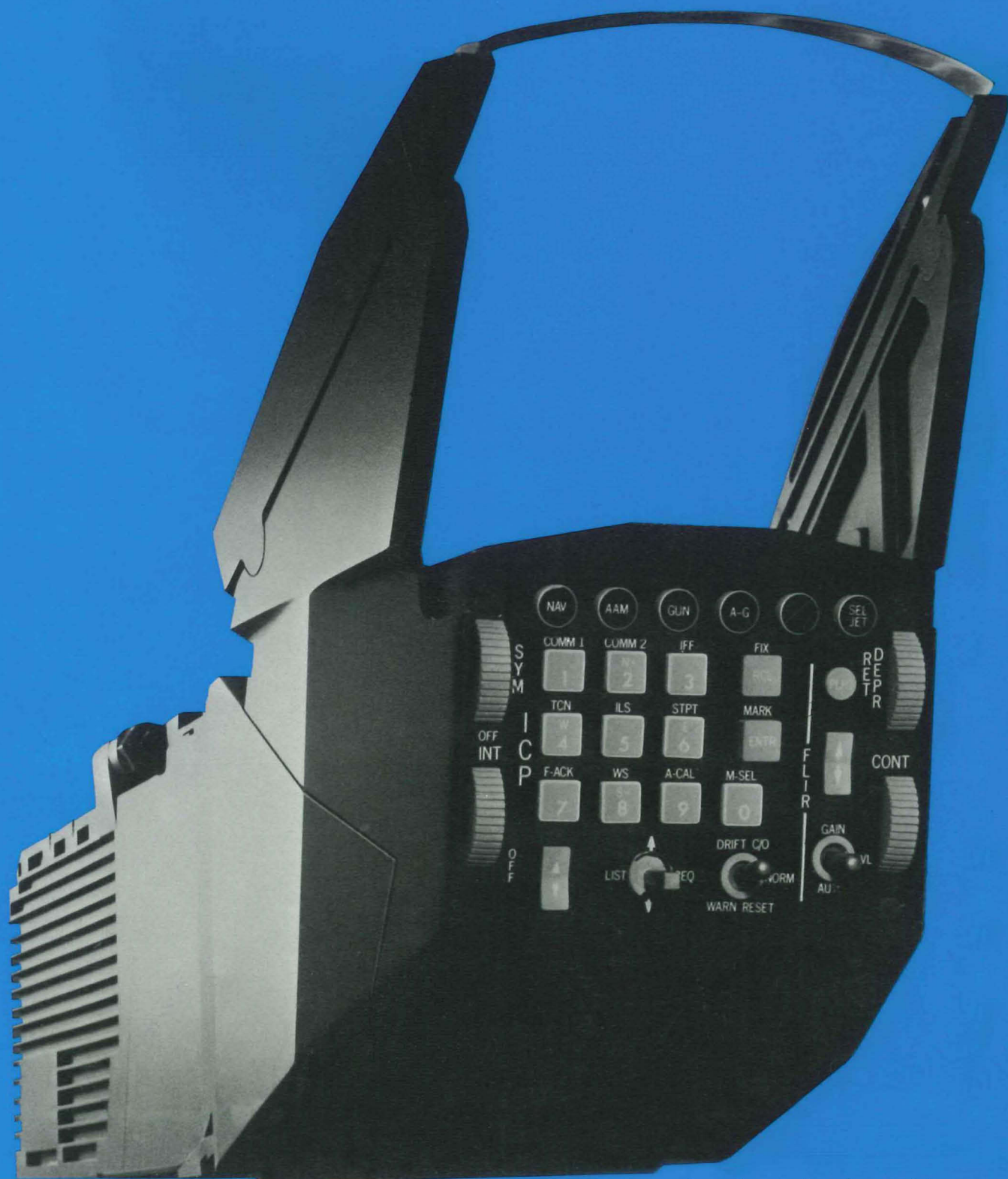


GEC AVIONICS

# Airborne Display Division Induction Manual



A.D.D. Document No. 29/828/2/M05  
Issue 6  
February 1986

# Airborne Display Division

## Induction Manual

Authorised by:



G.R. Sleight  
Divisional Manager

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CONTENTS

		Page
	Foreword	iii
Section 1	INTRODUCTION TO GEC AVIONICS LTD	1-1
	1.1 Historical Background	1-1
	1.2 Company Organisation	1-1
	1.3 Research Facilities	1-2
	1985 Achievements	1-5
Section 2	ADD ORGANISATION AND FACILITIES	2-1
	2.1 Function of ADD	2-1
	2.2 Structure of ADD	2-1
	2.3 GEC Avionics Technical Library	2-5
Section 3	EQUIPMENT MANUFACTURED BY ADD	3-1
	3.1 Head Up Displays	3-1
	3.2 Head Down Displays	3-2
	3.3 The "Cats Eyes" System	3-3
	3.4 Waveform Generators	3-4
Section 4	GEC Avionics/BP KENT CLUB	4-1
	4.1 Social Activities	4-1
	4.2 The GEC Avionics/BP Kent Clubhouse	4-3
	4.3 Entertainments	4-4
	4.4 Social Club Noticeboards	4-4
Section 5	TIME RECORDING	5-1
	5.1 Time Sheets	5-1
	5.2 Time Recording and Variable hours	5-2
	5.3 Overtime	5-3
	5.4 Holidays	5-3
	5.5 Absence Through Sickness	5-4
Section 6	ACQUISITION OF MATERIALS	6-1
	6.1 Purchase of Goods and Services	6-1
	6.2 Store Requisitions	6-1
	6.3 Direct Purchase of Urgent Material	6-1
Section 7	PATENTS	7-1
	7.1 Introduction	7-1
	7.2 Procedure	7-1
Section 8	TECHNICAL ARTICLES	8-1
	8.1 Introduction	8-1
	8.2 Procedure	8-1
Section 9	OUTGOING VISITS, USE OF PRIVATE CARS AND RECOVERY OF EXPENSES	9-1
	9.1 Outgoing Visits	9-1
	9.2 Casual Use of Private Cars on Company Business	9-1
	9.3 Petty Cash Vouchers	9-3
	9.4 I.O.U. Vouchers	9-5
	9.5 Cashing of Cheques	9-5

CONTENTS (Continued)

	Page
Section 10	10-1
EMERGENCY EVACUATION PROCEDURES	
10.1 Introduction	10-1
10.2 Alarm Signals	10-1
10.3 Invalids	10-1
Section 11	11-1
SAFETY AT WORK	
11.1 GEC Avionics in General	11-1
11.2 ADD in Particular	11-2
11.3 What to do in the Event of Fire	11-4
11.4 What to do in the Case of Accident	11-4
11.5 Special Notes	11-4
Figures	
1.1 Corporate Structure	1-3/4
2.1 ADD Family Tree	2-6
3.1 HUD and HDD Cockpit Layout	3-1
3.2 HUD Position and Cockpit Layout	3-2
3.3 F16 Symbology - Navigational Mode	3-3
3.4 Buccaneer Symbology	3-5
3.5a Current HUD Projects	3-5
3.5b Head-Up Display Units	3-6
3.6 Head-Down Displays	3-7
3.7 Cats Eyes Visual System	3-8
3.8 Cats Eyes Helmet Attachment	3-8
3.9 Display Processors - Special Purpose	3-9
4.1 Location of GEC Avionics/B.P. Clubhouse	4-3
4.2 Club Membership Card	4-3
5.1 Typical Time Sheet	5-1
5.2 Notification of Leave Form	5-5
5.3 Application for Holiday Wages Form	5-5
6.1 Purchase Requisition	6-2
6.2 Material Requisition Form	6-2
9.1 Application for Rail Facilities	9-6
9.2 First Page of a Visit Report	9-7
9.3 Authorisation Form for Casual Car Users	9-8
9.4 Petty Cash Voucher	9-9

FOREWORD

This brochure is intended to introduce to new staff the organisation, facilities and operating procedures of Airborne Display Division.

The brochure will be updated periodically, but there will be occasions when changes have occurred before corrections are issued (eg Mileage Rates, etc), and staff are reminded of the need to check with their Supervisor or the Administration Officer if in doubt.

Other Sources of Information

A Company Instruction Manual, detailing the general operating procedures of the Company, is available on loan from the Administrative Office.

Engineering Procedures and Standards are also available as required.

