



A T L A S

Minutes of the 14th RESOURCES REVIEW BOARD Meeting

(Held at CERN on 23rd April 2002)

Present:

Europe:

A. Kotzinian (Yerevan Institute of Physics, Yerevan);
F. Suransky (Ministry of Industry and Trade, Praha), R. Leitner;
O. Hansen, J. Dines Hansen (NBI, Copenhagen);
D.O. Riska (Helsinki University of Technology, Helsinki);
M. Spiro (CEA-Saclay, Gif sur Yvette), J. Erwein, P. Debu;
G. Wormser (IN2P3, Paris), D. Fournier;
J. Richter (BMBF, Bonn), D. Ehret, K. Kleinknecht (Universität Mainz);
S. Bethke (MPI, München), H. Oberlack;
D. Horn (Tel Aviv University Ramat Aviv, Tel Aviv), G. Mikenberg;
F. Cervelli (INFN, Roma), U. Dosselli, S. Patricelli;
J. Engelen (NIKHEF, Amsterdam), A. J. Van Rijn;
S. Irgens-Jensen (Norwegian Research Council, Oslo), S. Strapnes;
J. Królikowski (State Committee for Scientific Research, Warsaw), M. Turala;
F.D. Bello (ICCTI, Lisboa), G. Barreira;
E. Popa (Institute of Atomic Physics, Bucharest), C. Alexa;
F.E. Grishaev, V.I. Savrin (Ministry of Science, Moscow);
A.N. Sissakian (Dubna), N. Rusakovich;
D. Valachovic (Ministry of Education of the Slovak Republic, Bratislava), A. Sitarova;
M. Mikuz (Ministry of Science and Technology, Ljubljana);
A. Ferrer (CICYT, Madrid), M. Cavalli-Sforza;
L. Gidefeldt (Natural Science Research Council, Stockholm);
A. Clark (Université de Genève, Genève);
R. Wade (PPARC, Swindon), G. Strong.

N. America:

N. Lloyd (NSERC, Ottawa), R. Orr;
J. Lightbody, J. Whitmore (NSF, Washington), H. Gordon;
B. Willis (Columbia);
J. Yeck (DOE, Washington).

Asia:

N. Wang (National Natural Science Foundation of China, Beijing), Y. Zhang, M. Pu;
T. Kondo (Monbusho, Tokyo), J. Kawabata;
Z. Ren (NSC, Taipei).

Australia:

S. Tovey (AUSHEP, Melbourne).

CERN:

R.J. Cashmore (chairman), E.M. Rimmer (secretary), P. Geeraert, K.H. Kissler,
A.J. Naudi, D. Schinzel, D. Schlatter, P. Schmid, E. Tsesmelis.

ATLAS:

P. Jenni, T. Åkesson, M. Nessi, M. Nordberg, K. Smith.

Apologies:

Bundesministerium für Bildung, Wissenschaft und Kultur, Wien

14th Meeting of the ATLAS Resource Review Board RRB, 23rd April 2002

Documents **CERN-RRB-2002-nnn** can be found at <http://web.cern.ch/Committees/LHCRRB/ATLAS/>

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1. & 2. Introduction & Approval of the minutes of the last meeting

*R.J. Cashmore,
 Director for Collider Programmes*

The Chairman, R.J. Cashmore, welcomed delegates and introduced a new participant, Karl-Heinz Kissler, the CERN Programme Controller, who will attend the RRBs of all 4 experiments from now on. He singled out Maintenance & Operation and Costs to Completion as especially important agenda items for the present meeting.

The Minutes of the last meeting were **approved** without changes. There were no matters arising.

3. Status of the experiment *Spokesperson P. Jenni*

Paper CERN-RRB-2002-017 Presentation CERN-RRB-2002-054

Common Projects are covered by M Nessi in a separate report (see below).

• *Collaboration:* ATLAS now has some 1,800 collaborators from 149 institutes; 1,546 are named as scientific authors in the M&O MoU of which 1,366 hold a PhD or equivalent degree. Since the last RRB the Bulgarian Academy of Sciences, Sofia, has joined as part of the JINR team working on MDT construction, while the Helsinki Institute of Physics has announced its withdrawal for end June 2003, respecting the 18 months notice stipulated in the Construction MoU. Contacts have been made with potential newcomers: Gazi University Ankara, Turkey, the Institute of Physics Belgrade, Serbia and the Universities of Texas Pan America and of Yale, US. The only change in the ATLAS Organisation has been the appointment of K. Smith as Collaboration Board Chair, Deputy J. Pilcher

The new Technical Coordination, in place for a year, is showing very visible benefits in detector integration and installation planning. ATLAS acknowledges the significant contributions of

collaborating institutes and CERN in strengthening this area; these efforts will need boosting even further as the installation phase approaches.

- *Inner detector*

- Pixels

Pre-series sensors from the two producers have been successfully tested; final version batches of 10% and 25% will be delivered May/June 2002. Hybridisation is proceeding well after passing Production Readiness Reviews during in the last 6 months. Fully functioning prototypes now exist for the Deep-Sub-Micron DSM Front-End electronics, a major step for this critical component. Planning still has a considerable float to meet the installation date for the initial detector with 2 layers (out of 3).

- Silicon Tracker SCT

Over 60% of the sensors have been delivered and accepted and ~ 25% of the rad-hard DMILL FE electronics wafers have been delivered and partially tested. All barrel module components and support cylinders are in production, while the noise problems in the endcap modules have been solved and a Final Design Review is foreseen June - July 2002. There is good progress with optical links, power supplies, and off-detector electronics, and the expected sub-system delivery is on schedule.

- Transition Radiation Tracker TRT

Raw straw production and reinforcement are complete and endcap straw preparation is 50% finished. After initial problems, endcap wheel construction is now underway; all type 'A' and 'B' wheels (linked to the endcap SCT) will be ready in time for the initial detector while 'C' type wheels will be staged. Although analog and digital DMILL electronic chips are both satisfactory, the digital chip is also being developed in DSM for cost reasons with a decision to be taken May 2002. Long-term irradiation tests of barrel modules with the final gas mixture showed failures in the joints used to split the wires in the middle of the modules so that they can be read-out from both sides. Alternative solutions are being sought with top priority to reach a final choice by end May 2002. Meanwhile, mechanical barrel module production continues with the aim to resume wire stringing in June. This rearrangement remains compatible with the TRT and ID schedules.

- Common ID items

Major relocation of patch panels has led to definitive progress in the critical routing of ID services through the calorimeter and muon systems. Progress is also reported in the evaporative cooling system for the pixels and SCT with a 'phase-II' set-up operating at 1/6 final capacity. Integration and commissioning of the entire ID will take place from 2003 to 2006 in a new large clean room near the ATLAS pit; future ID maintenance and upgrade work will be done in this room.

- *Calorimetry*

Technical difficulties that delayed start-up of all LAr sub-systems (pre-samplers, EM, hadronic endcaps, and forward calorimeters) have been overcome. However, some over costs were incurred and ATLAS is grateful to the Funding Agencies FAs that have covered them.

- LAr electronics

11 DMILL chips have been successfully tested and the SCAs are in production. The first radiation tolerant Front End Board FEB has operated successfully (complete except for voltage regulators) and the first full FEB crate should be tested by end 2002. Off-detector components are on schedule.

