evaluates all UITF test plans and schedules them for execution by control room staff via the *UITF Shift Plan* (see Section 1.4.2 on page 1-11).

3.6.5 Record Keeping

Accurate record keeping is an essential part of UITF operations and is required for both administrative and technical reasons. UITF operations record-keeping documents include the *UITFLog* and *Radiation Control Log*. Requests for additional record keeping by the control room staff should be directed to the UITF Facility Manager.

The UITF Operator is responsible for on-shift record keeping. The UITF Operator must enter and review these records frequently to ensure that entries clearly and accurately describe shift activities.

3.6.5.1 UITFLog

The *UITFLog* is the sequential record of the events occurring during the operation of the UITF. All information must be entered promptly, since delays often lead to incomplete or inaccurate entries. All entries require the date, time and name of the person making the entry. The *UITFLog* is a computer based electronic log book which can be accessed from https://logbooks.jlab.org/.

3.6.5.2 Radiation Control Log

Radiological activation in not expected at UITF because the maximum beam energy will be approximately 10 MeV; however, the Radiation Control Department will perform a radiation survey each time the UITF accelerator is operated at a new, historically higher beam energy or current as specified within the *Operational Restrictions*. These surveys will help identify possible areas of activation and establish trends that may predict future activation. The radiation survey sheet must be filled out in pen, signed, and dated by the Radiation Control Department staff member. The original survey sheet must be scanned, with the resulting image posted in the electronic *UITFLog* and *RADLog* (see https://logbooks.jlab.org/logbooks) and the original survey sheet placed in the Radiation Survey binder inside the UITF Control Room, which contains a record of previous surveys. Any activation of equipment will require radiological work controls or access controls, with instructions from the Radiation Control Department

conveyed to the UITF Facility Manager, who is responsible for transmitting work restrictions to all affected personnel.

3.6.5.3 Operations Problem Reports (OPS-PRs)

The Operations Problem Report (OPS-PR) system is an electronic tool used by the control room staff to notify the "owners" of systems when those systems do not function properly. OPS-PR reports shall include sufficient descriptive information and detail to allow the appropriate individual(s) to properly diagnose and correct the problem (see Section 4.2.4 on page 4-3).

3.6.5.4 Operational Restrictions

The *UITF Operational Restrictions* (see http://opsweb.acc.jlab.org/internal/ops/ops_webpage/restrictions/ops_restrictions.html) are a set of maximum operating thresholds and other restrictions that are maintained in a limited-access database. Some limits are specified as Operations Envelope limits (see Section 1.1.4.1 on page 1-6). These restrictions include but are not limited to the following:

- Energy restrictions
- Current limits
- Power limitations for dumps

The UITF Operator and any Secondary UITF Operators must be aware of all limits established in the *UITF Operational Restrictions*. Violations of the *UITF Operational Restrictions* must be addressed as described in Section 3.5.2 on page 3-5.

4 Maintenance

Maintenance refers to work performed on UITF hardware, software, or the facility itself. Examples of UITF maintenance activities include:

- Making repairs after a failure
- Periodic replacement of high-wear parts
- Fixing inspection deficiencies
- Post-repair testing
- Calibration
- Alignment
- Equipment and software upgrades

UITF maintenance tasks are carried out within the labwide resource priorities established by JLab management. Major installations may be performed either by JLab staff and/or subcontractors and, when appropriate, require either cross-divisional coordination or extensive engineering effort in the planning and execution phases and during checkout.

4.1 Personnel and Responsibilities

For JLab-related tasks, UITF maintenance is the responsibility of the UITF Facility Manager. Maintenance and project oversight for non-JLab tasks are a shared responsibility between the UITF Facility Manager and the project's Experiment Principal Investigator. The UITF Work Coordinator handles day-to-day task scheduling and oversight. Maintenance and project activities for the UITF are supported by the JLab system support groups and subcontractors, who perform maintenance tasks for the UITF, LERF, and CEBAF accelerators. Approved repairs are performed by authorized personnel.

4.1.1 UITF Work Coordinator

The UITF Work Coordinator responsibilities encompass the UITF and include coordination and scheduling of all maintenance and non-JLab installation activities.

UITF Work Coordinator responsibilities are as follows:

- Serve as the primary contact for work to be performed in the UITF.

- Coordinate and schedule the safe and efficient installation of equipment in the UITF, including new experiment equipment and UITF system modifications or upgrades to accommodate non-JLab projects.
- Maintain equipment documentation and work control documents in a central electronic repository.
- Participate in the demonstration and testing of new equipment and systems as they move from development to operational running.
- Lead focus meetings to address any potential or existing issues.

