

14 September 2001

MEMORANDUM

To: Roger Cashmore - DG/DI
From: M&O Scrutiny Committee
Subject: Status Report

The M&O Scrutiny Committee met twice at CERN. In its first meeting, on 23 August 2001, the committee concluded that, due to the very short time available, a careful scrutiny of all cost estimates was practically impossible. It was therefore agreed that a limited but well visible number of cost entries should be thoroughly investigated. It was further agreed that costs should be scrutinised by concentrating on the years 2002 - the coming budget year - and 2007 - the first year of full running (cf. attached list of questions, Annex 1). In addition it was decided to concentrate on Category A costs.

The committee concluded further that "Commissioning and Integration" (C&I) costs should be clearly separated out from M&O costs. The guidelines for the cost separation were defined thus:

- M&O consists of work in or close to the pit.
- C&I consists of work in mounting and test areas, away from the pit.

The reasons for the non-negligible C&I costs were identified to be oversights in the Construction MoU CORE costs and unforeseeable circumstances (e.g. caused by delays in civil engineering or necessary changes in integration strategy). It is worth mentioning here that so far visible C&I costs appear only for ATLAS and CMS, since their construction is further advanced. In addition, the first versions of their (Interim) MoUs for Construction date from 1995 when the CORE costs for these experiments were fixed. At this time, C&I costs were traditionally covered by the CERN group's exploitation budgets. In addition, CERN services were free of charge. The committee recommends treating the C&I costs in the forthcoming RRB meetings at the same level of importance as the Costs to Completion.

In order to obtain results rapidly, sub-groups were formed to work on the above-mentioned list of questions. In particular, each sub-group was asked to address the following issues:

- Attempt to identify and separate C&I costs from the M&O exercise.
- Identify cost drivers and indicate the possibilities of cost reductions by change of strategy.
- Standardise the data presentation formats in order to facilitate comparisons, e.g. list all manpower under Operation and not spread between Operation and Maintenance lines. The result is that the distinction between these lines has now been suppressed.

It was felt that, by proceeding in this way, reasonable results could be achieved despite the short time available. It also became clear that this procedure would, in the longer term, help to lay the foundations for the efficient functioning of standing M&O scrutiny groups, advisory to the RRBs.

A short and very philosophical discussion took place concerning the definitions of Category A, B and C M&O costs and their evolution. The committee arrived at the following recommendations:

- Video-conferencing (in Communications) should not be listed as an M&O item, since collaborating institutions operate their own video-conferencing facilities free of charge.
- Cooling & Ventilation as well as Power (in General Services) should not exhibit a step function behaviour starting in 2002, but rather a ramp-up reaching a plateau value in 2005-6.
- Reliable Power metering should be introduced to improve the estimates for the Power item (in General Services).

- The general ventilation exhaust systems of the experimental areas and auxiliary buildings are linked to the safety of personnel. They should therefore appear (in General Services) not under Cooling & Ventilation (an A cost) but rather under Safety (a C cost). This would reduce the Cooling & Ventilation Category A costs significantly.
- Secretarial Assistance (in Secretariat) should show a reasonable ramp-up.

The replies to the eight points of the question sheet (Annex 1) were thoroughly scrutinised by the Scrutiny Committee for the years 2002 and 2007. The numbers that are now quoted in the spreadsheets for M&O Category A costs and for C&I costs were found to be sound. During the exercise it became evident that outsourcing through service contracts may not always be the best solution to M&O problems. Several Category A costs are for Service Contracts that are negotiated by CERN. It will be desirable to consult Collaborations when drafting the terms of such contracts.

It was also noted that Industrial Service manpower costs are a visible cost driver due to the staff reductions imposed by the CERN Council. It is therefore suggested that Collaborations should investigate the possibility of forming support teams consisting of technical staff from Collaborating Institutions if effective cost reductions can be achieved in this way and the employment regulations on the CERN site can be satisfied.

Concerning Category B costs, only ATLAS has so far worked out a detailed breakdown. ALICE provided a breakdown at a less detailed level but for the other two experiments only gross numbers are currently available. The committee recommends that adequate, subsystem-oriented templates for Category B be prepared. These templates should be filled out by the Collaborations during the coming months for thorough scrutiny by the committee.

The time-profile of the C&I expenses shows that it is urgent to find means of covering these costs.

Category C costs could not be scrutinised at all in the short time available.