- LAr EM Calorimeter

Pre-sampler modules for both barrel and endcaps are in series production and expected to meet the required delivery dates. 15 of the 64 barrel modules are made and, after delays, the second production site has now started up. Fabrication of the EM read-out electrodes is no longer on the critical path and will be completed soon. About 55% of the endcap- and 70% of the barrel- absorbers are complete and stacking and cabling is underway at 3 barrel- and 2 endcap- assembly sites. Barrel completion is expected in spring 2003; endcaps in fall 2003. The endcap schedule remains very tight because of manpower limitations.

- LAr Hadronic EndCap Calorimeters

Production continues to run smoothly; 107 out of 134 modules are finished with 83 cold tested and accepted. Machining the copper plates for the front modules is still a critical issue but nevertheless the subsystem is expected to be ready on time.

- LAr Forward Calorimeters

Assembly is in full swing; absorber structures for the 1st side are expected to be ready mid-2002 and work is well underway on the 2nd side. W-rod delivery is still a schedule risk though the situation has considerably improved since the last RRB. Test beam calibration of one side FCAL must occur in 2003.

- LAr integration in Hall 180

Major integration activities have started. Modules will be assembled into half-barrel rings and endcap wheels and then introduced into the cryostats. Pre-operation activities include complete cold tests of the three fully loaded LAr calorimeter units with test electronics.

- Tile Calorimeter

About 85% of all modules are at CERN ready for Cs-source calibration. All electronics components are being procured and integration into the drawers has started. About 75% of the PMTs have been delivered and tested satisfactorily. Pre-assembly of the complete tile calorimeter cylinders will start in summer 2002. Although timely acquisition of support structures and the manipulation tool needed for this are on the critical path, overall the system is on schedule.

- *Muon system*

The spectrometer is instrumented with precision chambers (MDTs in the barrel and endcaps, CSCs at large rapidities in the innermost endcap stations) and with fast trigger chambers (RPCs in the barrel, TGCs in the endcaps). A sophisticated alignment measurement system is needed to achieve the required positional accuracy.

- Precision chambers

MDTs: about a third of the series MDT tubes have been assembled and tested, with reject rates well below the acceptable level. More than 20% of the bare MDT chambers have been assembled in 11 out of 13 production sites (as planned, 2 will start later in 2002). Quality is regularly monitored using an X-ray facility and all sites are reaching the required high accuracy. Pre-series FE MDT electronics are working and final versions are being tested now. Planning meets initial detector installation dates. CSCs: the initial detector will have 32 chambers, i.e. half of the layers, the rest being a high-luminosity upgrade. 4 pre-series chambers are under test, all material for the remaining chambers has been purchased and full-scale production, starting now, is expected to complete in June 2003.

- Trigger chambers

RPCs: a first pre-series of 24 RPCs has passed a Production Advancement Review with special emphasis on QA/QC procedures in view of problems experienced elsewhere. Components and facilities are ready for the assembly of a second pre-series of 85 chambers. On-chamber electronics component production is well advanced. Despite considerable delay in production start-up, recent improvements in delivery capacity now ensure timely completion.

TGCs: the TGCs are expected to be on schedule: 60% of all material is machined and prepared, 40% of chambers have been produced at the first site, 25% at the second site, and the third production site has started. The full FE electronics board production has been finished for some time.

- Integration

Muon detector integration is closely linked to overall detector integration and major progress has been made with Technical Coordination on supports, shielding, services routing and access scenarios. A large system test facility is becoming operational in the SPS H8 beam. Remaining concerns are finding space for storage and pre-assembly and cost issues of common muon items.

- *Trigger/DAQ/DCS*

The system is expected to be ready in time for the commissioning of ATLAS. For the level-1 trigger, major emphasis has been put on large-scale system tests ('slice-tests') to confirm final designs. High-level trigger and DAQ studies involve coherent software and hardware activities; an Integrated Prototype, to demonstrate full functionality and performance scaling, will be completed by end 2002. A major effort is underway for evaluating trigger and event rates so that full exploitation of the discovery potential of ATLAS can be carefully balanced against the costs of both the HLT/DAQ system and offline computing. A large testbed is being assembled for performance studies of the data flow system. The DCS has been developed to meet the radiation specifications of the embedded local monitor board (ELMB) and the SCADA system and ELMB are already used in all detector subsystem tests. The Detector Interface Group continues to play a major role in standardizing DAQ interfacing to the various subsystem read-out electronics and in test beams.

• *Computing*

Activities are now focussed on Data Challenges DCs that need most key software components to work together. DC0 is underway and DC1, planned for the second half of 2002, will provide a high statistics simulation sample (10 million events) for HLT/DAQ performance evaluation for the TDR. DCs should be embedded into the CERN LHC Computing Grid Project as soon as possible. ATHENA, the backbone of the whole software chain, has been further developed, as have C++ versions of reconstruction codes and some existing Fortran codes. For simulation studies, active and fruitful cooperation continues with the GEANT4 collaboration. There has recently been a broad, strategic ATLAS Overview Review of progress, with the participation of external reviewers. This revealed good progress in many areas but also the need for significant improvement in a few key areas like the Event Data Model and Detector Description and in infrastructure support for the users.

• *Initial staged detector*

The initial staged detector, matched to available resources, was already presented to the LHCC and RRB in 2001. The main staged components are:

- one pixel layer in the ID
- outermost TRT end-cap wheels (C-type)
- part of the LAr ROD system
- tile gap scintillators
- EES and EEL MDTs
- half of the layers of CSCs
- part of the Common Project processors
- part of the high luminosity shielding

The main impact of this configuration during the first physics run is about 10% loss of discovery potential for the Higgs (20% more integrated luminosity will be required to compensate); effects on other physics channels are less well established at present.

• *Schedule and milestones*

The current v. 4.02 schedule, with the initial staged detector ready in autumn 2006, is very tight, especially for the barrel toroid. So ATLAS will profit from the revised LHC machine start-up date to optimise its installation plans. Ongoing system construction schedules will not be slowed down but systems can reinstall the minimal 4 months float as contingency (except the last barrel toroid coil where the float is only 2 months). To follow construction progress, LHCC milestones are monitored 3 times a year and the integrated number of milestones passed is compared to those planned. This milestone planning will be re-baselined once the new LHC schedule is official. ATLAS also uses an internal Project Progress Tracking system to monitor the advancement of work packages.

• *Conclusions*

ATLAS detector construction is going well with more and more subsystem components and modules delivered to CERN. Pre-assembly and integration activities have started and pre-operation activities include major large-scale system tests. Critical path items remain the barrel toroid, LAr barrel and second endcap, and the second TRT endcap, but in all cases the situation has improved recently. Data Challenges are providing a focus for computing and physics preparation is in full swing.

4. Common Projects

Technical Co-ordinator M. Nessi

Papers CERN-RRB-2002-019, -020 Presentation CERN-RRB-2002-055

Status

Nessi reported on the status of the Common Projects listed in Annex 10 of the Construction MoU, except the solenoid which is at CERN ready for integration, as was reported at the last RRB.

• *Barrel Toroid Magnet:* engineering and monitoring are done by CEA and LASA. Final checking of the complex mechanical structure is well advanced. Component manufacturing is well underway, about half way through overall. Some major problems were encountered with the firm that had signed a

3.5 MCHF contract to integrate the pancake conductor and Al coil casing. The firm stopped work at the end of 2001, claiming substantial extra costs. ATLAS negotiated a new solution with the second bidder, respecting the original cost and schedule and using a CEA Saclay/JINR/ATLAS team to do the work at CERN, ready to start in mid-May 2002. Coil integration into the cryostat and final functional testing will also be done at CERN under contract to the JINR group with CEA supervision.