4.1.2 Accelerator Support Groups

Individual Accelerator Support Groups oversee all aspects of each UITF system (e.g., SRF, RF, DC Power, I&C) to assure system performance in support of the scheduled program. Support groups should ensure that the element data contained in the UITF Element Database (UED) (see Section 2.1 on page 2-1) matches the existing system configuration and incorporate any UED changes in a timely manner.

4.2 Directives

4.2.1 Safety Guidelines for Maintenance Activities

Maintenance and project tasks are performed within the guidelines established by the Jefferson Lab *ES&H Manual, Section 3000, Planning for Safe Operations.* Work control documents associated with these tasks include, but are not limited to, Standard Operating Procedures (SOPs), Fire Hazard Work Permits, Confined Space Work Permits, Electrical Service Work Permits, and Radiological Work Permits. Prior to performing work, the *ES&H Manual, Section 3210, Work Planning, Control, and Authorization Process* must be followed in order to properly plan the work, identify and analyze risks, and gain the required authorization.

The *UITFList* work planning tool (see Section 4.2.2 on page 4-3) contains a hazard identification worksheet that helps facilitate preliminary task hazard analysis and identify any risks associated with the planned work.

If a hazard associated with a task is not addressed by the *ES&H Manual*, then the hazard is considered unusual, and specific written approval in the form of Operating Safety Procedures (OSPs) or Temporary Operating Safety Procedures (TOSPs) is required prior to beginning the work. Guidance about hazard assessment and work control document selection and development can be found in the *ES&H Manual, Chapter 3320, Temporary Work Permits.*

When planning or performing maintenance work, unreviewed safety issues (USIs) that might arise from the work must be identified and reported (see Section 1.1.3 on page 1-5). In general, the standard industrial hazards encountered during maintenance are addressed by the *ES&H Manual*. Certain work, however, may affect systems that act as credited controls used to mitigate the known hazards of UITF operations. Such work includes, but is not limited to the following:

- UITF modifications that are not replacement-in-kind activities.
- Change-out/replacement of safety equipment that is identified in the FSAD or *UITF ASE* and not identical in form, fit, and function.

- Changes to the safety systems and equipment.

The *Unreviewed Safety Issue (USI) Procedure* (https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-16644/USI%20Procedure.doc) provides additional guidance helpful in identifying USIs and specifies the steps required to address any USI.

4.2.2 UITFList Work Planning Tool

Through *UITFList*, personnel can electronically submit tasks for approval and scheduling, serving as a means to efficiently plan and perform work that could potentially interfere with UITF operations, UITF-related work performed by other groups, or activities happening outside of UITF but within the Test Lab High Bay area. Each *UITFList s*ubmission includes task details, the potential impact to UITF operations, task hazard identification and a hazard mitigation plan, a backout plan, and supporting documentation as attachments. Once submitted, a task is automatically routed via email to the appropriate parties for comment and approval. After approval, the task waits in the pending queue until the work is scheduled by the UITF Work Coordinator or Facility Manager.

4.2.3 Bypassing System Interlocks

Interlocks constrain the operation of equipment in some fashion, either electronically or mechanically, and prevent equipment from being placed in an unintended state. The process for intentionally bypassing an interlock is specified in *ES&H Manual, Section 6112, Interlock Bypass Program*. A listing of bypassed interlocks is maintained in the Accelerator Bypassed-Interlock Log (ABIL) (http://opsweb.acc.jlab.org/abil/pro/).

It should be noted that the process for bypassing interlocks associated with the Personnel Safety System is specified in a separate document, the *PSS Configuration Management Procedure* (https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-110171/PSS%20Config%20Mgmt%20Proc%201.pdf).

4.2.4 OPS-PR Problem Reporting System

OPS-PR (Operations Problem Report) is an electronic tracking and reporting system for corrective action requests. OPS-PR entries are made using either the control screen interface or the web-based interface.

