

M E M O R A N D U M

To: Members of the RRB via J Engelen - RRB Chair
From: M&O Scrutiny Group¹
Subject: M&O Scrutiny Group Report for the October 2006 RRB

Introduction

The RRB Scrutiny Group (SG) met twice after the April 2006 meeting of the RRB, at the end of May and at the end of August. In both cases special sessions with the Resource Coordinators took place. In addition, subgroups of the SG met with the experimenters in between the two plenary meetings. The tasks of the SG were to review the collaborations' spending of the 2005 budget, to review their 2007 cost estimates and to comment on the sharing of 2007 Cat. B costs.

The Group met with J Engelen at the end of their Spring meeting.

As in the past, the work of the SG has been greatly facilitated by the quality of the documentation provided by the Resource Coordinators and their competence in addressing the questions raised by the SG. The SG has pursued the goal of defining a set of common tables to be used by all experiment for their budget and cost reports and projections but, although there is progress, the effort is still ongoing.

1. Year 2005 Cat. A spending overview (w/o power)

Experiment	Estimates	Spent and committed
ALICE	1560	1467
ATLAS	4479	4739
CMS	3585	3517
LHCb	852	749

Table 1 – 2005 M&O Category A budget versus actual expenditure (kCHF).

1.1.1 Missing contributions

The SG acknowledges the continuous progress in recovering missing contributions. Three collaborations have now defined and agreed procedures to deal with those cases where Funding Agencies persist in delaying or neglecting M&O Cat. A payments. The Collaboration Board of LHCb has set up a WG to make such rules but they are not yet formally adopted.

The SG does not want a certain level of non-payment to become regarded as acceptable. We will be interested to see if the procedures to remove names from papers actually have an impact.

1.1.2 Budget under- and over- spending

The SG took note that at the 2006 April RRB meeting, a document describing a mechanism of implementing refunds of M&O accounts surpluses was made public. In addition, the document addressed the occurrence of shortfalls and over-spending, introducing for the first time the possibility for the experiments to over-draft the M&O accounts beyond the amount of collected contributions and, with explicit approval by the chair of the RRB, even beyond the approved budget. The SG appreciates the fact that guidelines for dealing with such special circumstances are now defined, though it might have been appropriate to include, in the new procedures, consultation with the chair of the SG.

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1.1.3 Cost reporting

The four experiments have so far chosen to breakdown their expenditures and commitments at different level of details, in their annual reports. Although in the past such differences may have been justified by the different M&O ramp-up rates, M&O budgets have now reached for all experiments levels that are close to the projected plateau. Therefore the SG deems it appropriate to ask in the future for reports with a breakdown at level 2, i.e., the same degree of detail used in the budget proposals. Such information will be very valuable in assessing future needs, not just for the SG, but also for the experiments. The SG appreciates, though does not fully understand, the difficulties Resource Coordinators may face in allocating some costs to specific level 2 line items. However special cases should not be taken as a justification for not reporting the majority of the costs that are clearly associable with the appropriate level 2 budget items.

In addition, all experiments should deliver at the May meeting a summary of the actual costs/commitments for the past year, at level 1, as well as a summary of the contributions received, such that a balance can be made for cost vs. budget vs. funds for this all previous years. The SG has developed a template that will be given to the experiments to facilitate the adoption of a common format for such reports.

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The SG discussed general issues that are common to all LHC experiments.

1.2 Costs related to M&O of Online systems

In the future, costs for DAQ and online computing will represent a sizable fraction of the total Cat. A budget. In 2004, the SG reached an agreement with the Collaborations on a common basis of estimate for planning the replacement of obsolete equipment and to determine the level of professional manpower needed to operate the online systems. The SG examined in detail how the experiments had implemented those guidelines in their 2007 budget proposals. While the manpower turned out to be at the expected level (or below), the proposed costs for maintenance and replacements did not seem in most cases to follow the agreed rules, and did not take into account the changes in the LHC accelerator schedule. Although the different estimates do not represent a large fraction of the 2007 M&O budget, due to the modest amount of obsolete equipment to be substituted, they are projected to have a very significant impact in the years to come. Therefore, the SG believes that it is necessary to proceed next year with a revision of the guidelines and projected budget profiles the experiments have so far developed.