- *End-cap Toroid Magnet:* engineering and monitoring are done by RAL and NIKHEF. This magnet is also in the middle of component manufacture and integration is starting. Integration of the cold mass, an in-kind contribution from Netherlands, was contracted to a firm that partially stopped production in 2001 claiming substantial over-costs. In March 2002 it was agreed that work will continue in the frame of the original contract while financial negotiations are held in parallel. The new delivery dates (finishing end 2004) are still within schedule. Integration of the cold mass with the cryostat is also contracted to the JINR group working at CERN, this time with RAL supervision. An unusual technical problem occurred during delivery of the second toroid endcap cryostat to CERN; a large crane was needed to lift it over a bridge recently built for skiers in the Jura.

- *LAr Barrel Cryostat:* the barrel cryostat is at CERN ready for installation of the modules. A small leak, the only one detected, has been repaired, integration work is finished, and all feedthroughs and cryolines are installed. Final acceptance tests of the flange and pressure tests of the feedthroughs are still to be done. EM calorimeter installation is foreseen Nov 2002 - June 2003, followed by solenoid installation and final testing of seals, pump line, etc.

- *LAr End-cap Cryostats:* some problems were found and solved during leak, pressure and cryogenics tests of the first endcap cryostat at the manufacturing company. The cryostat is now at CERN and final cold tests are to be done at CERN before acceptance, expected May 2002. Insertion of detectors should take place Nov 2002 - Aug 2003 with final cryogenics tests in Sept 2003. The second endcap cryostat should arrive at CERN in October 2002.

- *LAr Cryogenic Plant:* in mid-April 2002 an Internal Review was completed with positive results. A project, led by A. Gonidec CERN, has been set up to carry out the installation, etc. Most work packages needed are being supplied as in-kind contributions.

- *Radiation Shielding:* several million CHF and several thousand tons of iron and copper are needed for the complex ATLAS radiation shield. A redesign has optimised shielding of the muon chamber as well as access to and mobility of the shield itself. Final design reviews should be completed by June 2002. Discussions are underway with industrial producers as well as possible in-kind contributors.

- *Experimental Infrastructure:* the Feet & Rails contract has been signed with a Russian firm and first delivery expected is expected in 2002. Final engineering of the external rails, 'trucks', is underway in Poland (being negotiated as an in-kind contribution). Major infrastructure procurements e.g. cranes, cooling & ventilation, metallic structures, etc., are all running on schedule for delivery in spring 2003. Most of the surface building will be handed over to ATLAS in autumn 2002. Underground civil engineering will end in spring 2003 and installation should start at Point 1 in April 2003.

Nessi then reported on the financing of the Common Projects.

Contributions

Details are given in *CERN-RRB-2002-019* and summarised, in MCHF:

	COST	COMMITMENTS		
		Common Fund	In-kind	% of total
Magnets	136.8	38.4	76.8	84%
LAr cryostat & cryogenics	36.5	3.5	29	89%
Trigger/DAQ	7.2	0.1	0	1%
Infrastructure	28.2	5.7	4.4	36%
<i>Total</i>	<i>208.7</i>	<i>47.4</i>	<i>110.2</i>	<i>76%</i>

In-Kind Contributions CERN-RRB-2002-020

The following forthcoming procurements of Common Project items and expressions of interest for in-kind contributions were brought to the attention of the RRB:

<u>Magnet</u>	MCHF	
Power circuit components		
Busbars	0.6	CERN, Russia
Power supplies	0.4	CERN, Israel
Dump & switch system	0.4	INFN
Solenoid power supplies, varia	0.9	
BT superinsulation assembly	0.15	Russia
BT cryoring	1.1	
BT installation	1.4	
Proximity cryogenics	3.5	

Infrastructure

Trucks for Feet & Rails	0.6	Poland
Shielding components	0.3	Czech Rep.
Movable air pads	0.6	
Copper shielding plugs	1.2	Australia, ...

M. Nordberg said he will report later on corrections to CORE contributions for the LAr cryogenics.

5. Report from the LHCC *LHCC Scientific Secretary E. Tsismelis*
Paper CERN-RRB-2002-011

Since the last RRB, the LHCC held ATLAS sessions in November 2001, January 2002 and March 2002.

The Committee reviewed the configuration of the ATLAS initial detector for cases in which the total supplementary funds requested are fully or only partially available by 2007. With 80% funding available, the ATLAS detector will perform below a fully-funded initial detector, with Higgs significance reduced by 10%. In addition, conditions for commissioning ATLAS will be much more restrictive engendering higher risks. Given even fewer resources, cuts in the main physics potential will be very severe.

A preliminary version of the new ATLAS installation schedule, incorporating the revised LHC schedule, will be available for the July 2002 Comprehensive Review of ATLAS.

- *Magnets:* the LHCC MAG has no major concerns for the central solenoid magnet. For the end-cap toroid, it was underlined that the schedule can be kept as long as there are no further problems with the coil manufacturer. Concerning the barrel toroid magnet, ATLAS is considering cancelling the contract to integrate the coils into the casings. Any delay (3 months) should be recoverable by a careful re-arrangement of activities at CERN, re-organisation of responsibilities, and doubling the number of shifts, though the Committee finds such measures are an extra burden on ATLAS.
- *Inner Detector:* there is good progress on the pixel detector and the silicon tracker. However, the TRT wire joint problems and the resulting impact on the schedule of the Barrel TRT worry the LHCC. The Committee will monitor TRT progress and ATLAS will present a decision on the solution in May.
- *Calorimeters:* good progress was reported for the LAr EM, LAr Hadronic Endcap and Tile Calorimeters. However, the LHCC is concerned by presampler production and the tight schedule for the FCAL, and will be closely watching these areas.
- *Muon Spectrometer:* good progress.
- *Trigger:* the LHCC is reviewing the ATLAS trigger rates and associated physics performance and is making a comparison with the corresponding studies in CMS.

LHC COMPUTING GRID PROJECT

The LHCC has recommended that it should treat the LHC Computing Grid Project in the same way as the experiments. This means that the Grid Project will submit documents and reports for review by the LHCC, including the project's TDRs. The Committee is now analysing the relation between detector parameters and computing requirements, particularly the trigger rates and associated physics performance.

TEST BEAMS

The LHCC has reviewed requests for test beams in 2003 - 2006. It considers that all 4 experiments need beams in 2003 - 2004 to calibrate calorimeters, validate front-end read-out electronics and DAQ chains, monitor detector construction quality and test alignment procedures. In 2005, ALICE, ATLAS and LHCb have no compelling test requirements, while CMS's needs in 2004 - 2006 are driven primarily by ECAL calibration. Therefore, the experiments have been asked to proceed without SPS test beams in 2005. However, the LHCC recommends that PS test beams operate throughout 2003 - 2006.

