PROGRESS REPORT ON RCBC

R.W. Newport

1. CHAMBER AND VACUUM ENCLOSURE

1.1 Chamber Assembly

After the discussions following the National Engineering strike last year a new delivery date at the end of March was agreed. Until about a month ago progress on the new programme was good, the chamber was cleaned electro-chemically and the beam entry and exit windows welded in satisfactorily; the next stage of alignment of the chamber and the support tube was protracted by distortion in both items during earlier welding. These problems have now been overcome and the two items welded together very satisfactorily. After shot preening, due to take place this week, the reference surfaces will be finally machined and the hydrogen shield attached. The further delays have now extended delivery until the end of April.

1.2 Main Windows

Both windows have now been satisfactorily pressure tested to 19.5 bars and the first is mounted in the window flange ready for trial fitting in the chamber.

1.3 Window Gasket

Both commercial pressings and spinnings from the CERN workshops were available for inspection at the end of last year. The former were preferred because of their better uniformity and some twelve samples together with bubble screen spinnings from the CERN workshops have been sent to MORFAX for inspection and selection. If they are satisfactory a first gasket is expected in June.

1.4 Vacuum Tank

After the successful trial fitting in the iron structure last year the centre section and optics end section were sent to RL where the optics end plate was successfully trial fitted. The optics end section is now with IMI for modification to give correct alignment of the bolt holes. The modifications have been approved by National Vulcan and IMI expect to have completed the work ready for pressure testing early in April.

Development work and testing for the proposed GRP wrapped beam entry and the design accepted exit section has been succssfully completed by the CERN Safety Section. The new centre section has been chemically etched and is with IMI for machining.

1.5 Beam Entry and Exit Windows

The spare beam exit window is being prepared for forming after pre-machining, annealing and rolling.

2. OPTICAL SYSTEM

2.1 Telecentric Lenses

We have taken delivery of all four lenses. Their performance is excellent from f/11 to f/19.5 and two have been fitted with apertures of f/11 and two with f/16.

The manufacture of narrower band filters has been deferred until the specification of a high resolution optical system has been agreed.

2.2 Lens Mounting Plate

The lens mounting plate was delivered and mounted on its assembly frame before Christmas. The lenses, lens mounts, bellows and Ferguson drive unit have all been satisfactorially trial fitted. The vacuum pipes are now being installed.

2.3 Illumination System

The light box castings are now being made.

The non imaging concentrations are being machined and polished; delivery is expected at the end of this month.

Three main flash tube power supplies have been delivered and checked and sent to CERN. We have still to receive the spare supply and the supply for the data board.

2.4 Small Windows

We have taken delivery of all eight camera windows and six of the intermediate windows. The former are with OCLI for anti-reflection coating and the latter are being pressure tested.

2.5 Data Board

The data board control has been delivered to CERN and tested with the data board. After receipt of fibre optics light guides for two channels it will be used on trial with LEBC.

2.6 Cameras

Cameras 2 and 3 have been rebuilt to suit LEBC and were used on the LEBC run in December. Some 37,000 cycles have been performed and operation is satisfactory up to 16.5 Hz. With a modified operating cycle higher operating speeds are anticipated.

3 CHAMBER TEMPERATURE CONTROL

3.1 Valve Vessel

The mechanical assembly is complete and ready to be delivered to MORFAX. There are still a small number of instrumentation leads to be connected.

The improved bellows seals for the valves have been delivered, tested and fitted.

3.2 Control System

A revised synoptic panel has been agreed. Printed circuit boards are being manufactured and control units are being installed in panels.

4 EXPANSION SYSTEM

4.1 Piston - Bellows Assemblies

4.1.1 First Prototype

Apart from fitting scotchlite and preparing the indium seal this is available for installation.

4.1.2 Second Prototype

This has been dynamically tested at LN_2 temperatures for 1 million cycles. It is now being prepared for installation in the chamber, although there is some crazing in the bellows surface.

4.1.3 Drive Shaft Joint Test

Fatigue testing of the drive shaft joint at LN_2 temp has been successfully carried out to 33½ million cycles and has been discontinued.

4.1.4 Bellows Development

As a result of the detection of crazing in the resin rich regions a thorough investigation of the bellows stressing and the manufacturing techniques is being carried out. While we are confident that the present bellows will be mechanically satisfactory for the test programme there will undoubtedly be some spurious bubble nucleation on the surface and we are aiming to have a third piston fitted with improved bellows available at the end of 1980.

