



12 GeV CEBAF Upgrade

Risk Management Plan

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Original CD-2	4/01/05 5/29/07	All All	General update to maintain consistency with all CD-2 documents.

12 GeV CEBAF Upgrade

Risk Management Plan

1. Introduction

- 1.1 The upgrade to Jefferson Lab's Continuous Electron Beam Accelerator Facility (CEBAF) proposes to double the energy of the electron beam to 12 GeV (billion electron volts). Other key elements of the upgrade are the addition of a fourth experimental hall equipped with state-of-art detectors, and upgrades of up to three existing halls. The 12 GeV Upgrade would provide much more precise data on the structure of protons and neutrons as well as open up new physics regimes for study.
- 1.2 The purpose of this document is to describe the Risk Management Plan for the 12 GeV CEBAF Upgrade project. A disciplined risk management process will allow the project team to forecast and manage risks before they become serious issues. When established, risk mitigation plans will support the project team in performing informed decision-making, optimizing resource allocation and use, and coordinating trade studies against cost, schedule, and technical performance goals.
- 1.3 This plan provides a brief description of the risk management processes (risk identification, risk analysis, risk handling, risk monitoring, and risk documentation) to be used in carrying out this important effort.

2. Definitions

2.1 Risk

Risk is a measure of the potential inability to achieve overall project objectives within defined cost, schedule, and technical constraints. Risk has two components: the probability/likelihood of failing to achieve a particular outcome; and the consequences/impacts of failing to achieve that outcome.

2.2 Risk Events

Risk events are the elements of an acquisition that should be assessed to determine the level of risk, i.e., things that could go wrong in a project. The events should be defined to a level where an individual can comprehend the potential impact and its causes.

2.3 Risk Management

Risk management is the act or practice of dealing with risk. It includes planning for risk, assessing (identifying and analyzing) risk areas, developing risk-handling options, monitoring risks to determine how they have changed, and documenting the overall risk management program.

2.4 Risk Planning

Risk planning is the process of developing and documenting an organized, comprehensive, and interactive strategy and methods for managing project risk. This includes identifying and tracking risk areas, developing risk handling plans, performing continuous risk assessments to determine how risks have changed, and assigning adequate resources. The result is the project Risk Management Plan.

2.5 Risk Identification

Risk identification is the process of examining the project areas and each critical technical process to identify and document the associated risk events.

2.6 Risk Analysis

Risk analysis is the process of examining each identified risk area or process to refine the description of the risk, isolate the cause, and determine the effects. It includes risk rating and prioritization in which risk events are defined in terms of their probability/likelihood of occurrence, severity of consequence/impact, and relationship to other risk areas or processes.

2.7 Risk Handling

Risk handling is the process that identifies, evaluates, selects, and implements options in order to set risk at acceptable levels given project constraints and objectives. This includes the specifics on what should be done, when it should be accomplished, who is responsible, and the associated cost and schedule.

2.8 Risk Mitigation

Risk mitigation is the process that describes the actions taken to control an identified risk event by risk reduction, transfer, or elimination.

2.9 Risk Monitoring

Risk monitoring is the process that systematically tracks and evaluates the performance of risk-handling actions against established metrics throughout

the acquisition process and develops further risk-handling options, as appropriate.

2.10 Risk Documentation

Risk documentation is the process of recording, maintaining, and reporting the results of risk assessment, handling, and monitoring processes.

3. Jefferson Lab Project Organization

3.1 12 GeV Project Manager (Contractor Project Manager)

- Plan, organize, direct, and control the risk management process
- Advise the project team on project risk and its mitigation
- Authorize expenditure of resources to support approved risk handling plans
- Schedule periodic reviews of project risks at least semi-annually
- Approves the Risk Management Plan and any future revisions

3.2 12 GeV Deputy Project Manager

- Serve as the overall Risk Management Coordinator
- Develop and maintain the Risk Management Plan
- Administer the risk management process
- Evaluate risk assessments, risk handling plans and risk monitoring results
- Develop and maintain the risk documentation
- Plan, organize, and direct semi-annual review process for project risk