Discussion

- M. Spiro (FR): does ATLAS need test beams in 2006?
- ET: the main push for SPS beams in 2006 is to calibrate the CMS ECAL and to do injection tests for the SPS/LHC machines.
- P. Jenni: ATLAS cannot make a case to have the SPS running in 2006 but if there is beam we foresee some regular checks e.g. with the tile calorimeter and inner detectors.
- RJC: it is clear that ATLAS is making excellent progress and the LHCC finds the experiment moving forward very well; the RRB should make sure that this can continue. It is important to keep to schedule and that includes retaining some contingency. Residual problems – e.g. with the TRT – are being solved; JINR, CEA and ATLAS have 'scrambled' to avert potentially serious difficulties with the barrel toroid; clearly this creates an extra load, especially on manpower.

8. Financial matters *CERN Finance Division Leader A.J. Naudi*

• **Collaboration accounts** *CERN-RRB-2002-001*

Updating the distributed document, Naudi announced that additional membership fees have been received for a total of 971.1 kCHF, plus cash contributions from Romania (30 k), Japan (200 k) and Slovenia (50 k). The current income balance is 26.336 MCHF. Additional commitments of 1.013 MCHF bring the current balance of outstanding commitments for 2002–2006 to 29.736 MCHF. There are still quite a few FAs with outstanding debts and Naudi urged them to pay as soon as possible given the advancement of ATLAS.

• **Market Surveys & Invitations to Tender** *CERN-RRB-2002-002*

Updating the distributed document, Naudi reported on:

	<i>Description</i>	<i>Funding</i>
MS-3081/EP	LV power supplies: R&D services, components and systems	Common Fund (~ 1.5 MCHF)
MS-3114/EP	Stainless steel supports for TileCal	Non-common fund (~ 450 kCHF)
MS-3115/EP	VME-board computers for ATLAS RO and LHC control system	Common Fund (~ 1 MCHF)
IT-2624/EP	Proximity cryogenics for the toroids	Common Fund
IT-2916/EP	VME crates for FE electronics; contract being prepared with WIENER PLEIN & BAUS GMBH (DE)	LHC experiments CERN participation: max 2.3 MCHF
IT-3039/EP	PCBs with HV supplies for MDTs; contract placed with S.E.I. (IT)	ATLAS-ITALY account

7. **Construction Budget matters**

Resource Co-ordinator M. Nordberg

- **Report on 2001 CORE expenses and Update on 2002 CORE expenses**
Paper CERN-RRB-2002-018 Presentation CERN-RRB-2002-058

Nordberg presented the final status of 2001 CORE expenses, summarised:

	<i>Inner Det.</i>	<i>LAr Cal.</i>	<i>Tile Cal.</i>	<i>Muon chambers</i>	<i>TDAQ/ DCS</i>	<i>Common Projects</i>	Σ MCHF
<i>Approved Oct. 2000</i>							
commitments	33.9	10.6	1.0	7.9	1.5	38.5	93.4
payments	27.9	12.6	2.7	9.2	1.2	39.8	93.4
<i>Book closing April 2002</i>							
commitments	14.1	9.7	1.0	6.4	0.8	38.0	69.9
payments	13.2	12.8	2.7	7.4	0.8	27.4	64.4

Payments, especially for the super-conducting cable, were requested later than expected. In the case of the inner detector, commitments and payments were adjusted to match the lower-than-anticipated production yields of rad-hard electronics. By end 2001 ~ 60% of the total CORE costs had been committed and ~ 50% paid.

The update on 2002 CORE expenses (excluding C-to-C and C&I) is summarised:

	<i>Inner Det.</i>	<i>LAr Cal.</i>	<i>Tile Cal.</i>	<i>Muon chambers</i>	<i>TDAQ/ DCS</i>	<i>Common Projects</i>	Σ MCHF
<i>Approved Oct. 2001</i>							
commitments	22.1	9.5	0.8	9.3	2.7	42.6	87.0
payments	30.0	9.4	1.0	8.9	2.4	50.5	102.1
<i>Status April 2002</i>							
commitments	21.5	12.1	0.9	9.2	1.6	41.0	86.4
payments	26.2	10.6	1.1	8.8	1.5	49.9	98.1

By end 2002 ~ 80% of the total CORE costs will have been committed and ~ 70% paid.

- **Estimates for 2003 Construction Expenses**
Paper CERN-RRB-2002-021 Presentation CERN-RRB-2002-058

The preliminary 2003 estimates cover baseline CORE costs only; they do not include C-to-C or C&I. They are based on 2006 start-up plans and so will be revised before the October RRB. However, 2003 figures will be little affected, if at all, by the change to a 2007 LHC machine start-up schedule.

	<i>Inner Det.</i>	<i>LAr Cal.</i>	<i>Tile Cal.</i>	<i>Muon chambers</i>	<i>TDAQ/ DCS</i>	<i>Common Projects</i>	Σ MCHF
<i>Estimated April 2002</i>							
commitments	12.1	7.7	0.0	7.5	9.4	10.9	47.6
payments	15.1	9.3	0.3	8.5	9.1	41.4	83.7

D.O. Riska and L. Gidefeldt queried the estimated contributions for Finland and Sweden respectively in CERN-RRB-2002-021. Nordberg agreed to sort out the points they raised off-line. Gidefeldt commented that it would help if it were indicated in each budget paper whether the RRB is to note, approve, discuss, etc., its contents.

8. Maintenance & Operation

- **Scrutiny Group Report on M&O** *Scrutiny Group Chair D. Schinzel*
 Paper CERN-RRB-2002-036 Presentation CERN-RRB-2002-078

Cashmore introduced this item by thanking, on behalf of the RRB, everyone who has worked hard to get the M&O of the experiments to the present point, especially members of the Scrutiny Group.

Schinzel explained that the four experiments were scrutinised together and so his four talks have a lot in common. He then listed the current members of the Scrutiny Group:

Atul Gurtu	Tata Institute
Bernard Aubert	IN2P3, Annecy
Brigitte Bloch-Devaux	CEA, DAPNIA
Franco Cervelli, Paolo Giubellino	INFN
Guy Lujckx	NIKHEF
Jim Yeck	DoE
Kai Koenigsmann	University of Freiburg
Peter Chochula	Comenius University, Bratislava
Steinar Stapnes	University of Oslo
Sven-Olof Holmgren	University of Stockholm
T. Camporesi, D. Plane, D.Schinzel (Chair) and E.M. Rimmer (Secretary) CERN	

Given M&O estimates for 2002 – 2007, the SG:

- removed items linked to Commissioning and Integration (linked to construction)
- ensured that no costs were unreliable
- found very few items for which a change in strategy might produce minor economies
- identified the main cost drivers as service contracts and manpower

The Group decided to:

- standardise the data presentation formats to facilitate comparison between Collaborations; this nonetheless leaves open the fact that each experiment has its own approach to certain cost categorisations.
- review and analyze the spending profiles to ensure that they matched past experience.

M&O 'A' costs, to be paid in common across the experiment, were identified and the estimates checked. They include operating the collaboration, maintaining and operating test beam facilities, workshops, storage areas, installations (cryogenics, vacuum), moving equipment, lifting gear, etc.

The SG made a preliminary report to the RRB in October 2001 (RRB-D-2001-8) having carefully scrutinised 8 major A cost items; it has now scrutinised all A, B and C items. Moving several items from Maintenance & Operation Category A into Commissioning & Integration has given realistic spending profiles for both for M&O and C&I (see graphs in the presented documents).