5 VACUUM SYSTEMS

5.1 Backing Pump

Three Roots-rotary units have been delivered to CERN, and mounted.

5.2 Main Vacuum System

The pipework for the main vacuum system is being manufactured and some has laready been delivered and trial fitted to the valve vessel.

The synoptic panels have been delivered to CERN.

5.3 Pump-Out Panels

Both the warm and cold pump-out panels have been delivered, wired and checked. Pirani/Penning gauge head fittings are being fitted before shipping to CERN.

6 MECHANICAL HANDLING

6.1 Main Window

Those items concerned with the assembly of the window capsule have been delivered and used satisfactorily in performing the window pressure tests.

6.2 Chamber and Piston-bellows Assembly

All items have been completed and will be tested shortly.

7 ACCESSORIES FOR CONTROL AND MONITORING

7.1 Electronic Controls

Six racks have been delivered to CERN.

7.2 Gas Control Panels

Three units have been delivered to CERN. A further sixteen are almost complete.

7.3 Pressure Transducers

The chamber pressure transducers have been delivered and have been sent to MORFAX for welding into their mounts.

7.4 Flash Illumination Control

This and the data board flash control are almost complete.

8 IRON STRUCTURE

Nothing to report.

9 TRANSPORT TO CERN

Nothing to report.

10. PROGRAMME

The latest programme, valid on 1st March, 1980 is attached. Points to note are as follows:-

10.1 The revised delivery date for the chamber, at the end of April, 1980.

10.2 The reduced programme of work at RL, allowing delivery to CERN at the end of June, 1980.

10.3 The completion of many key items:

10.3.1 The main window components.

10.3.2 The valve vessel.

10.3.3 The piston-bellows tests.

10.3.4 The lens plate.

10.3.5 The lenses

10.3.6 The beam entry/exit windows

10.3.7 The flash power supplies.

10.3.8 The backing pump units.

11. FINANCIAL

11.1 A financial statement, valid at 1st March 1980 is attached. Points to note are as follows:

11.1.1 The commitment has reached £903,236. This includes the commitments made at CERN on the optics and expansion systems and £9,500 recoverable from another CERN budget to pay for some features of the iron structure.

11.1.2 The lastest revised estimate for all items is $\sim$ 14% more than the original estimate after correction for inflation.

11.1.3 The inflation correction factor is shown in Figure 1.

17th March, 1980

Rutherford Laboratory.