1.2.1 Heavy Ion Running

The SG asked ATLAS and CMS about the sharing of the M&O costs to support running during future Heavy Ion LHC operation. Both experiments confirmed that the Heavy Ion program represents an integral part of their overall physics program and therefore the associated M&O costs have always been included in their global projections and they will be shared by the whole collaboration.

1.3 CERN Services

The service agreement model proposed in 2004 by the SG has now been implemented for nearly all services provided by CERN. Service contracts are in place, agreements have been reached and budget settled. However in some cases, the Cat. A requests are not yet fully aligned with the costs outlined in the agreements and need to be updated. The SG has asked the Collaborations to provide a list of all service agreements and to prepare an updated yearly profile of the associated costs.

1.3.1 Outreach

The SG examined the plans of the experiments as well as the program that CERN had developed for the upcoming events in 2007. Progress has been made in coordinating and integrating the ongoing efforts while the respective roles of CERN and the experiments are being defined. In this framework

the SG deemed it appropriate to devote M&O funds at the requested level for the development and maintenance of educational material and tools. The SG noted that the bulk of the work is expected to come from the collaborating institutions and encourages the strengthening of cooperation among the experiments and CERN to avoid unnecessary duplication of efforts and waste of resources.

1.4 Collaborative Tools

The SG, recognizing that appropriate collaborative tools are critical to the operation and physics productivity of large international collaborations, highlighted in the past the need for a realistic plan, supported by CERN and aimed at providing, on a short time scale, the basic infrastructure and tools, specifically for auditoria and conference rooms that need to be setup for video and phone conferencing. The SG believes that such a plan, presented by an IT department representative during the last SG meeting, is now defined, though financial support has apparently not yet been approved by CERN. The SG has agreed to let the collaborations use a limited amount of M&O Cat. A funds for urgent needs in this area. However this additional load on the FA is meant to be extraordinary and it is not intended to diminish, but rather underline, the need for quick action by CERN as the host laboratory. Cat. A M&O budgets should in the future contribute only to cover operations costs of those facilities.

1.5 Discussion with ATLAS

ATLAS submitted the closing report for the 2005 M&O Budget to the RRB on April 25, 2006. The actual costs amounted to 5.717 MCHF for Cat. A (including power costs and deferred costs of 90 kCHF), and to 2.191 MCHF (including 212 kCHF from past years) for Cat. B. At the end of CY2005 the total remaining open commitments amounted to 340 kCHF for Cat. A+B. These costs are to be compared with budgeted costs of 5.509 MCHF and 1.970 MCHF for Cat. A and B.

Category A: The major Cat A expenses in CY2005 were for the operation of the cryogenics plants and the magnets, and the TDAQ systems, plus various technical services like crane operation and surveying. The increase in cost of 0.5 MCHF for extended crane operation and electronics racks at Point 1 was offset by savings elsewhere. These adjustments were approved by the chairs of the SG and RRB.

The Cat. A costs included 90 kCHF of prior year commitments, comprised of delayed payments for technical services provided by CERN, including storage costs, handling of heavy equipments, power distribution, cooling and ventilation, replacements of electronic components and rental fees.

In addition to the total Cat. A cash contributions for CY2005 of 4.094 MCHF, there were in-kind contributions of 284 kCHF. At the end of 2005, CERN permitted an exceptional overdraft until the remaining contributions were transferred.

ATLAS projects significant increases in Cat A M&O budgets: in CY2007 11.722 MCHF (+25% relative to CY2006). These projections include an annual power cost of 1.470 MCHF and take into account the impact of the most recent schedule for the LHC machine, i.e. a two-month delay of closure of the beam pipe and the detector.

The main increases are due to the larger detector related costs, i.e. the consumption of gases, cooling fluids, cryogenics, technical support and the operations of the control rooms. The single most important component is an extra-cost related to the Main Refrigerator system of about 1 MCHF in '07 and '08 and half a million afterwards. The establishment of team of technical experts to support core computing was agreed upon. The build up of the team is somewhat slower than expected, but as of now 15 of the planned 16.4 FTEs are filled. In CY2007 and beyond, an additional 30 kCHF is budgeted for the replacement of servers and CPUs for software builds.