In the past, B cost estimates were not discussed by RRBs. However, some ATLAS sub-systems are as big as a LEP experiment and so it is legitimate for the collaboration to ask that B costs are also subject to review. Since October 2001, the SG has prepared B cost templates and scrutinised the estimates, in particular, expressly excluding double counting with Cat. A items as well as any apparent upgrades and C&I items. Guidelines for reasonable estimates were provided based on past experience and manpower estimates were requested in FTEs to avoid inconsistencies in equivalent cash values from country to country. In the case of electronics spares, it is understood that some must be bought 'now' while the technologies are still available rather than at the time they will be needed. The Group discussed B cost estimates with experts from each sub-system and from CERN before accepting them as accurate and reasonable.

As to C costs, the Group unanimously considered that CERN's support for LHC experiments is significantly more than that given by the existing template. If needed, CERN should provide a complete list with Cost Estimates.

The Group concluded that ATLAS M&O cost estimates for 2002 and 2003 are sound; 2002 costs are ready for endorsement at the full 100% level, 2003 costs will be further examined before the October RRB. Costs for 2004 - 2007 depend on LHC machine schedule and will therefore have to be revised to be in line with the new start-up date. The SG noted that ATLAS plans to have the detector ready in October 2006 and considered that the 6 months contingency will be very valuable in managing the project. M&O cost drivers are manpower and service contracts. For on-line computing, a common strategy is needed for charging for raw data storage and common guidelines are needed for equipment replacement cycles. There is a wide discrepancy between the experiments at present in projected on-line costs, however this has little impact in 2002 and 2003.

Discussion

- M. Spiro: is it normal to charge the experiment for cranes, heavy transport and survey? I think this is not the case in SLAC and DESY.
- RJC: transport is still provided except for exceptional conveyors for which CERN does not have the trucks; it has always been so. CERN no longer has crane drivers, they were part of the personnel reduction and now have to be bought in when needed and CERN has fewer resources to pay such bills. CERN can provide the organisation and supervision for these activities but little beyond that. We are all in the same boat and together have to assemble resources from wherever possible.
- S. Tovey (AU): can the transparencies of this presentation be made available?
- E.M. Rimmer (CERN): they will be on the website at <http://web.cern.ch/Committees/LHCRRB/ATLAS/>
- RJC: the SG did not address the costs for computing (data storage and equipment replacement) in detail; data will be stored at the Tier 0 centre here at CERN and so we have started a discussion with the off-line community to work out some guidelines for the SG and RRB.
- S. Bethke (DE): have I understood correctly; the SG thinks CERN's actual contributions are larger than are shown in the present lists?
- DS: the entire Group thought that the list is incomplete and that some estimates were too low; the C costs should reflect what CERN does to ensure a safe working environment in the experimental and associated areas; it is essentially the business of CERN's Technical Sector.
- S. Bethke: ATLAS had their own C list; are there also missing items there? What are they?
- DS: I prefer not to give specific examples; I think the ATLAS lists were the same; it was not the job of the SG to define whether an item was C-type or not.
- J. Engelen (NL): I think the question is whether there are more costs still to be charged to CERN or others, or whether they are taken care of but not, in the case of C costs, clearly accounted as part of CERN's overall support.
- RJC: the C costs were mainly worked out to ensure the safety of the experimental areas, however, operating Point 1 for example incurs a lot of expenses which have not been identified in the present C cost lists although they are covered by CERN's budget
- K. Kleinknecht (DE): the C costs are 4 MCHF out of 61 MCHF; so it does like a bit meagre, <10%
- RJC: CERN also pays its share of A and B as a collaborating institute and picks up a large fraction of the energy costs of the experiments.
- A. Clark (CH): why are C costs for insuring ALICE & LHCb significantly higher than for ATLAS & CMS?
- RJC: C costs have not been scrutinised; at this stage they indicate which items will not be charged as A or B costs.

- ***M&O budget estimates for 2002*** *M. Nordberg*
Paper CERN-RRB-2002-022 Presentation CERN-RRB-2002-058

Cashmore reminded delegates that RRB must approve the 2002 M&O updated cost estimates and agree that invoices for the remaining 70% (revised) of the A costs can be issued. Nordberg presented the status of M&O 2002 cost estimates:

<i>Payments MCHF</i>	<i>Estimate Oct 2001</i>	<i>Updated April 2002</i>
M&O A	2.3	1.4
M&O B	0.7	0.9
Σ	3.0	2.3

In October 2001 the RRB approved 30% invoicing of A costs and left the Collaboration to handle the system-specific B costs. The top priority M&O A item for 2002: is the magnet cryo-operation in Hall 180, followed by TDAQ test beam support activities, software licenses for on-line computing, and general services. By mid-March, A cost cash contributions had been received for a total of ~190 kCHF.

Priorities for 2002 M&O B items are to provide standard electronics for test-beams (pool rentals) and to continue system testing and qualification of delivered components. To date, cash contributions received amounted to ~ 250 kCHF.

Concerning spares, in October 2001 RRB, ATLAS stated the need for advances of up to 6.3 MCHF, to be amortised > 2005, for certain critical spares that must be purchased < 2005 because of availability and cost. The first such arrangement is in place for LAr FEB spares (up to 1.4 MCHF) and ATLAS thanks CERN and those FAs that have made this possible. For 2002, an option for up to 1.1 MCHF is proposed for SCT DMILL spares to be used only against firm pledges; and not before the end of 2002.

Nordberg concluded by stating that if available resources in 2002 turn out to be less than the planned payments, ATLAS will try to shift Cat A costs into 2003 and scale down Cat B activities. He asked the RRB to approve the 2002 M&O budgets, as detailed by Funding Agency in CERN-RRB-2002-022.

Discussion

- G. Wormser (FR): how is B cost sharing done?
 MN: B sharing is based on CORE contributions in each sub-system.
 RJC: ATLAS pointed this out last October and it was generally approved by the RRB.
 D. Horn (IL): in October ATLAS gave cost estimates for 2002 - 2005; but these are not in the present documents; are there changes?
 MN: in October the 2002 - 2005 total was 24.9 MCHF, now it is ~ 3 MCHF less. Numbers > 2003 will be presented later by Jenni. These will be updated in time as described in the MoU.
 S.Bethke: in the table shown (page 12 of CERN-RRB-2002-058) is Germany/Munich MPI or the University?
 MN: the University. However, contributions received after March 19th are not included.
 A. Naudi: up to yesterday, nothing further had been received.
 U. Dosselli (IT): should the RRB approve both A and B M&O costs or approve A and take note of B?
 RJC: approve both A and B.
 G. Wormser: how much is the rebate/power discount; it should be clearly indicated; is it ~ 90 kCHF?
 MN: for 2002 it is ~ 80 kCHF; power cost adjustments are not included in the tables presented.
 RJC: ATLAS are preparing total A and B costs; invoices will be issued for A costs less the power costs that CERN will pay for Member States and contributing non-Member States. For 2002 the power costs are low. In future the actual amounts to be billed will be shown clearly; we are learning.
 R. Wade (GB): the M&O MoU has not been approved so are we agreeing total or individual contributions?
 RJC: we are agreeing both because the RRB previously agreed to operate 2002 as if the MoU had been approved. ATLAS has an agreed author list for 2002 Cat. A sharing; this list will be updated annually.
 F. Cervelli (IT): in future, before approving B costs the RRB must be assured that prior discussions have been held between FAs and the collaboration for each sub-detector.
 RJC: that is a very helpful comment; if the collaboration presents a B-cost split it has to have been agreed with the FAs that will be paying.
 Y Zhang (CN): what are the numbers of PhDs for each FA?
 MN: I can supply that; national contact physicists provided the numbers (the list is in the MoU).