FINANCIAL STATEMENT

RAPID CYCLING BUBBLE CHAMBER FOR EHS CERN

PROJECT NOs NA71500 - NA71799 INCLUSIVE

PROGRESS STATEMENT AS AT 1.3.1980

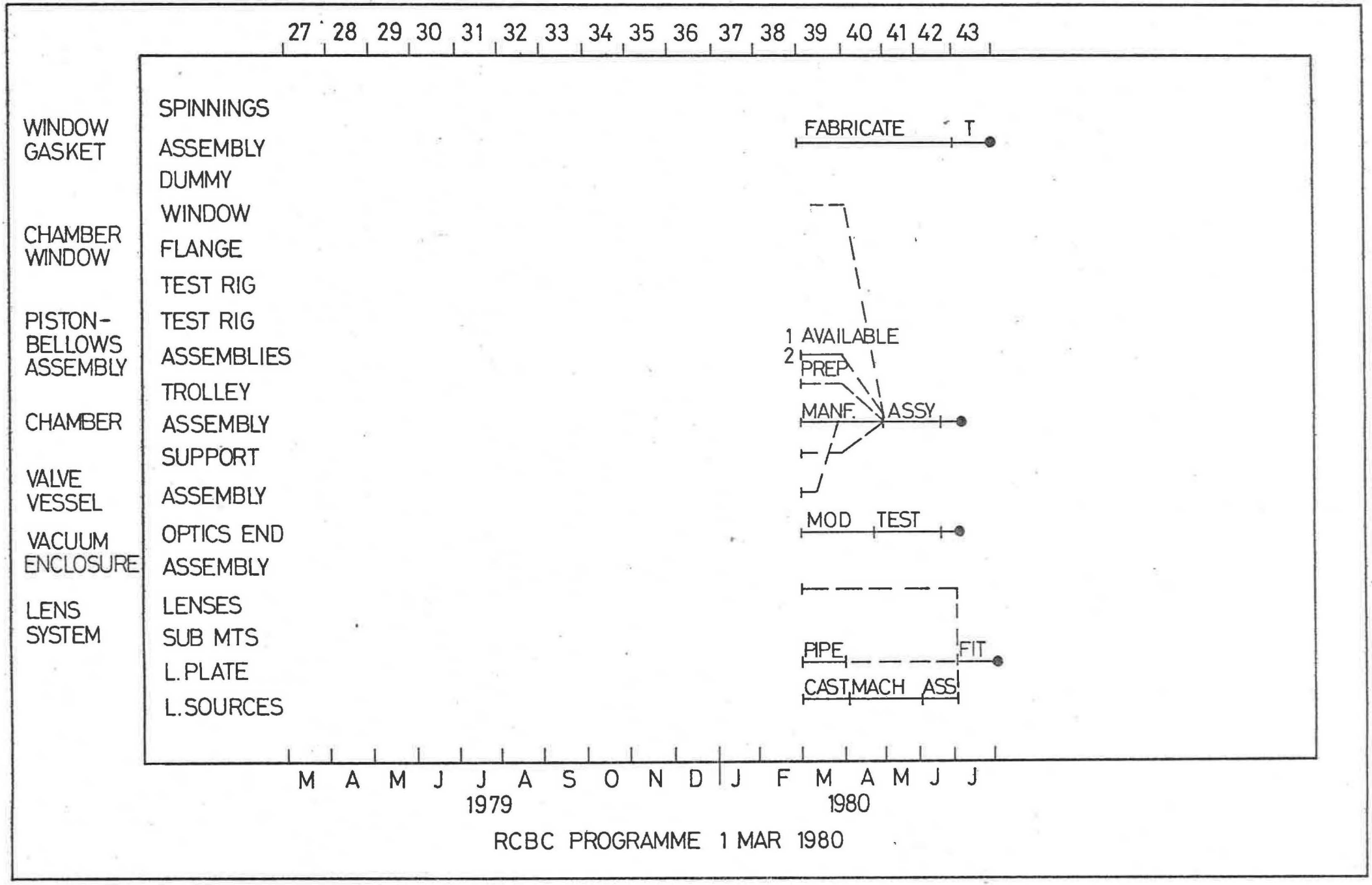
	A	B.	C	D	E	F	G
	INITIAL COST ESTIMATE 15.2.77	LATEST COST ESTIMATE 31.5.79	COMMITTED TO 1.3.80	FORECAST DELIVERY DATE	TOTAL SPEND IN PRIOR YEARS	ACTUAL SPEND IN CURRENT YEAR TO 1.3.80	SPEND FORECAST 19
	£	£	£		£	£	£
1. Chamber & Vac Enclosure	297,235	313,096	399,891	30.6.80	128,165	91,686	-
2. Optical System	86,925	93,468	117,497	31.7.80	8,060[c]	24,801[c]	-
3. Chamber Temp Control	46,640	46,640	49,890	30.6.80	34,464	17,967	-
4. Expansion System	58,488	64,071	59,420	30.6.80	49[c]	1[c]	-
5. Vacuum Systems	36,559	53,000	64,303	30.6.80	44,004	11,516	-
6. Acc for Control etc	17,798	17,798	12,449	31.5.80	3,927	10,414	-
7. Mech Handling Equipment	29,120	30,920	61,777	30.6.80	6,031[c]	11,690[c]	-
8. Iron Support Structure	78,000	118,956	130,224[+]	Delivered	137,094	-	-
9. Transport to CERN	18,200	18,200	7,782	-	7,734	392	-
10. Miscellaneous	1,040	1,040	3	30.6.80	-	-	-
	670,000	757,189	903,236[+]		366,528[c]	168,467	200,000[c]

+ £9500 will be paid from another CERN budget.

[c] Not including payments by CERN.

Contract price £670,000 (+15% contingency) at 15.2.77 prices.

All prices exclude VAT.



