

# **MICE - Resource Loaded Schedule Review (RLSR) Nov 13<sup>th</sup> 2013: Panel Report**

*Professor Ian Robson, Panel Chair, Nov 16<sup>th</sup> 2013*

## **Introduction**

The RLSR was held at the RAL on the above date. The previous Review of May 2013 had requested the project and funding agencies to answer a series of recommendations and actions; these are given in Appendix 1. The charge to the Panel is given in Appendix 2 and the Panel members in Appendix 3.

The project has responded well to these challenges and the quality of work in the papers leading up to the meeting was impressive. The project answered all the *recommendations* to the best of their ability and available information and the project is encouraged to build on these new tools (such as the dashboard) for future meetings. However, this positive aspect was negated significantly by the unacceptably late delivery of the papers and the inability to read much of the multicoloured material on a laptop screen, or an A4 printout. This should not be allowed to happen again as it detracts from the high quality of the work that had been produced by the project.

Unfortunately, the Panel did not receive any written input to our questions from the funding agencies; however, these were discussed in the closed session. The outcomes are that the UK issues are still ongoing (see recommendations) and that the timeliness of MICE with regard to the US muon programme is such that a demonstration of cooling by the end of the decade is now seen to be adequate.

Regarding the two *actions* from the previous meeting; there is still some work to be done on undertaking an analysis of the cost of risk mitigation to the same level on both UK and US sides to determine the potential impact on schedule and cost-to-completion by the autumn round of meetings in 2013. This is reflected in recommendation 1 (see below).

Technical progress on the project has been positive in the last six months with the arrival at RAL of numerous items of equipment, such as the RF amplifier, 11 crates of material from the University of Mississippi, the electron muon ranger (EMR) detection system and the first of the spectrometer solenoids. Progress in other areas is also going well. The technical review of the magnetic shielding in the hall provided a very positive result that is now being taken forward.

On the other hand, the testing of the first Focus Coil Module (FC#1) was disappointing in that it barely achieved the minimum current required in the more challenging of the two operating modes resulting in no margin whatsoever. This has potential implications for the science achievable and a critical decision point will arrive when the second Focus Coil is tested in the very near future. The project has produced a decision tree that covers the possible outcomes and ways forward.

## **Project Management**

There have been a number of changes to key personnel within the project since the last meeting, with some of the decisions having only been taken just before this meeting. Professor Alain Blondel decided not to seek re-election as Project Spokesperson and Professor Ken Long was elected unanimously to this role. At the meeting the Panel thanked Alain for his strong leadership and enthusiastic work over the many years of the Project. This change also means that Professor Long will need to relinquish his role as UK-PI. A replacement is in progress.

The Mice International Project Office (MIPO) that was introduced for the previous RLSR has undergone some change in the light of experience over the summer. The International Project Manager is now Roy Preece and a new post, the Project Engineer, is Andy Nichols. This post is effectively responsible for the UK host lab construction efforts. Another new post (or redefinition of tasks) is that of UK Project Associate, which is effectively a planning engineering post and is occupied by Alan Grant. A number of the previously vacant posts have now been filled.

As the international project looks towards operations in Step IV and beyond, it has identified the need for another management tier, the Mice Experimental Management Office (MEMO). This is work in progress and is intended to provide overlap with the UK and US construction project (through the MIPO). Two posts in the MEMO are currently vacant but work on recruitment to these is in hand. It turns out that neither the MEMO nor MIPO appeared in the original Charter for the project and the MICE Executive Board is seeking to address this.

The Panel felt that there was still some way to go in fully integrating the two sides of the project. This will be a challenge for the new Project Manager and will be reflected in the delivery of some of the recommendations for the next meeting of the RLSR (see below).

## **Finance**

On the US-side further progress has been made of refining the cost planning, including schedule risk and R&D risk. One outcome of this is that Step VI is 29% of US total without risks being taken into account. Information such as this is crucial in being able to determine the cost-benefit of how the project should proceed beyond Step IV (see Recommendations). While the US is not subject to a flat-cash spending profile, nevertheless, there is a belief that within the MAP programme there is an annual ceiling of around \$5M gross spend (including contingency). It is anticipated that this figure might be hit during a couple of years later in the project and this could result in an impact on the schedule.