Category B: The main cost drivers are the detector subsystem operation and related electronics maintenance and replacements. The amortization of the critical spares for the calorimeter and inner

detector is included. The cost of technical manpower to run facilities and the operation of the SR1 add 3 MCHF.

Cat. B also includes core computing and software management and operation. An estimated 63 FTEs are to be provided as in-kind contributions. The ATLAS management has initiated detailed planning of the detector subsystems operations costs. MoUs are being formulated.

1.6 Discussion with CMS

In common with other experiments, the issues covered included the outreach efforts, the 2005 budget table, the status of service level agreements, the impact of heavy ion running, the funding for future detector elements, and the desire to see spending associated with particular second-level tasks. The conclusions are listed above.

The total (without power costs) Cat. A cost increases from 6.7 MCHF in 2006 to 9.3 MCHF in 2007, a 39% increase. The main cost drivers for this increase are:

- Detector related costs (increase 1.0 MCHF). The increases are in gases, cooling fluids, and external cryogenics and in shutdown operations. The SG feels these are reasonable given the pace of installation;
- Online computing (increase 0.9 MCHF). This reflects an increase in staff costs for system management, which is on the agreed plan, and support for purchases of new equipment that will be discussed below;
- Cooling and ventilation costs (increase 0.23 MCHF) ;
- Outreach (increase 0.16 MCHF) which was discussed as above

The SG noted the updated staffing plan for Core Computing. Compared with the originally forecast number of 15 FTE to be attributed to M&O Cat. A in 2006, 5 FTE have been reallocated to M&O category B. The remaining 10 FTE are in place, but a number of them are on short term engagements and will leave after roughly a year, so a satisfactory solution is not yet in place. The number of Cat. A funded core computing experts is expected to rise to 12.5 FTE in 2007, and 14 FTE in 2008.

The collaboration reported that they are starting the process of establishing MoU's between CMS and the collaborating institutions covering "service tasks." This will include core computing. The Scrutiny Group welcomes this development and encourages the CMS management to make sure that the computing related responsibilities of collaborators are fully covered in these MoU's.

Concerning the DAQ and online computing, we note the points made above about the replacement schedule policy and the need to re-discuss the planning in 2007. In the case of CMS, there is the additional issue of the missing DAQ "slices." Currently, 3 slices are funded, 3 slices are expected to be financed by new collaborators, and 2 slices are proposed to be funded from M&O Cat. A. The intention of using M&O funds to buy slices had already been mentioned by CMS at past RRB meetings, but the SG had assumed that this was going to have an impact on the M&O budget only later in the decade. Recently, a revised plan for online replacement showed that funds for two remaining DAQ slices could be accommodated in the Cat. A 2007-2009 budgets, without significant changes in the overall profile. The SG believes that this option would maximise the physics output of the experiment, and thus should be considered by the RRB and settled as soon as possible, taking into account the revised LHC machine schedule and overall funding plan for the online system. However CMS should provide a revised plan before asking for more than approval in principle. Such a plan should remain compatible with the original projections of Online Cat. A costs for future years and should take into account possible savings due to deferred initial purchases and Moore's law of increasing performance.

1.7 Discussion with ALICE

ALICE submitted the closing report for the 2005 M&O Budget to the RRB on April 25, 2006. The actual costs amounted to 1.467 MCHF for Cat. A, including power costs, 305 kCHF in outstanding

commitments and 28 kCHF of in-kind contributions. These costs are to be compared with budgeted costs of 1.607 MCHF for Cat. A.

For CY 2007, the Cat. A projected budget increases to 5.108 MCHF, an increase of 60% over the CY2006 budget of 3.149 MCHF. There are large increases in all Level 1 categories, except for the secretariat, test beam support, and the laboratories operations. ALICE needs to provide a full cost accounting of past years at level 1 of the WBS., and an updated summary of all contributions.