The RRB **approved the M&O A and B budgets for 2002** and the remaining '70%' invoicing for Cat. A.

- **M&O budget estimates for 2003** *M. Nordberg*
Paper CERN-RRB-2002-023 *Presentation CERN-RRB-2002-058*

In 2003 M&O activities will be similar to those in 2002 and first estimates for 2003 budgets are:

<i>Payments MCHF</i>	<i>Estimate April 2002</i>
M&O A	2.4
M&O B	00.8
Σ	3.2

Full details are given in CERN-RRB-2002-023. The estimates assume physics in 2006 and will be adjusted when the new machine schedule is official. Power discounts are not included; the total 2003 power bill will be ~ 280 kCHF. Concerning spares, ATLAS proposes an option for commitments of 1.1 MCHF for TRT and 0.1 MCHF for the TileCal.

Discussion

- RJC: these figures are an 'early warning'; the RRB should take note of them and instruct the Scrutiny Group to examine and adjust them for approval at the October meeting.
- U. Dosselli: ATLAS and CMS have used different criteria to prepare their author lists (engineers); this can create problems inside some Universities. I hope that next year they use the same approach.
- RJC: we knew that the collaborations needed flexibility in agreeing their author lists and wanted them to have that freedom.
- R. Wade: there is concern about consistency of author lists; the collaborations need flexibility but cost sharing is of real interest to the RRB and the collaborations could look into some level of harmonisation.
- RJC: we could ask the collaborations to talk together about this, but the ATLAS RRB could agree a slightly different cost sharing from that agreed by say the CMS RRB; such flexibility can be useful for dealing with problems and should be retained if possible.
- P. Jenni: ATLAS has iteratively evolved their author list in conformity with Article 9.2 of the MoU.
- RJC: we have not compared ATLAS and CMS lists; they are probably not very different.
- R. Wade: we are reassured by the scrutiny of total costs but shouldn't author lists also be independently scrutinised because they determine how much the FAs have to pay
- RJC: there is a danger of ending up with a rigid formula if we try to strictly define a 'PhD equivalent', but it that is what the RRB wants we can instruct the collaborations accordingly.
- S. Tovey: scrutinising authors is very hard; in my own institute there are academics who give 30% of their time to ATLAS and post-docs who give 100% but each shows as one unit in the list.
- RJC: past experience shows that after a year or so cost sharing settles down to something generally accepted.
- G. Wormser: can the MoU author list show totals and fractions?
- P. Jenni: it is trivial to add and it will be done.
- R. Wade: if the list and the numbers are very clear each year in the MoU, that is OK.

The RRB then took note of the 2003 M&O cost estimates as presented and asked the Scrutiny Group to examine them in preparation for the October meeting.

Cashmore then reminded the RRB that, according to the MoU, Scrutiny Group members serve for 2 years, half of them being replaced each year, and its composition agreed each April. He proposed that the present launch group be retained for the remainder of the 2002 exercise and that RRB delegates provide him with **names of candidates for the 2003 Scrutiny Group before the October meetings**. After further discussions, 50% of the present group can then be renewed next April. This was accepted.

- **Memorandum of Understanding for M&O CERN-RRB-2002-035**
Presentation CERN-RRB-2002-058

M. Nordberg

The ATLAS-specific annexes in the MoU reflect the status of the collaboration at a cut-off date of April 2, 2002. Annexes 1-8 are updated versions of those in the Construction MoU; Annexes 9-12 are the common M&O item classification and guidelines and operation of the Scrutiny Group; Annex 13 is the ATLAS author list (updated annually) of PhD physicists, and engineers with an equivalent degree; Annexes 14-16 define common power cost discounts and Cat. A payment procedures.

N. Lloyd mentioned that Annex 1 doesn't actually list the FAs for most countries. Nordberg explained that it is the list of FAs and Collaborating Institutes used in ATLAS money matrix tables. It is properly cross-referenced to Annex 2 and therefore can stand as is.

The RRB **accepted the M&O MoU for circulation for signature** after any final **updates and error corrections** in the ATLAS-specific Annexes; these should be sent to M. Nordberg by **May 10th 2002**. Cashmore commented that this was a very important step forward for ATLAS.

9. Costs to Completion and C&I

- **Scrutiny Group Report on C&I**
Paper CERN-RRB-2002-047

D. Schinzel
Presentation CERN-RRB-2002-079

In collaboration with the Resource and Technical Coordinators, C&I was agreed to be (non-recurrent) work in assembly and test areas, away from the underground cavern, whereas M&O is (recurrent) work in assembly and active storage areas, or (recurrent) work in or close to the cavern. The M&O scrutiny exercise revealed uncovered C&I costs that stood out clearly in the initial 'M&O' spending profiles of ATLAS and CMS.

Cashmore remarked that by October 2001, C&I and M&O were already separated but there was a potential unexamined overlap between M&O, C&I and CORE costs. After the RRB, albeit belatedly, he asked the CORE Group chair, W. Bartel, and the SG Chair to form a small, joint C&I Scrutiny Group with a mandate to check the reasons for C&I costs, scrutinize the levels, review the spending profile and identify accidental double counting. Its members were:

From CORE: W. Bartel, P. Lazeyras, K. Potter
From the M&O SG: P. Giubellino, D. Plane, J. Yeck
with E.M. Rimmer (Secretary) and D. Schinzel (Chair)

The Group recognised several valid reasons for uncovered C&I: initial underestimation of the complexity of LHC detectors, unforeseeable circumstances, an increase in outsourced service contracts that need to be paid for by the Collaborations, and justified changes in strategy for risk reduction and/or easier maintainability.

ATLAS splits C&I costs into type-A and type-B. The B costs could be understood once it was recognised that ATLAS is being built in a decentralised fashion (to save civil engineering costs) and this leads to a need for extra facilities. The C&I spending profiles peak in 2004, A-costs at 4 MCHF, B-costs peaks at 3 MCHF, and both reach zero in 2006 when ATLAS aims to be ready for physics.

The SG accepted that the C&I A costs (magnets and cryogenics) have the correct level and profile, but felt that the manpower (general services) may be underestimated and should be closely followed year-by-year. The SG also judged that the reasons for sub-detector specific C&I B costs, as well as the level and profile, are justified, and recommended that ATLAS 2002 C&I A and B costs should be endorsed.

Discussion

- S. Tovey: if manpower dominates and is underestimated the total cost could rise.
DS: ATLAS gets a lot of manpower from outside, but ATLAS moves a lot of heavy equipment and crane drivers and heavy riggers are probably not available.
G. Wormser: did the SG look whether ATLAS and CMS can combine their plans/needs to get some savings? And there is also outside manpower.
DS: joint efforts were discussed but the geography (Point 1 and Point 5) isn't very favourable.
M. Nessi: ATLAS and CMS are looking into a common strategy for pooling some services and ATLAS is looking into how to exploit external manpower for C&I (as well as for M&O); already 3-4 in-kind engineers are working on C&I A-type activities.
F. Cervelli we have understood the C&I A/B split but financially there is no difference.
M. Spiro: is there to be a cost-sharing difference?
P. Jenni: C&I A costs have been divided according to total investment, C&I B according to sub-system investment.
RJC: we have to see later how the total sum (of all supplementary costs) can be covered.