There continues to be a major question about the lack of UK contingency (or working margin) and how this affects the risk-based schedule. It is important that the UK (STFC) clarifies its position as to what it can and will do with regard to flat-cash funding or otherwise. The UK project has (or soon will) provide data about what it feels it really needs (working margin and contingency) to the Project Sponsor. It is imperative that a decision on this is made urgently (see Recommendation) as this flows directly into a realistic schedule

and resource delay implications. Following the same theme of funding allocations, it is also now urgent that the Project Sponsor advises the project about the 'permitted overspend' within this financial year, as this figure has now increased significantly.

It became clear during the Review that the impact of the partial return yoke shielding on UK costs and schedule for Steps V and VI has not yet been taken into account. While this impact occurs somewhat downstream, it must be addressed as a matter of urgency, at least for a first cut estimate (see Recommendations).

Good news was reported in that the concern over the project being charged VAT on goods imported from the US has been removed in that STFC has agreed to cover this should it be charged.

### **Staffing and other resources**

Progress has been made in filling some of the vacancies although there have been some resignations. The project appears to be in a healthier position than at the last meeting, but there is still some way to go before all staff are in place. There is still some uncertainty as to whether all the staffing posts identified can be currently funded (on the UK side). Should no increase in allocation be realised (see above) then difficult choices will have to be made and this will inevitably lead to a schedule slip.

### **Schedule**

This is an area where there is still work to be done to produce a unified schedule that takes on-board the risks across the project. The Panel accepts that this does not have to be very detailed, but should be done at a top-level plan with key, milestones and deliverables. The project has this information and presented these key dates and deliverables, but it needs to integrate it into a single, coherent plan that is transparent to reviewers.

As a result of the US reworking the risks and deliveries and incorporation of the shielding for Steps IV, V and VI, the overall schedule has slipped since the last meeting. Completion of Step V installation has moved back by 14 months to August 2018 and Step VI by 13 months to May 2020. The UK plan has not, as yet, managed to catch up with these recent changes, hence having a single integrated schedule for the next meeting is imperative. The entire question of the plan beyond step IV remains an open issue and is something that needs to be considered by the Funding Agencies no later than early 2015.

An opportunity has arisen in that it may be possible to claw-back some of this slippage (and save money) by using the prototype cooling coil that is at the MuCool Test Area (MTA) at Fermilab. If this achieves acceptable performance criteria for use in MICE operation, there would be an opportunity to remove it from the MTA and use it in MICE. This would make a significant saving of schedule and also cost. The decision point about whether to take this route occurs in early 2016 and has been added to the decision list.

## **Risk and risk mitigation**

Good progress has been made on addressing how to handle risks. The risk registers appear to be comprehensive and realistic. It is now very important that the US and UK agree on how to handle these risks and to feed this information either into the schedule, to provide a risk based schedule including 'slack', or to produce 'delay estimates' based on risks and probabilities when looking at key milestones. The UK work on 'best case', worst case' and 'mitigation cost' was good but needs taking further in terms of providing a 'realistic baseline' and 'most likely' risk-based schedule scenario.

It is accepted that assessing risk on an individual R&D piece of work is difficult and the US approach of taking half of the risks overall seems a pragmatic way forward. It is also acknowledged that the UK risks are more resource driven due to the funding situation. There is an ongoing concern that with the current flat-cash planning assumptions on the UK side, with zero contingency and working margin, it is inevitable that there will be continued schedule slip due to constant fire-fighting within limited staff resources. However, whether this impacts the critical path is as yet unclear, hence the need to have a unified approach and single risk-based schedule (see below).

## **Recommendations**

1. Complete the first action from the previous meeting. While the Panel appreciates the work to date it feels there is a need for more coherence between the two sides, especially the embedding of risk-contingency into schedule.
2. Produce a coherent single project plan that takes into account anticipated delays due to risk (and the R&D risks) by the next meeting.
3. Produce a *single*, coherent financial report for the project taking into account the schedule above by the next meeting.
4. Ensure that all workpackages are adequately integrated into the overall cost and schedule
5. Encourage, through the Project Engineer, the project to develop more rigorous integration protocols across the project, such as acceptance criteria, to minimise schedule delays.
6. The UK Project Sponsor should notify the project about the 'permitted overspend' for this financial year as a matter of urgency.
7. The STFC needs to determine the ongoing annual spend planning assumption (flat cash or enhanced) for the project as a matter of urgency.
8. Ensure a first cut estimate of the Step V and VI partial return yoke concept is folded into the UK funding requirements.
9. Following the good work done on establishing the criteria for the successful conclusion of Step IV, the project now needs to focus on looking at how to decide for Step V versus Step VI as it no longer looks like going to V and then VI sequentially is the most optimum option (this is not critical at this point but that decision point and the science trade-offs needs to be continually borne in mind by the project and the funding agencies).

