THE SITUATION OF RCBC AFTER THE SUMMER 81 RUNS

1. Technical Situation

Fourth Run of RCBC (2 - 6 July 1981)

Between the previous operation of RCBC mid June 1981 and beam period 5B beginning of July, RCBC was kept under hydrogen gas below 100K with intermittent cooling and supervision by on-call people only, to prevent the indium seals from degradation and to ease start-up. This worked very satisfactorily, and within 24 hours after re-start of shifts, RCBC was filled and made ready for expansions. During the remaining three days of beam, 105 000 expansions were made and 28 000 three-view pictures of good quality taken at 10 Hz to check out the trigger hodoscope of NA23. Unfortunately, a cold hydrogen leak developed across the piston-bellows assembly (which had previously been tested over 5 million expansions at nitrogen temperatures), which could, however, easily be handled by continuous pumping.

Fifth Run of RCBC (20 August - 2 September 1981)

After the warming-up of RCBC at the end of period 5B, the leak had disappeared; it was concluded that is must be related to thermal contraction at the gluing between GRP bellows and stainless steel flange. A new assembly, being available from Rutherford Laboratory, was installed for period 6C. This was not very successful as a similar leak appeared already during filling of RCBC. It was nevertheless possible to keep the pressure behind the piston low by continuous pumping and, using the automatic action of the chamber pressure on the piston zero position, re-fill the chamber only every couple of hours; under these circumstances the chamber rate was limited to 20-25 expansions per beam spill of 2 s, resulting in 10-20 pictures at the NA23 trigger rate.

The first week of the 10 days period was very inefficient, mainly due to accelerator problems and broken drift chamber wires, but also due to
problems on RCBC (leaks on hydraulic system, burned out motor on cooling circuit, power supply failure on cameras etc.). RCBC did nevertheless 650 000 expansions and produced 190 000 three-view pictures of good quality.

The fact that only 10 months after the first cooldown and despite the absence of some experts at the end of the school holidays, all problems on RCBC during period 6C could finally be solved and 65 000 pictures taken only during the last 24 hours showed that RCBC had reached a very satisfactory state of running for experiments.

At the beginning of 6C, an attempt was made to photograph small bubbles in RCBC, using a standard lens and running RCBC at 27K instead of 26K. Track bubbles smaller than 100 μm were recorded; it was evident that the resolution was mainly limited by distortions in the optics. It was concluded that a high resolution channel on RCBC with 40-50 μm bubble size is feasible if a lens matched to the thick window glasses can be provided.

Future Runs

At the end of period 6C, RCBC was taken out of the magnet M1 to make room for the NA26 set-up and the small high-resolution chamber HOLEBC. Data production with RCBC is expected again only in summer 1982, when more data will be needed for NA23 and when the additional detectors for NA21 and NA22 will be available. For the first fixed target period of the SPS in 1982 it is planned to run HOLEBC for studies of short-lived particles. However it is agreed that a technical run of RCBC should take place beginning of 1982 to test an improved piston-bellows assembly (under preparation at Rutherford Laboratory, including an invar insert to compensate the shrinkage of the plastic bellows), to eliminate weak points in the highly stressed mechanical system by an endurance test (doubling at least the number of expansions done with RCBC so far), and to develop operation conditions for repetition rates above 20 Hz as well as for simultaneous use of high-resolution and normal cameras.

2. Financial Situation

R. Newport has prepared a revised final status of the RCBC cost which eliminated discrepancies observed in his table 1 at CC22. This paper (CERN/EP/EHS-CC/81-128 rev.) was checked and approved by CERN Finance Division.
It established the revised ceiling (RCBC price estimate + 15% contingencies + inflation indexing - £145 000 for work handled at CERN) at £789 627. As the RCBC Steering Committee decided (letter of I. Mannelli to R.F. Heyn) to limit the cost for CERN of RCBC to an amount going at maximum by £25 000 above the ceiling, and as all invoices received at CERN by end of September 1981 give a total of £774 113, the final invoice to be paid by CERN will not exceed £40514. The corresponding total cost of RCBC in current prices is 3.566 MSF (see CERN/EF/EHS-CC/81-127 rev.).

3. Contractual Situation

With in total more than 1 150 000 expansions at rates between 10 and 20 Hz over 2 s every 12 s (specification: >10^6 expansions) and more than 200 000 good-quality three-view pictures (specification: >10^4 pictures) in full field of M1, the requirements for PROVISIONAL ACCEPTANCE of RCBC, laid down in section 8.2. of the RCBC specification, are fulfilled. The technical problems left for future improvements are:

* low-temperature resistant gluing of bellows to steel flange
* convective heat transfer in volume behind piston (which requires this volume to be pumped and consequently to live with higher than originally planned stresses in bellows)
* achievement of good track pictures at expansion rates closer to 30 Hz (requires reduction of spurious boiling and noise on dynamic pressure signal for microprocessor control of expansion depth along the burst)

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