The SG examined the level of contributions received by ALICE. By the end of August 2006, ALICE had received the following fraction of the expected contributions: 2002 (97%), 2003 (96%), 2004 (93%), 2005 (85%) and for 2006 (~70%). In order to handle cases in which funding agencies are not making their contributions on time, ALICE is implementing a formal procedure whereby in September of each year the funding agencies that have not paid their contributions for the year will be sent a letter asking for an explanation and for a payment schedule. If, by the end of the following year, the contribution has still not been made, the right of the scientists to participate in ALICE will start to be withdrawn.

The RRB SG examined in detail the overall ALICE M&O costs. Particular attention was given to items under Detector Related Costs (General Technical Support and Magnet/Magnet Controls), Secretariat, Communications, Test Beams & Calibration Facilities and General Services. The RRB SG considers the M&O procedures and associated costs presented by ALICE to be reasonable and no major issues were identified.

As for other LHC experiments, the RRB SG examined in depth the M&O costs for the technical services. ALICE has taken into account the projected costs as described in Service Agreements between ALICE and the responsible CERN groups. Nevertheless, some minor re-adjustments need to be made in order to fully align the ALICE M&O budgets to the projections provided in the Service Agreements. ALICE is asked to provide a list of all the Service Agreements and their annual cost profile to the SG.

1.8 Discussion with LHCb

The expenditures in 2004 exceeded the preliminary budget due to an advance purchase of gas for the RICH detector that had been agreed by the SG. The overspending was made possible by using the part of the cash surplus that the experiment had accumulated in the previous two years.

LHCb presented to the RRB a closing report for 2005 where the total costs plus outstanding commitments were not final, but projected to eventually be very close to the budgeted costs (912 kCHF for Cat. A , including power).

For CY 2007, the Cat. A projected budget increases to 2.822 MCHF, including power, an increase of 92% over the CY 2006 budget of 1.578 MCHF. There are large projected increases for detector related expenditures and online computing, plus an increase in the power from 100 kCHF to 600 kCHF.

The SG judges that these increases can be justified, given the expected intensification of installation, commissioning and operation activities.

The SG was informed about the progress in recovering missing Cat. A payments and welcomed the news that China is now paying all the M&O Cat. A and Common Fund debts.

The SG noticed that, given the level reached by Cat. A costs, it would be appropriate also for LHCb to report their expenditures at the April RRB meeting at a more detailed level than it has been done in the past. This would make it possible for the SG to understand how the proposed budgets compare with the costs incurred in previous years.

The SG discussed with LHCb in detail most lines in their M&O Cat A request and was satisfied with the explanations. As justifications for the amounts were given in all cases, small reductions were made in some of the lines.

This year LHCb presented for the first time Cat. B M&O budgets for several sub-detectors, though the report presented to the SG was still in evolution. Criteria for sharing the costs have been established and the collaboration confirms the decision of not invoicing Cat. B costs via central accounts, but rather asking the Funding Agencies to provide direct support to the institutions.

2. Year 2007 Category A estimates (without power)

Experiment	RRB Autumn 2005 estimates	Present estimates
ALICE	4042	3875
ATLAS	9037	10267
CMS	8762	8098
LHCb	2532	2222

Table 4 - Year 2007 estimates (kCHF)

3. Year 2007 Category B estimates

Experiment	9/2005 projection	Current estimates
ALICE	771	952
ATLAS	7062	7084
CMS	6756	6262
LHCb	-	1581

Table 5 - Year 2007 estimates (kCHF)

4. Summary

The SG has looked at the M&O budgets of the four experiments and has examined in detail some of the line items, leading in some cases to refinements of the proposed estimates.

The RRB-SG recommends that the 2007 estimates for the M&O budgets be approved by the RRB.

The SG takes the opportunity to remind the RRB how essential it is for the experiments to receive contributions to the Cat. A accounts in a timely manner, in accordance with the rule established in the M&O MoU (50 % paid by 10th February and the remaining 50% paid by the 10th June).

5. Acknowledgements

Two of the four CERN members (R. Landau and E. Tsesmelis) as well as three external members (V. Luth, M. Morandin and B. Stugu) have now served for three years or more and should normally be replaced by the RRB. Their contributions to the SG work have been very valuable and the group would like to thank them for their dedication to the SG activities demonstrated in these three years.