The results of the work of the committee and its sub-groups are reflected in the new spreadsheets and diagrams that are attached (Annex 2 and Annex 3). The principal changes with respect to the previously available data are:

- Visible cost reductions were achieved in the case of Magnet Controls by changing a foreseen service contract into a result- and multi-task-oriented contract.
- C&I was separated out from both Category A and B M&O costs.
- The manpower requirements for Shutdown Activities, Detector (re-) Integration and Survey, General Technical Support (in Detector-related Costs) and in Heavy Transport (General Services) have been determined. The transitions from C&I to M&O for these activities have also been identified.
- Service Contracts have been identified as cost drivers, but were difficult to scrutinise in the time available.
- The Cooling & Ventilation and Power costs have been re-assessed and now show a reasonable ramp-up.
- Shutdown Activities do not now start until 2005.
- The System Management costs for on-line computing have been evaluated following the general guideline, derived from the experience of large computing centres, i.e. one technician/operator every 300 "boxes". The concept of "box" is considered the most appropriate to use, since maintenance involves mainly interfaces, connectors, switches and the like that scale with the number of units rather than with their power). It was left to each of the experiments to fine-tune this parameter to the most appropriate value for their specific installation.
- Concerning the costs of Data Recording Media, the committee recommends that only those written at Tier0 (i.e. primarily raw data) are included as M&O, while all those written at the Tier1s will be treated under "Off-line computing". This corresponds to the traditional separation. Since, however, all media costs are being assessed and discussed in the overall context of setting up the LHC Computing Grid project, it was decided that they should not be included in the total M&O costs at present.

- For the maintenance of the on-line computing hardware, guidelines were followed that are very similar to those proposed for off-line computing; i.e. maintenance is by replacement at regular intervals. It is considered that On-line Computers will be replaced on a three-year cycle and LAN equipment on a four- or five-year cycle. For initiating these cycles for particular pieces of equipment, the actually foreseen installation profile is taken into account. The replacement cycle in units of years is obviously the parameter that will be adjusted in due time.

Having completed its initial, rapid scrutiny of the M&O estimates, the committee concludes that it should continue its work in the coming months in order to examine more closely the aspects for the consideration of which there was not yet sufficient time. This applies in particular, as mentioned above, to Category B and C expenses.

Dietrich Schinzel, Chairman

Annex 1

List of Questions Posed to the Collaborations

DETECTOR RELATED COSTS

- 1) Explain how the costs for magnet, magnet controls, magnet power supply, external cryogenics, proximity cryogenics and cryogenic fluids have been reached and indicate the amount of manpower involved.
- 2) List and explain the FTE manpower requirements for shutdown activities, detector (re-)integration & survey, general technical support and (in General Services) heavy transport and indicate whether there is a transition from 'Commissioning and Integration' to 'Maintenance and Operation'.

SECRETARIAT

- 3) Explain why costs (at least during the next 3-4 years) are considered to be M&O.

COMMUNICATIONS

- 4) Give the assumptions used for charging; in the 2002/2007 totals there is a factor of > 15 between the smallest and largest estimates (146 kCHF for LHCb, 2,315 kCHF for CMS).

ON-LINE COMPUTING

- 5) Give the total number of boxes and the number boxes per FTE of manpower assumed for System Management.

TEST BEAMS, CALIBRATION FACILITIES

- 6) Explain why costs (at least during next 3-4 years) are considered to be M&O.

LABORATORY OPERATIONS

- 7) In the 2002/2007 totals for these activities, there is a factor of >20 between the smallest (270 kCHF for CMS and LHCb) and the largest (5,980 kCHF for ATLAS), and the ATLAS annual cost peaks in 2003. These discrepancies should be explained.