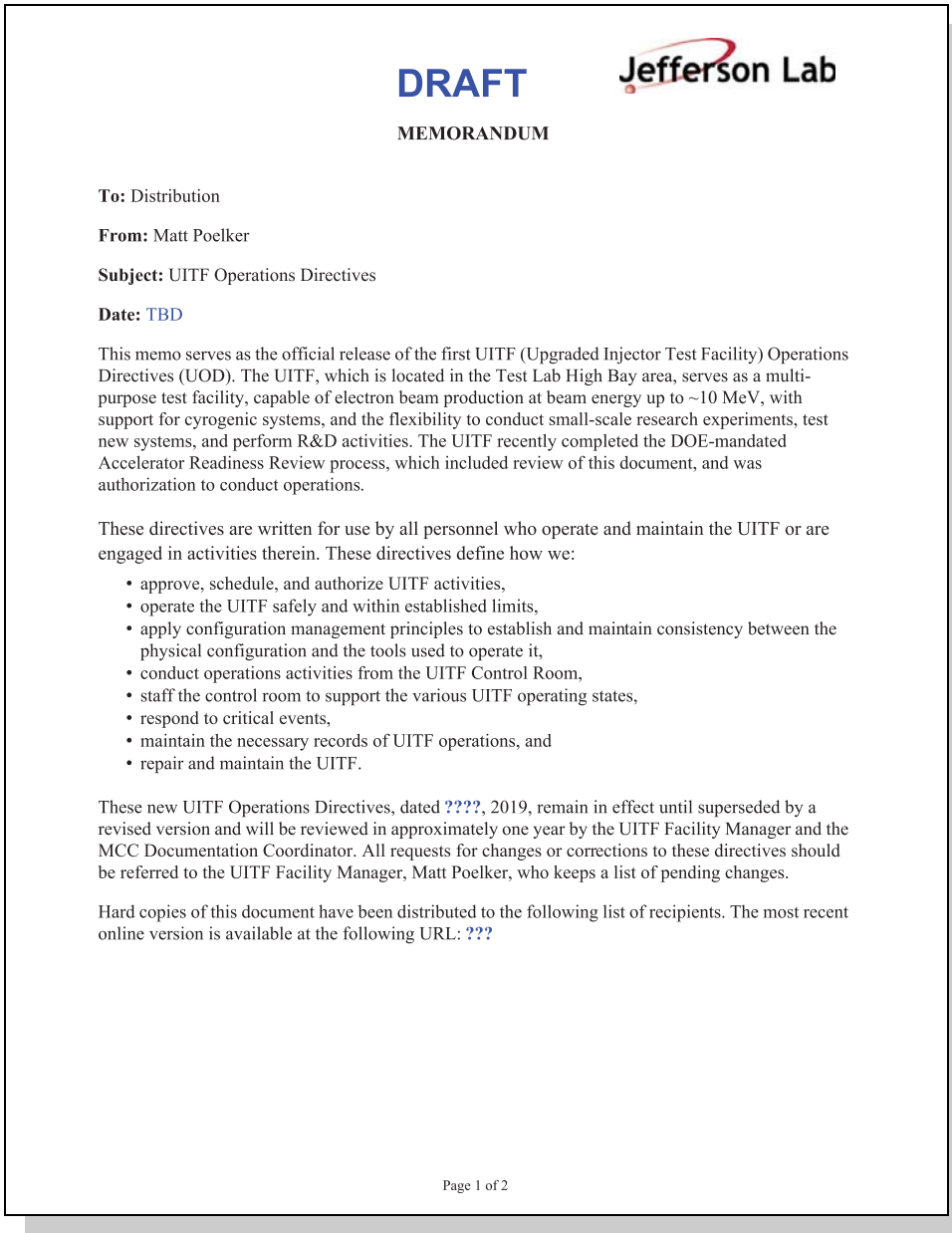
The OPS-PR initiator describes the problem and also selects from the lists of systems, groups, and regions to categorize the problem. For some common problems, guidance for a solution may be presented as the entry is made. Files can be attached, and the entry can also be associated with other similar entries. The electronic logbook(s) where the entry will appear can also be specified. When the entry is submitted, the system support group and other subscribed personnel automatically receive the entry via email; other recipients can also be entered. Once generated, an OPS-PR can be reassigned by the system support group and comments can be added as progress is made toward resolution.

Appendix A UOD Release Memo

General Description:

After each revision, the UOD is re-released under cover of the UOD Release Memo, which, after the initial release, will include a brief change summary.

Figure A-1: UOD Release Memo, p. 1



DRAFT

Jefferson Lab

MEMORANDUM

To: Distribution

From: Matt Poelker

Subject: UITF Operations Directives

Date: TBD

This memo serves as the official release of the first UITF (Upgraded Injector Test Facility) Operations Directives (UOD). The UITF, which is located in the Test Lab High Bay area, serves as a multi-purpose test facility, capable of electron beam production at beam energy up to ~10 MeV, with support for cyrogenic systems, and the flexibility to conduct small-scale research experiments, test new systems, and perform R&D activities. The UITF recently completed the DOE-mandated Accelerator Readiness Review process, which included review of this document, and was authorization to conduct operations.