THIS BROCHURE SHOULD NOT BE REMOVED FROM COMPANY PREMISES AND SHOULD BE TREATED AS "COMPANY CONFIDENTIAL" IN VIEW OF THE INFORMATION CONTAINED HEREIN

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SECTION 1  
INTRODUCTION TO GEC AVIONICS LIMITED

1.1 Historical Background

GEC Avionics, now the largest UK company engaged in aircraft electronics systems, began in 1901 as Elliott Brothers (London) Ltd., a small firm engaged in the production of scientific instruments. In the early days of aviation, Elliotts entered into the field of flight equipment and by 1951 had produced a range of drone aircraft autopilot systems, and also a first European inertial navigation system.

The Elliott Company became known as Elliott Flight Automation, and in 1967 merged with the Marconi Aeronautical Division to produce military and civil aircraft navigational equipment. It was then named Marconi Elliott Avionic Systems Ltd. (MEASL).

In 1968 MEASL was absorbed into the General Electric Company, the largest electrical and electronic manufacturing Company in Britain. The name MEASL was changed to Marconi Avionics Ltd in March 1982 and MAV became a trading company in its own right as a major GEC Company. Then in 1984, having been managed independently from the Marconi Company for some time, the name was changed finally to GEC Avionics. The Company is now established as a world leader in aviation electronics and has a reputation for products of high performance and dependability. As a result of this high standard of technology, and because of its export achievements, the Company received a Queen's double Award for Industry in 1983 and a single Award in 1985.

1.2 Company Organisation  
(See Figure 1.1)

1.2.1 GEC Avionics has its head office and main factory at Rochester, Kent. Other factories

are located at Basildon, Borehamwood and Nailsea.

There are two associated Companies overseas; GEC Avionics Inc in the USA and the Canadian Marconi Company at Montreal PQ, Canada.

Each manufacturing Division in the Rochester establishment specializes in a particular branch of avionics. Within each Division, a Divisional Manager controls development, design and production resources, and is supported by Sales and Commercial Staff.

The Divisional Manager is responsible to Head Office and to General Management for the successful operation of his business, and to his customers for the work undertaken by his Division.

1.2.2 Design, development and production activities are supported as required by centralised services available to all Divisions. These are:

- o Flight Automation Research Laboratory (FARL).
- o Central Quality Department (CQD), which provides environmental testing facilities, and ensures continuing high quality of production output.
- o Central Machine Shop (CMS), which produces or modifies hardware by means of a number of computerised machines.
- o Aviation Service and Repair Division (AS&RD), which supports, worldwide, the range of Company products.

1.2.3 Responsibility for the Company as a whole rests with the Chairman, the Managing Director and the Assistant Managing Directors.

1.2.4 In accordance with Company Policy, a General Manager is responsible for a group of Divisions. He monitors the performance of his Divisions, and takes control of activities such as resource allocation and marketing. The Head Office and General Management are supported by specialists who advise on matters of group purchasing, finance, technology and publicity.