• **Strategy and Scenarios for Deferrals**

Paper CERN-RRB-2002-025

Presentation

P. Jenni

CERN-RRB-2002-062

Jenni recalled the situation as it was last October for the initial staged detector to be installed by April 2006. The total 2002–2005 Cost to Completion C-to-C was 98 MCHF, which covered construction completion costs (52.0 MCHF), C&I (21.1 M) and M&O (24.9 M, A+B+C costs without power discounts). Computing costs for ATLAS and the common CERN LHC Computing Grid Project are under separate evaluation, with a dedicated RRB session, and are not included. The construction completion costs were split into common items and system-specific items. It was and is proposed to share the extra cost of common items between all ATLAS collaborators according to CORE investments, with an extension of the membership fee to 2004–2006 as the minimum contribution. The extra cost of system-specific items is to be shared between the collaborators in each sub-system as agreed by their Institute Boards and reported to the RRB. (Sharing of C&I and M&O costs has been discussed earlier).

Since October, continued external and ATLAS internal scrutinies have led to some A/B and M&O/C&I reclassifications and to some reductions in M&O and C&I estimates. The revised Cost to Completion for the collaboration is now 87.3 MCHF: reductions are 4.9 MCHF for area infrastructure items now moved into LHC completion costs, 3.1 MCHF for M&O (A and B), 2.5 MCHF for M&O Cat. C and 0.2 MCHF for C&I. M&O costs (A and B) for the period 2002–2005 are 19.3 MCHF, leaving a supplementary cost for construction and C&I of 68 MCHF.

With this funding, ATLAS can construct and commission its initial detector in which some components needed for high-luminosity are staged:

- one Pixel layer in the ID
- outermost TRT end-cap wheels (C-type)
- part of the LAr ROD system
- tile gap scintillators
- EES and EEL MDTs
- half of the layers of the CSCs
- part of the Common Project processors
- part of the high luminosity shielding

This staging creates a contingency of 8 MCHF; other staged components needed for high-luminosity will be handled as upgrades.

There is a very strong motivation to keep costs to a minimum faced with the physics impact of missing components. ATLAS acknowledges major efforts already made by FAs and Institutes to cover costs and manpower of their MoU deliverables, and Jenni stressed that serious efforts are being made to contain and constrain costs wherever possible. For example, cost limitation played a crucial role in the

reorganization of the barrel toroid integration and a joint effort is underway with CEA to minimise a recently identified possible overcost of 1.2 – 1.5 MCHF for the barrel toroid engineering contract. (CEA made a special contribution of 1 MCHF to ATLAS concerning BT engineering at the time of the Construction MoU as an advance on future contributions. Spiro later mentioned that this must be accounted for in the recognition of supplementary contributions).

After the last RRB, the Director of Research requested ATLAS to prepare plans for two deferral scenarios A and B in which 20 MCHF and 40 MCHF of the then shortfall (98 MCHF) are not covered on time but may become available later. This evaluation should demonstrate priorities and introduce flexibility to cope with reduced supplementary funding. The term 'deferral' means that funding is redirected to the highest-priority completion construction and time-critical items. Inevitably, this will entail a reduced physics performance initially, depending on the level of deferrals. The main discovery goals of the LHC are difficult to achieve and require a complex detector therefore staging and deferrals are not simple to plan. After an initial running period, the LHC will operate for many years at its high design luminosity. This implies the need for robustness and redundancy for the most vulnerable detector components as well as a clear upgrade path in any staging/deferral plan.

In the document RRB-2002-025, ATLAS presents a scenario A that retains the performance needed for the main goals of the initial run, namely Higgs, SUSY and exploratory searches for new physics. The C-to-C in this scenario is 80.4 MCHF (including M&O Cat. C and without power discounts). In the case of further funding limitations, two cases for scenario B have been studied in which HLT/DAQ processing power, designed to handle an input rate of 75 kHz, is deferred. A 10 MCHF deferral, representing almost half of the HLT/DAQ investment, reduces the rate to 30-35 kHz, cutting into B-physics. A 15 MCHF deferral would bring the rate down to 10-15 kHz, cutting into the very basic high-pT physics. In addition, further severe system-specific staging and cuts up to some 6.7 MCHF would have to be made, such as reduced off-detector electronics. These would initially affect the operational integrity of the detector. More severe cuts on M&O and C&I would delay and endanger important parts of integration and commissioning, increasing the risk of starting LHC operation with a detector not fully tested.

Jenni then presented guidelines for sharing the 68 MCHF of supplementary construction costs among the collaborators, including extension of the membership fee period. He reported that the National Contact Physicists have formed crucial links between the ATLAS management and the FAs and that many very encouraging and constructive interactions have taken place. Although it is premature to draw any definite conclusions, indications are that support for ATLAS continues to be strong and that within a time frame of up to 2006/7, this funding will be within reach, for which the collaboration is most grateful. A considerable fraction (~ 60%) is already expected from those FAs that have given an estimate, while the rest are preparing requests for upgrades and additional funding.

It is also clear that CERN's help will be needed with cash flow difficulties, backed by pledges from FAs. Therefore, a definite plan with sharing and profiles is urgently needed for the October 2002 RRB and ATLAS asks the FAs for support to build the initial staged detector for the first physics run in 2007. In the meantime, the collaboration must press on with the most time-critical components for the magnet system and infrastructure that are needed for any viable detector configuration.

Discussion

L. Gidefeldt (SE): how much is staged?

PJ: of the initial staged detector, about 20MCHF is staged but only 8MCHF is really available because the rest is staged anyhow for high luminosity running.

G. Wormser: does the HLT/DAQ staging take account of cost savings [on purchasing computer components] due to the 1 year shift in schedule?

PJ: not explicitly; the exact amount of HLT/DAQ staging/saving will be fixed when we know the overall situation.

Cashmore asked the meeting to consider how to assemble the 68 MCHF shortfall, assuming that M&O costs are being handled satisfactorily. He presented a table showing the ATLAS guideline requests for extra funds from each country and some very preliminary indications received to date of the amounts that might be forthcoming. These already amount to a substantial fraction of what is needed; CERN plans to contribute an additional 13.7 MCHF. Cashmore then asked each FA in turn to say whether they could commit to the sums requested. At the end of this survey it appeared that a good fraction of the additional funds will be found.

[Responses were positive and supportive but the line-by-line examination of the requests is not minuted in detail as several FAs reported that they were still negotiating at a national level and not all FAs were present.]

It is now urgent for ATLAS, after further discussions with the FAs, to prepare a plan based on realistic funding levels and profiles. Pressure is already building up in 2002 and 2003 to take on some of the supplementary items. Also Cashmore needs such a plan if CERN is to be asked to help with cash flow problems. Therefore it was decided that FAs will send **written indications of amounts and profiles for additional funds to ATLAS by end June** so that the plan can be presented to the RRB in October.

Wormser suggested that the plan should start pessimistically and build up later. Cashmore felt there is a danger in being too pessimistic; the October RRB can judge whether the plan is realistic.

Cashmore reminded the RRB that last October they had agreed that, until this meeting, critical, high priority items could be funded by **well-documented transfers** from Common Funds. Although this has not yet been necessary, he asked that the right to do so should continue. The **RRB agreed** to this. The urgency will become apparent in the following presentation and Cashmore emphasised that if any additional funds can be made available immediately that will lessen the need to move money around.