3.3 12 GeV Associate Project Managers

- Participate in the risk management process of their WBS systems including risk identification and analysis
- Integrate risk information from all Assistant Project Managers
- Assure that risk analyses results are appropriately handled, monitored, and documented
- Inform the Project Director about any significant risks and the status of risk mitigation strategies of their WBS systems

3.4 12 GeV Assistant Project Managers

- Participate in the risk management process of their WBS element
- Identify new risks, estimate probability of occurrence and determine impacts to the project
- Assist in risk prioritization and recommend handling actions
- Implement risk mitigation plans

3.6 12 GeV Federal Project Director (FPD)

- Ensure the development of an effective 12 GeV Risk Management Program, which includes the development of a Risk Management Plan, Risk Assessment Matrix, Risk Document Forms, and Risk Registry.
- Monitors effective implementation of the contractor's Risk Management Program
- Concurs on the Risk Management Plan and any future changes

4. Risk Management Process

4.1 Risk Identification

Risk identification begins by compiling the project's risk events. Along with their Assistant Project Managers, the Associate Project Managers should examine and identify project events by reducing them to a level of detail that permits an evaluator to understand the significance of any risk and identify its causes, i.e., risk drivers. This is a practical way of addressing the large and diverse number of potential risks that often occur in acquisition projects. Risk events are best identified by examining each WBS product and process element in terms of the sources or areas of risk.

4.2 Risk Analysis

- A. Risk analysis is a systematic evaluation of identified risk events by determining the probability of occurrence and consequences, assigning a risk rating based on the established criteria, and prioritizing the risks.
- B. The first step in the risk analysis process is to determine for each risk event the probability that the event will occur. For the 12 GeV CEBAF Upgrade project, likelihood will be determined in each of three areas: technical, schedule, and cost.

Risk Probability	
Likelihood	Probability of Occurrence
High	$\geq 90\%$
Moderate	$\geq 50\%$
Low	$< 50\%$

- C. The next step in the risk analysis process is to determine for each risk event the magnitude of the consequence should the event occur. For the 12 GeV CEBAF Upgrade project, consequences will be determined in each of three areas: technical, schedule, and cost.

Risk Consequence			
	Low	Moderate	High
Technical Impact	Minor degradation of performance	Significant degradation of performance	Desired performance in doubt
Schedule Impact	Delays major milestone or project critical path by < 1 month	Delays major milestone or project critical path by ≤ 3 months	Delays major milestone or Project critical path by >3 months
Cost Impact	$\leq \$300K$	> \$300K	> \$1M

- D. Once the level of likelihood and the consequences of a risk event have been determined, a risk rating can be assigned to the risk event. This rating is a reflection of the severity of the risk and provides a starting point for the development of options to handle the risk.

Risk Rating			
	Consequence		
Likelihood	Low	Moderate	High
High	Moderate	High	High
Moderate	Low	Moderate	High
Low	Low	Low	Moderate

- E. At this stage in the risk analysis, a risk rating has been established for each risk. The final step is to prioritize the risk events in the order of importance. Prioritization will be based on the following criteria:

- Risk Rating: High/Moderate/Low
- Consequence: Within each rating, the highest value of consequence
- Likelihood: The probability of occurrence

Risk handling plans and the allocation of risk management resources will be dictated by the ranking of the risk events.

4.3 Risk Handling

- A. There are four approaches to handling risk:

- Risk Acceptance: An acknowledgment of the existence of a particular risk situation and a conscious decision to accept the associated level of risk without engaging in any special efforts to control it. A general cost and schedule reserve may be set aside to deal with any problems that may occur as a result of various risk acceptance decisions. This approach is most suited for those situations that have been classified as low risk.
- Risk Avoidance: A change in the concept, requirements, specifications, and/or practices that reduce risk to an acceptable level. Simply stated, it eliminates the sources of high or possibly moderate risk and replaces them with a lower risk solution and may be supported by a cost/benefit analysis.
- Risk Control: Not an attempt to eliminate the source of the risk but a plan to reduce or mitigate the risk event. It monitors and manages the risk in a manner that reduces the probability and/or impact of its occurrence or minimizes the risk's effect on the project.
- Risk Transfer: Reallocation of the risk during the concept development and design processes from one part of the system to another, thereby reducing the overall system risk.