1.3 Research Facilities  
GEC Avionics has research laboratories at Rochester and Borehamwood.

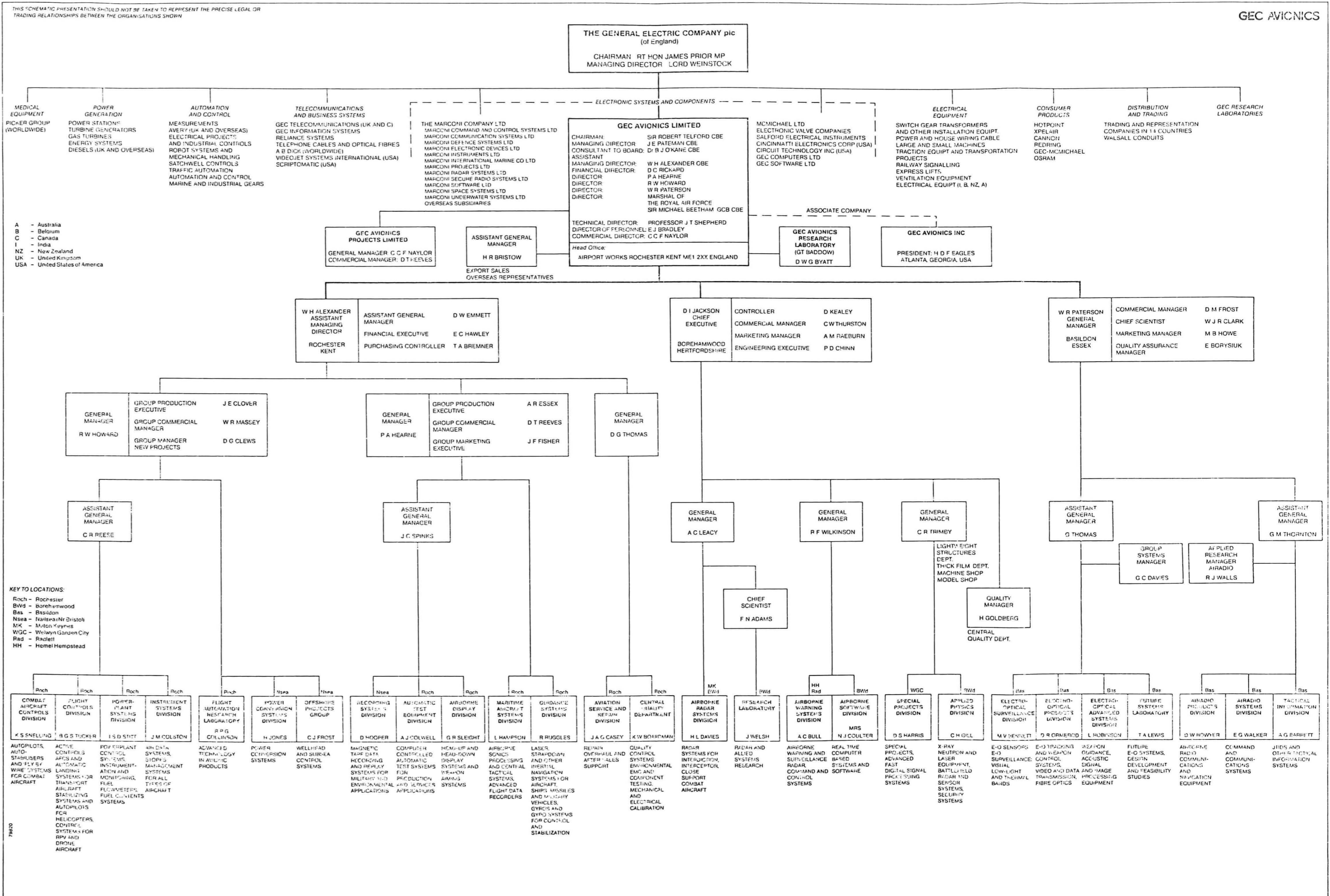
Both laboratories support manufacturing Divisions within the Company and also carry out new research and development programmes for Government agencies in the United Kingdom and in the United States.

The Flight Automation Research Laboratory at Rochester carries out research into new avionics systems, techniques, and processes. The laboratory Engineers specialise in many fields, some of which are as listed below:

- o Avionic Control Systems
- o Signal Processing
- o Data Transmission and Management
- o Displays
- o Sensors
- o Activators
- o Power Supplies
- o Design and Manufacturing Techniques.

The Research Laboratory at Borehamwood specialises in the microwave techniques needed for ground mobile and airborne radar. These techniques encompass advanced antenna design and profile satellite tracking.

Further research facilities are available at the research laboratories of the GEC-Marconi Electronics Group at Great Baddow, Essex, and at the Hirst Research Centre of the General Electric Company. Fundamental research into advanced electronic techniques is carried out at these laboratories, using the full resources of Europe's largest electronics company.



1985 ....An Eventful Year

The year began well with the announcement of the Company's selection as prime contractor for an £80 million fixed price order for the British Army's Phoenix Remotely Piloted Vehicle (RPV). EOSD soon followed suit with a fixed price follow-on production order for thermal imaging equipment, this being part of the United Kingdom's export-winning TICM II Programme.

The ceremony on September 13th, in which, on behalf of the Company, Airborne Display Division received the Queen's Award for Technological Achievement, was marked by an international salute. With typical Dutch generosity, the Royal Netherlands Air Force flew two F-16A Fighting Falcons over the factory before landing at RAF Manston. GEC Avionics was delighted that friends from General Dynamics and the US Air Force were able to see the F-16 over the Rochester factory - a unique experience and a tribute to ADD.

