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Plan of Action: JASPER Management Prestart Review (Surrogate Material Experiments)

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Plan of Action: JASPER Management Prestart Review (Surrogate-Material Experiments)

December 5, 2000

Revision 1

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1. Introduction and Overview

The Lawrence Livermore National Laboratory (LLNL) Joint Actinide Shock Physics Experimental Research (JASPER) Facility is being developed at the Nevada Test Site (NTS) to conduct shock physics experiments on special nuclear material and other actinide materials. JASPER will use a two-stage, light-gas gun to shoot projectiles at actinide targets. Projectile velocities will range from 1 to 8 km/s, inducing pressures in the target material up to 6 Mbar. The JASPER gas gun has been designed to match the critical dimensions of the two-stage, light-gas gun in Building 341 of LLNL. The goal in copying the LLNL gun design is to take advantage of the extensive ballistics database that exists and to minimize the effort spent on gun characterization in the initial facility start-up.

A siting study conducted by an inter-Laboratory team identified Able Site in Area 27 of the NTS as the best location for the JASPER gas gun. Able Site consists of three major buildings that had previously been used to support the nuclear test program. In April 1999, Able Site was decommissioned as a Nuclear Explosive Assembly Facility and turned back to the DOE for other uses. Construction and facility modifications at Able Site to support the JASPER project started in April 1999 and were completed in September 1999. The gas gun and the secondary confinement chamber (SCC) were installed in early 2000. During the year, all facility and operational systems were brought on line. Initial system integration demonstrations were completed in September 2000. The facility is anticipated to be operational by August 2001, and the expected life cycle for the facility is 10 years.

LLNL Nevada Experiments and Operations (N) Program has established a Management Prestart Review (MPR) team to determine the readiness of the JASPER personnel and facilities to initiate surrogate-material experiments. The review coincides with the completion of authorization-basis documents and physical subsystems, which have undergone appropriate formal engineering design reviews. This MPR will affirm the quality of those reviews, their findings/resolutions, and will look most closely at systems integration requirements and demonstrations that will have undergone technical acceptance reviews before the formal MPR action. Closure of MPR findings will finalize requirements for a DOE/NV Real Estate/ Operations Permit (REOP) for surrogate-material experiments. Upon completion of that experiment series and the establishment of capabilities for incorporating SNM into future experiments, the team will convene again as part of the process of authorizing those activities.

2. Name of Facility Being Reviewed

This MPR addresses the execution of surrogate-material experiments at the JASPER Facility, including the two-stage gas gun and all supporting features located in Area 27, NTS.

2.1 Description of Facility

The JASPER facility is a complex consisting principally of three buildings and three trailers located behind a common security perimeter in the south–central section (Area 27) of the NTS. Area 27 occupies 130 km^2 and is comprised of the 5300 complex (Nevada Energetic Materials Operations Facility, NEMOF) and the 5100 complex (Able Site). JASPER facilities are located in Able Site, and the majority of JASPER operations will take place in this location. However, the Device Assembly Facility (DAF), located in Area 6, and the NEMOF bunkers will also be used for selected activities (i.e., assembly of the target plug and propellant preparation, respectively). Able Site is situated 8 km west of Mercury Highway, 24 km northwest of Mercury, and to the north of the NEMOF.

A siting study, conducted by an inter-Laboratory team, identified Able Site as the best location for the JASPER gas gun under development. Construction and facility modifications at Able Site to support the JASPER project started in April 1999. A Title II design review was conducted prior to facility modifications, and all facility drawings were approved by DOE/NV prior to construction. Building 5100 has been extensively modified and upgraded to house the gas gun, control room, and mechanical equipment room. A new small metal building has been added to the exterior of Building 5100 to house high-efficiency particulate air (HEPA) filters. Building 5180 will be used to assemble the primary target chamber, with its accompanying high-explosive closure valve system. Building 5191 will be used to fabricate the gas gun projectiles.

2.1.1 Facility Systems

The MPR will encompass all JASPER-related technical facilities and operations impacting safe execution of experiment operations in Area 27, NTS. The following systems, including defense-in-depth elements, will be subject to this review:

- Confinement systems:
  - Primary confinement
  - Secondary confinement
- Gas gun and experimental support equipment:
  - Gas gun
  - Gun firing system
  - Gas supply system
  - Vacuum and vent system
  - Alignment system
  - Ultrafast closure valve system trigger system
  - Velocity/timing measurement systems:
    - Optical beam break sensors

    - Continuous wave x-ray system
    - Flash x-ray system
- Safety support systems:
  - Control system
  - Fire protection system
  - Chemical/radiological monitoring systems
  - Lightning protection system
- Utility distribution systems:
  - Electrical system
  - Wastewater system
  - Communications systems
  - Water supply
- Auxiliary systems and support
  - Material handling systems
  - Compressed air system
  - Heating, ventilation, and cooling system

2.1.2 Facility Processes

The functionality of systems will be judged in their safe support of the following experiment execution processes:

- Transportation and loading/unloading operations for target assemblies, high explosives, and propellant
- Experiment preparation, assembly, and installation operations
- Diagnostics operations
- Pre-experiment operations
- Gun firing and safing activities
- SCC safing and reentry activities
- Cleanup and waste processing and disposal

2.1.3 Hazard Categorization

JASPER is categorized as a Radiological Facility on the basis of the postulated radiological release from three bounding accidents. These accidents include (1) failure of

the Ultrafast Closure Valve System, (2) Primary Target Chamber dropping accident, and (3) fire in Building 5180 during PTC assembly. Additional non-radiological hazards considered in the Hazard Analysis Report (HAR) include:

- Hydrogen.
- High explosives.
- Propellant.
- Radiation-generating devices.
- Lasers.
- High-voltage components.
- Fire.