RCBC PROGRAMME 1 MAR 1980

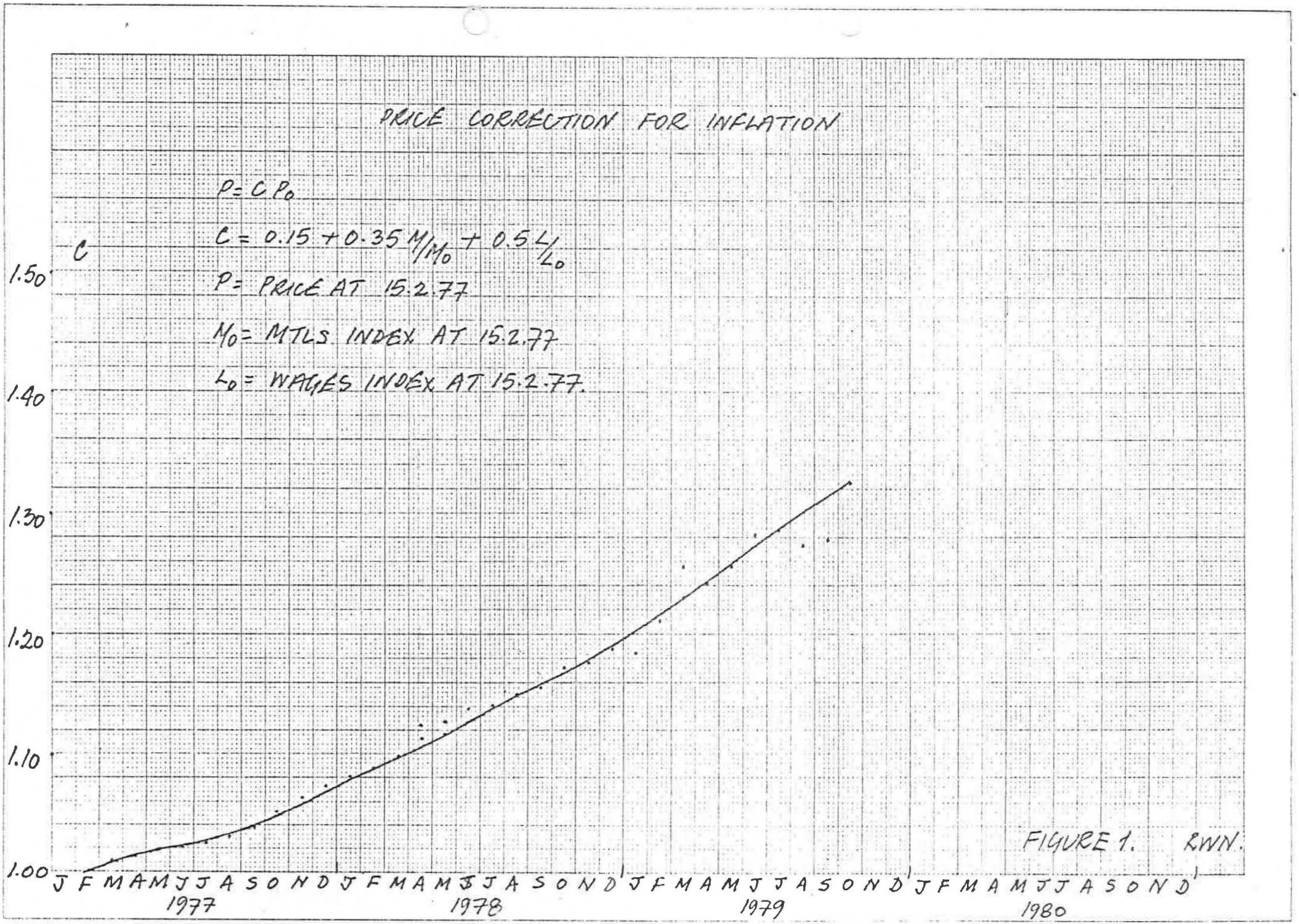

PRICE CORRECTION FOR INFLATION
$P = C P_0$
$C = 0.15 + 0.35 M/M_0 + 0.5 L/L_0$
P = PRICE AT 15.2.77
M_0 = MTLS INDEX AT 15.2.77
L_0 = WAGES INDEX AT 15.2.77.
C
1.50
1.40
1.30
1.20
1.10
1.00
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
1977
1978
1979
1980

FIGURE 1. RWN.