B. For all risk events, the various handling techniques will be evaluated in terms of feasibility, expected effectiveness, cost and schedule implications, and the effect on the system's technical performance. For those risk events rated High or Moderate, a risk mitigation plan will be developed. Risk mitigation plans identify the activities to reduce the probability of the occurrence of a particular risk and/or to minimize the adverse impact of the occurrence of a particular risk event. Each risk mitigation plan will contain:

- Statement of risk/problem
- Assessment of risk/problem
- Consequence of risk occurrence
 - Performance level (attribute) loss
 - Schedule slip
 - Cost overrun
- Identification of other risk areas or handling plans which may be impacted
- Alternatives considered with risk and cost of each
- Implementation start date and key milestone schedule
- Criteria for closure of risk event
- Responsible organization and individual

4.4 Risk Monitoring

Risk monitoring is the systematic tracking and evaluation of the progress and effectiveness of risk handling actions. By comparing the predicted results of planned actions with the results actually achieved, the need for any change in risk handling plans can be determined. All identified risks will be reassessed at least semi-annually with higher frequency for those rated Moderate and High. Monitoring results may also provide a basis for developing additional risk handling options and identifying new risks. The status of risk handling actions for all Moderate and High risks will be an agenda item at each weekly 12 GeV Integrated Project Team meeting, as well as the weekly 12 GeV Change Control Board and management meeting.

4.5 Risk Management Documentation

A. Risk Document Form (Exhibit A)

A Risk Document Form will be completed by the Associate Project Managers and submitted to the Risk Management Coordinator when a potential moderate or high risk event is identified (usually, but not always, by the Assistant Project Manager or Senior Team Leaders). The Risk Document Form will be updated as the risk assessment, handling, and monitoring functions are executed. The collection of Risk Document Forms will form a project risk database which the Risk Management Coordinator will oversee.

B. Risk Assessment Matrix (Exhibit B)

The 12 GeV CEBAF Upgrade Risk Assessment Matrix will contain a summary of the risk assessment for each Level 3 WBS element. Each Associate Project Manager is responsible for reviewing and maintaining accurate risk management data in the Risk Assessment Matrix for their WBS system. The Risk Management Coordinator will assist the Associate Project Managers in this effort. Any overall risk rating of moderate or high will require the preparation of a Risk Document Form to detail the specific risk and the mitigation plan. The Risk Assessment Matrix is a dynamic document throughout the life of the project and will be updated as required, but at least semi-annually, based on the addition or elimination of moderate and high risks.

C. Risk Registry Document (Exhibit C)

The 12 GeV CEBAF Upgrade Risk Registry is a risk management tool

for tracking those project risks with an overall risk rating of moderate or high. For each risk assessed as overall moderate or high, a Risk Document Form will be completed and that item will be added to the Risk Registry for tracking purposes. The Risk Registry is a dynamic document throughout the life of the project and will be updated as required based on the addition or elimination of moderate and high risks.

Exhibit A
Risk Document Form

12 GeV CEBAF Upgrade Risk Document Form		
Risk ID: <Sequence number>	WBS: <WBS element number>	Report Date: <Date this risk report was last updated>
Description: <Describe each risk in the form “condition – consequence”.>		
Probability: <What’s the likelihood of this risk becoming a problem?>	Impact: <What’s the damage if the risk does become a problem?>	Risk Rating: <Probability plus Impact determines risk rating.>
First Indicator: <Describe the earliest indicator or trigger condition that might indicate that the risk is turning into a problem.>		
Mitigation Approaches: <State one or more approaches to control, avoid, minimize, or otherwise mitigate the risk. Mitigation approaches may reduce the probability or the impact.>		
Date Started: <State the date the mitigation plan implementation was begun.>	Date to Complete: <State a date by which the mitigation plan is to be implemented.>	Owner: <Assign each risk mitigation action to an individual for resolution.>
Current Status: <Describe the status and effectiveness of the risk mitigation actions as of the date of this report.>		

Exhibit B

Risk Assessment Matrix

[illegible]

Exhibit C

Risk Registry

[illegible]