- **Budget requests for Supplementary and C&I Costs 2002** M. Nordberg
Paper CERN-RRB-2002-026
Presentation CERN-RRB-2002-058

Item-by-item details of supplementary costs are in CERN-RRB-2002-025; the proposed sharing by FA of the supplementary and C&I costs for 2002 is in CERN-RRB-2002-026. Nordberg presented the updated 2002 estimates:

	Commitments MCHF		Payments MCHF	
	Estimate Oct 2001	Update April 2002	Estimate Oct 2001	Update April 2002
<i>Supplementary Costs</i>				
System-specific	2.5	2.5	2.0	2.3
Common items	15.0	15.0	7.6	7.6
Σ	17.5	17.5	9.6	9.9
<i>C&I Costs</i>				
Cat. A	1.0	1.1	0.7	0.9
Cat. B	2.5	1.8	2.4	1.7
Σ	3.5	2.9	3.1	2.6
Grand Σ	21.0	20.4	12.7	12.5

He explained that although no new commitments have been taken since last October, the numbers do contain some history. Of the 15 MCHF of common item commitments, ~ 10 MCHF are already committed, and of the 9.9 MCHF total for payments ~ 4 MCHF have already been paid from the baseline budget.

For C&I, critical Cat. A items for 2002 are designers for final configuration planning, integration of the traction system, and technical services for crane driving and heavy handling jobs. For Cat. B, LAr cryostat integration is the top priority. Cat. B also includes technical manpower, both hired (0.8 MCHF) and 2 FTEs from institutes to be credited at 91.5 kCHF/y/FTE, according to Scrutiny Group estimates.

Nordberg emphasised that these funds are needed to keep ATLAS going until 2003 and invited the RRB to approve the 2002 budgets on the understanding that FAs will contribute on a best effort basis as soon as possible. He noted that some FAs have indicated a preference for contributing to some categories rather than others (respecting overall totals). As in the case of M&O, if available resources fall below planned payments ATLAS will attempt to shift Cat. A costs into 2003 and scale down the Cat. B integration programme.

Discussion

- J. Engelen: if we contribute, are we starting to spend the 68 MCHF that we don't have?
RJC: that is correct; until we agree a new Financial Plan ATLAS can only find this money if FAs give actual extra money or by agreeing to give up part of the baseline plan if necessary.
- R. Wade: are we agreeing the totals or the individual contributions?
RJC: we have to agree the totals and not individual contributions; we will have to make arrangements on the fly until we have agreed a new Financial Plan.
- A. Clark: are we assuming a best effort basis?
RJC: yes but we cannot place contracts on that basis, they must have guaranteed funding.
- L. Gidefeldt: I don't know what 'best efforts as soon as possible' can mean for countries with no money; for Sweden it is zero.
RJC: this is what ATLAS has to determine between now and October to prepare a reliable plan. ATLAS was not created according to a formula and it will be easier for some than for others to find the extra funds requested. We still have to work out what is possible.
- O. Hansen (DK): Denmark has no money either.
RJC: nonetheless we can approve the total even though we cannot here and now agree to a cost split.
- G. Wormser: it would be better if ATLAS could find any extra money needed internally until the new Financial Plan has been agreed.
RJC: no one is being asked to commit or pledge a specified sum of money; the RRB is being asked to agree that ATLAS needs this amount of Supplementary and C&I money in 2002 to build the detector; the money can come from up-front payments by FAs or by deferrals, e.g. in the processor farm.
- F. Cervelli: if ATLAS has the money now, they can proceed, if not, they must wait until October.
RJC: it is more complicated; you have to track payments on a contract and in the worst case something else has to be given up. If money can be made available at CERN by any route whatsoever to ease the situation, it can be carefully accounted.
- D. Horn: the increase amounts to ~ 10% of the 2002 baseline budget approved for ATLAS, so it could be approved as long as the items are soundly accounted for.
RJC: in the end, if the RRB does not go ahead with this plan there will be something ATLAS cannot build. Deferrals can keep ATLAS going for one more year only; it only gets worse from now on.
- G. Wormser: it is only a 6-month problem.
U. Dosselli: the splits proposed are meaningless.
RJC: we are no longer discussing the splits, we are telling ATLAS whether they can continue or not; it is urgent to get this sorted out in October.
- J. Engelen: the problem is clear, it needs to be solved and ATLAS must go on; but will I get a bill this year?
RJC: we can work this out with a bi-lateral arrangement; ATLAS might have to agree that NIKHEF might have to give up something to provide this money.

The RRB then **agreed** that ATLAS can continue through **2002 at the level of Supplementary and C&I Costs presented**, using either actual additional funds from FAs or well-documented displacement funding from the baseline budget (or from FAs), on the understanding that such displacement places some items at risk at a later date.

- *Budget estimates for Supplementary and C&I Costs 2003* M. Nordberg
Paper CERN-RRB-2002-027 Presentation CERN-RRB-2002-058

Cashmore pointed out that although the RRB had only to take note of the 2003 estimates at this meeting, they will have to be approved in October. Nordberg presented the preliminary estimates, still based on a schedule for machine start-up in 2006:

	<i>Commitments MCHF</i>	<i>Payments MCHF</i>
<i>Supplementary Costs</i>		
System-specific	9.0	3.6
Common items	25.5	18.6
Σ	34.5	22.2
<i>C&I Costs</i>		
Cat. A	3.0	2.8
Cat. B	3.0	2.9
Σ	6.0	5.7
Grand Σ	40.5	27.8

He noted that all supplementary costs, dominated by the magnet system and pit infrastructure, items that must be in place before detector installation can start, will have been committed by end 2003. For C&I, Cat. A cost drivers are the integration of external cryogenics in the pit, magnet controls, and technical services; Cat. B cost drivers are hired manpower for pre-assembly and integration, and equipping system-specific laboratories and work areas.

Discussion

- G. Wormser: all of the supplementary costs must be committed by end 2003, but what happens if all of the money is not found? So in 2002 ATLAS must not commit for items that have to be dropped when the plan is finalised in October.
- MN: Jenni has taken account of that in his deferrals strategy.
- RJC: the same applies to the baseline budget; Wormser is emphasising the fact that great care is needed not to commit to 'unnecessary' items.

10. & 11. Summary, future activities & A.O.B.

R. Cashmore

ATLAS is making excellent progress and is working hard to contain costs. When the final numbers are agreed in October, ATLAS will then work within that budget. Cashmore thanked the RRB for having taken the important step of agreeing on the M&O MoU and encouraged FAs to sign it as soon as possible.

The need for a Financial Plan based on realistic numbers to be approved in October 2002 is well established, and this will require a lot of work from both the collaboration and the FAs during the summer. The LHCC will have to examine the plan and this can be done in October ahead of the RRB. Such a plan, especially the spending profile, is needed urgently if CERN is to be asked to help with any cash flow difficulties. To reach this goal, discussions concerning additional funds should continue and the FAs should send **written indications of amounts and profiles to ATLAS by end June**.

Peter Jenni thanked the RRB warmly for its support which is very encouraging for ATLAS, and expressed the determination of the collaboration to build a detector capable of doing exciting LHC physics.

Next meetings: October 21st - 23rd, with ATLAS on the afternoon of Monday 21st.