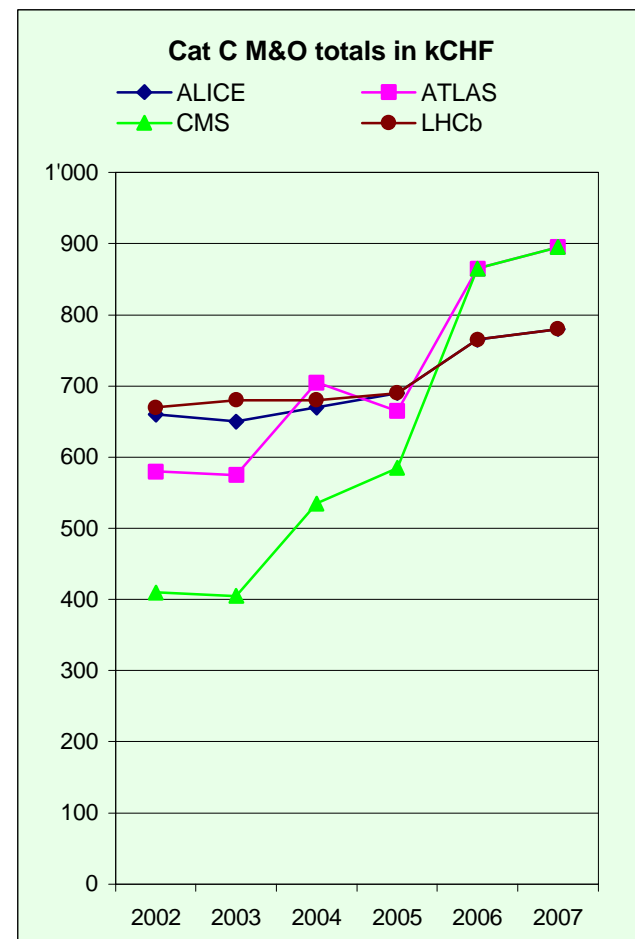
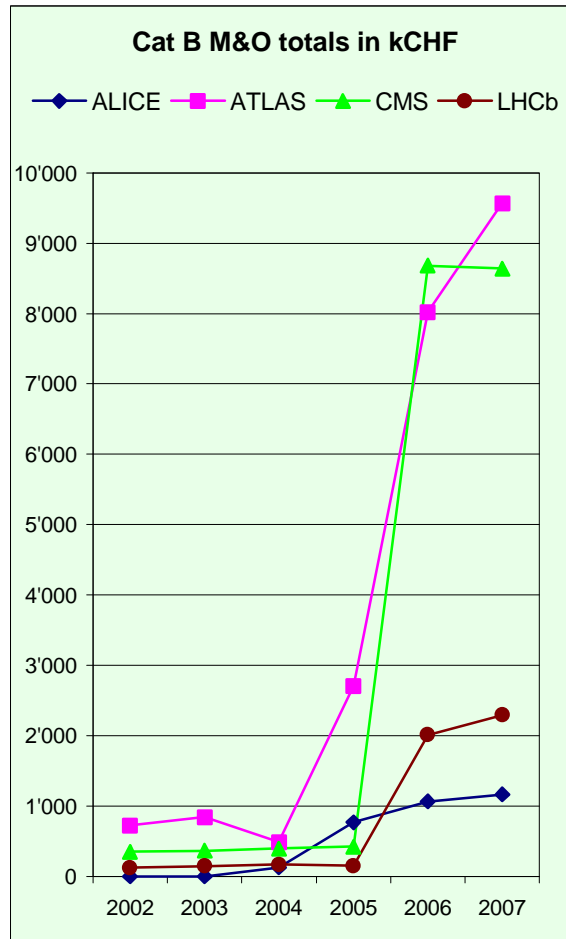
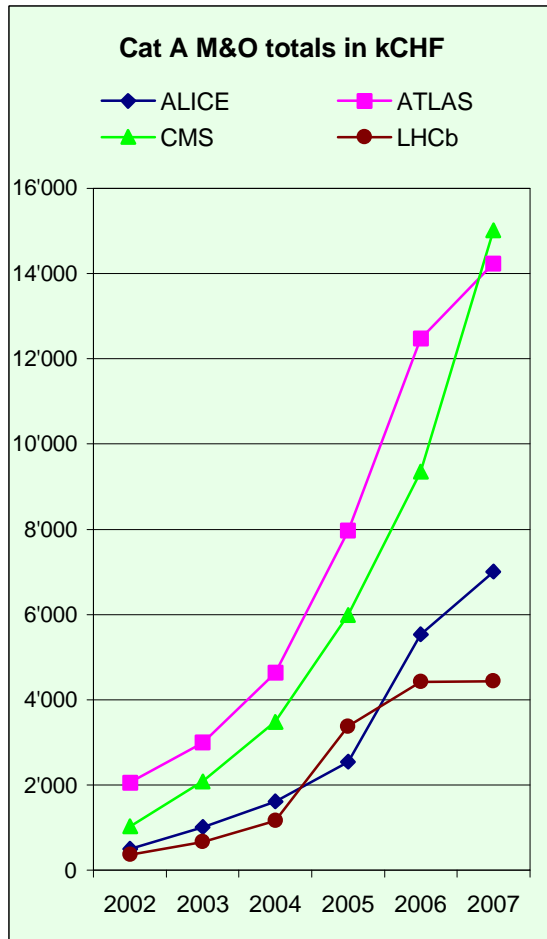
GENERAL SERVICES

- 8) Explain how cooling & ventilation costs have been reached.