These directives are written for use by all personnel who operate and maintain the UITF or are engaged in activities therein. These directives define how we:

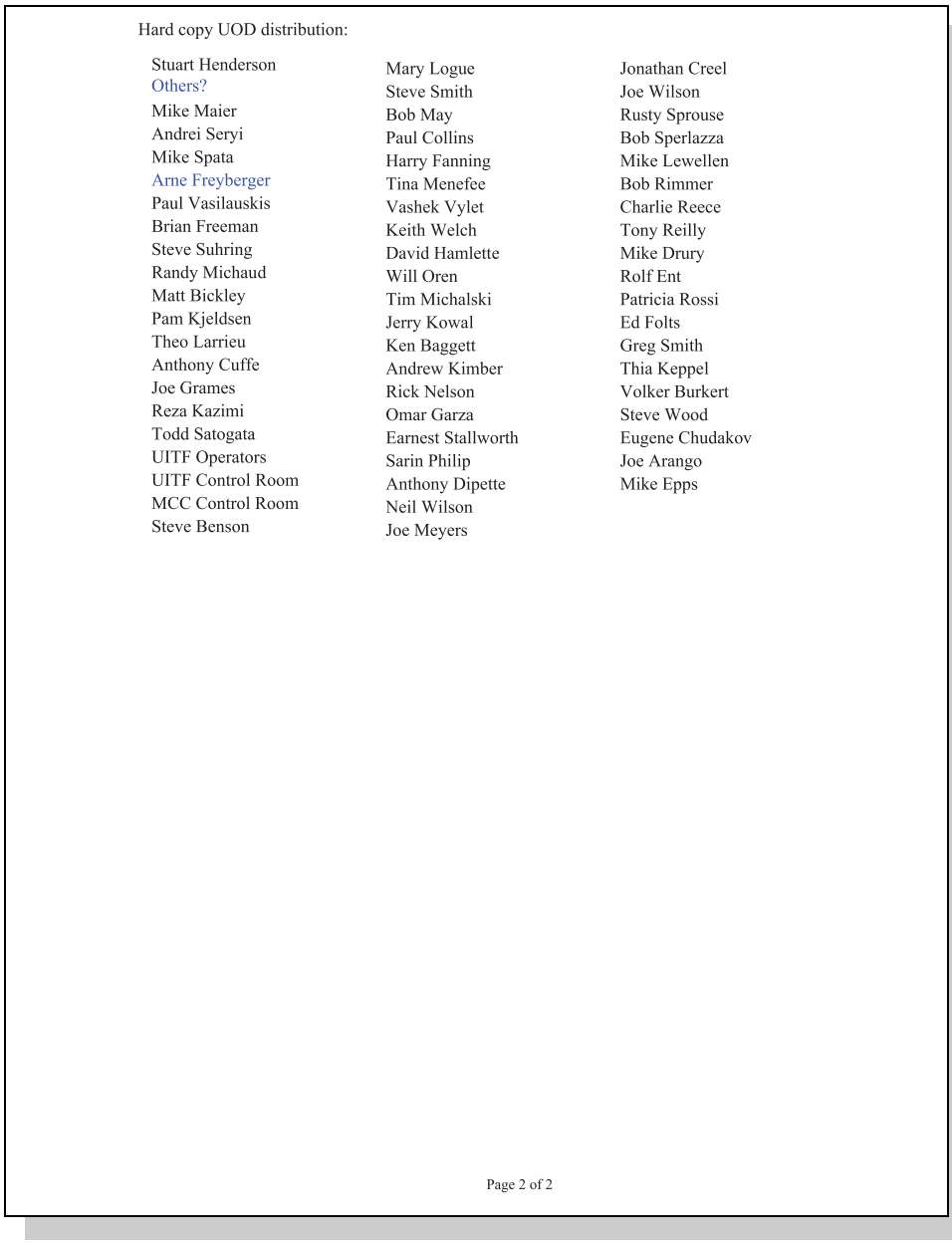
- approve, schedule, and authorize UITF activities,
- operate the UITF safely and within established limits,
- apply configuration management principles to establish and maintain consistency between the physical configuration and the tools used to operate it,
- conduct operations activities from the UITF Control Room,
- staff the control room to support the various UITF operating states,
- respond to critical events,
- maintain the necessary records of UITF operations, and
- repair and maintain the UITF.

These new UITF Operations Directives, dated ????, 2019, remain in effect until superseded by a revised version and will be reviewed in approximately one year by the UITF Facility Manager and the MCC Documentation Coordinator. All requests for changes or corrections to these directives should be referred to the UITF Facility Manager, Matt Poelker, who keeps a list of pending changes.

Hard copies of this document have been distributed to the following list of recipients. The most recent online version is available at the following URL: ???

Page 1 of 2

Figure A-2: UOD Release Memo, p. 2



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Page 2 of 2

Index

F

G

H

I

J

L

M

N

O

P

R

S

T

U

V