## **Appendix 1: Recommendations and Actions from the RLSR of May 2013**

### **Recommendations to the Project**

1. Develop a risk-cost-benefit decision tree that shows how decisions regarding performance, cost-schedule trade-offs might be taken, for the next round of oversight meetings in the autumn 2013.
2. Complete the financial analysis presented in the meeting of the savings of not proceeding beyond Step V by the autumn round of meetings.
3. Perform a cost-benefit analysis to support the final decisions on potential delays to key staff appointments by autumn.
4. Establish a set of criteria for the demonstration of the successful conclusion of Step IV for the autumn round of meetings.
5. Update the project schedule to present the best, most probable and worst-case dates for Steps V and VI by autumn.
6. Identify a set of appropriate intermediate milestones as a means of monitoring and reporting progress by autumn.

### **Recommendations to the Funding Agencies**

1. Analyse the re-profiling of allocation between financial years for specific items in order to maintain schedule by October 2013.
2. Clarify the timeliness of the MICE project outcomes within MAP and the future muon programme in the US by autumn 2013.
3. Re-examine the availability of funding for the MICE project in the UK in light of progress and developments on the US side.

### **Actions to the Project**

1. Undertake an analysis of the cost of risk mitigation to the same level on both sides to determine the potential impact on schedule and cost-to-completion by the autumn round of meetings in 2013.
2. Identify and recruit appropriate external specialists as members of the review panel assessing the stray magnetic fields in the MICE Hall that will be held at RAL in August/Sept 2013. Planning for the review should be starting now.

## **Appendix 2: The Charge**

February 20, 2013, C. Jamieson, B. Strauss

### **Charge to the MICE Resource Loaded Schedule Review Panel**

As the MICE project moves towards completion the various funding and support agencies would like to resolve, in detail, the financial and human resources that are required for completion. Modern project planning software is capable of estimating the most likely schedule as well as the quickest and longest schedules. The effects of potential budget fluctuations, the availability of personnel and the possibilities of manufacturing crises can also be taken into account for the simulations. This can be linked to a risk register that clearly identifies the effects of these major risks (schedule/cost) and the mitigation actions. STFC, the USDOE, and the USNSF therefore ask the panel to review and comment on the following:

1. Given a detailed resource limited, year by year schedule for the project to completion from each of the members of the collaboration, how reasonable are the assumptions taken with respect to technical issues? What is the sensitivity to funding profiles and to the availability of qualified personnel? Is the critical path clearly identified with the major risks associated with the technical/resource issues and the steps that the collaboration intends to take to mitigate these risks clearly set out?
2. Do the schedules presented adequately consider beam line commissioning and operating costs based on recent experience, *e.g.* the solenoid commissioning? Are appropriate estimates of liquid helium replacement and recovery times properly taken into account?
3. Please remark on the detailed plans for the integration and commissioning of the MICE experimental line.
4. Please comment on whether the collaboration has planned for the allocation of shared resources as well as national interface and support issues.
5. Novel hardware is required for the MICE experiment. Please comment on the collaboration's assumptions about the rate at which novel challenges also arise, and about the rate at which they can be handled.

The panel should be prepared to give a debriefing at the conclusion of their two days of deliberations, and should submit a detailed report to Grahame Blair within two weeks of the review.

### **Appendix 3: The RLSR Panel**

Professor Ian Robson	STFC (Chair)
Dr Steve Peggs	Brookhaven National Lab
Dr Jim Kerby	Argonne National Lab
Mr Ron Prwivo	Brookhaven National Lab
Dr Tom Taylor	CERN

#### In attendance

Mrs Charlotte Jamieson	STFC
Dr Bruce Strauss	DOE