Annex 2
M&O Estimates after Scrutiny

M&O Main Cost Estimates in kCHF

	2002				2003				2004				2005				2006				2007			
	ALICE	ATLAS	CMS	LHCb	ALICE	ATLAS	CMS	LHCb	ALICE	ATLAS	CMS	LHCb	ALICE	ATLAS	CMS	LHCb	ALICE	ATLAS	CMS	LHCb	ALICE	ATLAS	CMS	LHCb
<i>Detector related costs</i>	5	219	199		150	452	617	5	340	597	874	165	624	2'142	1'564	691	1'650	4'298	2'949	1'044	1'803	4'298	2'994	1'044
<i>Secretariat</i>	41	40	45	45	119	110	115	120	160	170	205	125	209	245	205	165	217	270	300	180	226	290	300	195
<i>Communications</i>		15	100	14		15	115	17		15	150	20		15	220	21		40	270	22		40	270	22
<i>On-line computing (no rec. media)</i>		340	80		10	345	260		20	820	1'150	150	238	1'715	1'560	570	471	2'935	1'990	740	1'167	3'955	7'640	770
<i>Test beams, calibration facilities</i>	305	645	390	220	227	655	490	250	177	605	410	270	177	165	410	230	177	120	260	160	177	120	200	140
<i>Laboratory operations</i>		160	20	65	280	180	20	55	280	180	20	45	280	210	220	45	280	910	270	35	280	875	270	25
<i>General services</i>	792	1'339	766	791	859	1'913	1'047	997	1'289	2'922	1'418	1'208	1'483	4'016	2'284	2'274	3'284	5'290	3'970	2'895	3'916	6'120	3'995	2'890
<i>Consultancy</i>		90	130	20		90	130	40		90	130	20	200	90	480	200	200	80	480	200	200	80	480	200
<i>Outreach</i>		20	50	60	10	20	60	10		20	50	60	10	20	125	60	20	200	60	20	20	125	60	20
GRAND TOTALS A_T + B_T + C_T	1'163	2'898	1'790	1'165	1'665	3'810	2'854	1'494	2'286	5'449	4'417	2'013	3'232	8'723	7'003	4'216	6'299	14'143	10'549	5'296	7'789	15'903	16'209	5'306
<i>no data recording media</i>																								
A TOTAL (no data rec. media) A _T	503	2'058	1'030	371	1'015	2'995	2'084	667	1'616	4'629	3'487	1'163	2'542	7'963	5'993	3'375	5'534	12'473	9'349	4'419	7'009	14'238	15'019	4'434
B TOTAL under above headings B _T	260	350	124		240	365	147		115	395	170		95	425	151		805	335	112		770	295	92	
C TOTAL C _T	660	580	410	670	650	575	405	680	670	705	535	680	690	665	585	690	765	865	865	765	780	895	895	780
Additional subsystem B costs (not included under above headings) B _S		465				600			130	370			767	2'612			1'064	7'215	8'345	1'900	1'165	8'800	8'345	2'200
B_T + B_S		725	350	124		840	365	147	130	485	395	170	767	2'707	425	151	1'064	8'020	8'680	2'012	1'165	9'570	8'640	2'292
A_T + B_T + B_S	503	2'783	1'380	495	1'015	3'835	2'449	814	1'746	5'114	3'882	1'333	3'309	10'670	6'418	3'526	6'598	20'493	18'029	6'431	8'173	23'808	23'659	6'726
A_T + B_T + B_S + C_T	1'163	3'363	1'790	1'165	1'665	4'410	2'854	1'494	2'416	5'819	4'417	2'013	3'999	11'335	7'003	4'216	7'363	21'358	18'894	7'196	8'953	24'703	24'554	7'506



Annex 3
C&I Estimates after Scrutiny

C&I Cost Estimates in kCHF

	2002		2003		2004		2005		2006		2007	
	ATLAS	CMS	ATLAS	CMS	ATLAS	CMS	ATLAS	CMS	ATLAS	CMS	ATLAS	CMS
<i>Detector related costs</i>	1'770	470	3'525	850	5'345	905	3'633	810				
<i>Secretariat</i>												
<i>Communications</i>	20		20		20		25					
<i>On-line computing</i>	170	50	155	70	115	350	320	140				
<i>Test beams, calibration facilities</i>	50	200	485	700	250	700		400		100		
<i>Laboratory operations</i>	800	150	895	150	970	150	800	150				
<i>General services</i>	205	820	315	1'280	715	1'590	50	1'430		60		
<i>Consultancy</i>	125	300	130	300	80	200	80					
<i>Outreach</i>												
GRAND TOTALS	3'140	1'990	5'525	3'350	7'495	3'895	4'908	2'930		160		