Additional hazards (of a more industrial nature) addressed in the Facility Safety Plan (FSP) include:

- Pressure systems.
- Machine shop operations.
- Hazardous chemicals.
- Cryogenic liquefied gases.
- Oxygen-displacing chemicals.
- Industrial hazards.

2.2 Identification of Responsible Readiness Review Organization

LLNL Nevada Experiments and Operations (N) Program.

2.3 Designation of Action as New Start or Restart

The establishment of the two-stage gas gun and its operation are significant new uses for this location. This review is for a new start.

2.4 Proposed Breadth of Review

This MPR for surrogate experiments at JASPER will address the adequacy and acceptability of safety documentation and implementation of safety features, training requirements and execution, system maintenance plans and demonstrated follow-through, and environmental documentation and compliance. The team will judge the effectiveness of completed process reviews in those areas so treated, looking at the qualifications of the reviewers and the closure of findings, if any. The team will pay close attention to the integration of these sub-components into the completed facility, in particular in areas

crossing organization boundaries. The structure of the process to be used is outlined in the *Implementation Plan for JASPER MPR (Surrogate-Material Experiments).*

2.4.1 Safety Documentation

Review objective is to determine that:

- The safety documentation as summarized by the FSP and Integration Work Sheet (IWS) are consistent with the JASPER HAR and are satisfactory for safe JASPER operations, and that there are adequate and correct procedures and safety limits for operating the process systems and utility systems.
- The design basis and baseline configuration are adequately documented.

2.4.2 Training and Qualification

Review objectives are to determine that:

- Training and qualification programs for operations and operations support personnel have been established, documented, and implemented.
- Level of knowledge of operations and operations support personnel is adequate based on reviews of examinations and examination results and selected interviews of operating and operations support personnel.
- There are sufficient numbers of qualified personnel to support safe operations.
- The technical and management qualifications of contractor personnel responsible for facility operations are adequate.

2.4.3 Controls

Review objectives are to determine that:

- The facility systems and procedures are consistent with the description of the facility, procedures, and accident analysis included in the HAR.
- A program is in place to confirm and periodically reconfirm the condition and operability of safety systems, including safety-related process systems and safety-related utility systems. This includes examinations of records of tests and calibration of safety system and other instruments that monitor limiting conditions of operation or that satisfy Operational Safety Requirements. All systems are currently operable and in a satisfactory condition.

2.4.4 Roles and Responsibilities

Review objectives are to determine that:

- Formal agreements establishing requirements are in place between DOE/NV, BN, and LLNL that govern the safe operations of the facility.

- Functions, assignments, responsibilities, and reporting relationships are clearly defined, understood, and effectively implemented with line management responsibility for control of safety.

2.4.5 Integration and Management

Review objectives are to determine that:

- Management programs are established, sufficient numbers of qualified personnel are provided, and adequate facilities and equipment are available to ensure operational support services (e.g., training, maintenance, waste management, environmental protection, industrial safety and hygiene, radiological protection and health physics, emergency preparedness, fire protection, quality assurance, criticality safety, and engineering) are adequate for operations.
- A startup test program has been developed that includes adequate plans for graded operations testing to simultaneously confirm operability of equipment, the viability of procedures, and the training of operators.
- A routine and emergency operations drill program, has been established and implemented.
- A process has been established to identify, evaluate, and resolve deficiencies and recommendations made by self-assessments, oversight groups, official review teams, and audit organizations.

3. Review Prerequisites

Review prerequisites include completion or acceptance of the following:

- System integration tests supported by startup Phase II operations Operational Safety Plan (OSP), Integration Work Sheet (IWS), and DOE/NV Real Estate/ Operations Permit (REOP).
- A startup plan for Phase II and Phase III operations.

The MPR will be part of the process for completing requirements, including updating the above documentation for Startup Phase III operations: firing the gun for system checkout with surrogate-material experiments.

4. Estimated Review Start Date and Duration

The MPR actions will take place from October through December 2000. It is anticipated that the formal review process will require about eight days, followed by about two weeks to complete the Final Report, address findings, and close action items.

5. Review Team Leader

Wilson E. Cooper has been designated as the MPR Team Leader.

6. Official to Approve Startup

M. R. Anastasio, Associate Director for Defense and Nuclear Technologies (DNT) Directorate is the official to approve startup.

7. Preparers, Reviewers, and Approver

This document will be prepared by:

- Review Team Leader: Wilson Cooper.
- MPR members: Tony Davito, Gordon Krauter.

This document will be reviewed by:

- JASPER Project Manager: Ted Valk.
- JASPER Test Director: Mark Martinez.
- JASPER Facility Manager: Gene Christensen.
- DNT Assurance Manager: Bill Vance.

This document will be approved by:

- N Program Leader: Larry Nattrass.
- DNT Associate Director: Mike Anastasio.

8. Distribution

This document will be distributed to the following:

- JASPER MPR team members.
- JASPER project management.
- N Program management.
- DNT management.
- DOE/NV management.
- BN management.

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