On behalf of colleagues in ADD, and of the Company in general, the Emblem of the Queen's Award for Technological Achievement was accepted from Her Majesty's Lord Lieutenant of Kent by John Read, ADD's Production Superintendent, and the Grant of Appointment by Jayne Wood, Software Project Manager.

ADD has received follow-on orders for the F-16 C/D HUD and new orders for the A-7G HUD. Production of the LANTIRN HUD has been authorized and the various refit HUD programmes are progressing satisfactorily, accounting for a significant proportion of the Division's business. Initial order for "Cats Eyes" night vision goggles have come from the United States and such items, along with other helmet-related systems, carry the promise of future business.

ADD continued its proud year by receiving a further production order for F-16 C/D Head-up displays (HUDs), worth \$75 million. This brought the total order for this particular HUD to \$150 million.

Other orders awarded the Company in 1985 are:

- o Over a thousand Standard Central Air-Data Computers (SCADC) (Order on ISD)
- o Naval Thermal Imager (Order on EOPD)
- o LRSOM project
- o Tornado SAGE support equipment (Order on CACD)

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## SECTION 2

### AIRBORNE DISPLAY DIVISION (ADD) ORGANISATION AND FACILITIES

#### 2.1 Function of ADD (See Figure 2.1)

2.1.1 The function of Airborne Display Division is to design and produce complex display systems, such as Head Up Displays, Head Down Displays and Symbol Waveform Generators, for military aircraft.

#### 2.2 Structure of ADD

##### 2.2.1 Engineering Department

The Engineering Department (headed by the Technical Manager), is responsible for all aspects of design and development of new equipment and for the continual technical support of equipment which is in production and in service with the customer. Because of the strong emphasis on technical development in the avionics field, the Engineering and Production Departments tend to be dominant in the Division.

In the Engineering Department are engineers specialising in a wide variety of electronics skills, and having at their disposal office and bench areas in which to build and test new circuit designs. The Engineering Department is also responsible for the design of the equipment required to test the prime equipment hardware.

##### 2.2.2 Production Department

The Production Department (headed by the Production Manager) is responsible for the manufacture and thorough testing of new equipment, and for any minor repairs which may be due to damage while installing the equipment into the aircraft.

The Production Department is subdivided into several smaller sections.

- o The manufacturing area itself, which is responsible for producing printed circuit cards, wiring of components and assembling of chassis work.
- o Inwards Goods.
- o Stores.
- o Stock Control.
- o Buying.
- o Production Engineering, Planning, Methods, Estimating, Scheduling.
- o Inspection.
- o Test.
- o Calibration.

##### 2.2.3 Quality Assurance

The Quality Assurance Department (QA) works in close proximity with both the Engineering and Production Departments. QA's main responsibility is to ensure that quality is maintained and that customers' requirements for price and delivery are adhered to.

The total quality programme used by QA involves monitoring all aspects of the product, i.e. sales, engineering design, procurement, production, test and inspection, providing a means by which product problems may be anticipated, interpreting the customer's requirements clearly by the application of specifications, and by achieving a "right first time" product by enforcing a chosen standard.



#### 2.2.4 Drawing Office

The Drawing Office is under control of the Chief Draughtsman and is staffed by Section Leaders, Design and Detail Draughtsman, Tracers and Checkers.

Its function is to produce the drawings or artworks (with relevant data) which are necessary for the manufacture of hardware. This includes:

- o Circuit diagrams, including layout of Printed Circuit Board (PCB) components.
- o Schematic diagrams.
- o Assembly and sub-assembly drawings.
- o Wiring diagrams.
- o Detail drawings.
- o Data Lists (DLs)
- o Parts Lists (PLs)
- o Wire Lists (WLs)

When a circuit design is established as being correct, drawings are first frozen, then sealed. Subsequent changes to artwork are then effected by the implementation of approved Change Notices.

##### 2.2.4.1 Computer Aided Design

A recent addition to the Drawing Office facilities are four APPLICON Computer Aided Design (C.A.D.) workstations. Two of the workstations are linked to the Digital Equipment PDP-11/44 computer and are used to produce highly complex circuit designs. When designing multi-layer printed circuit boards, the draughtsman is aided in the location of Integrated Circuits and other components by the computer which also determines the paths of the printed circuit

tracking on the various layers of the PCB.

This method facilitates the design process and provides a more practical and aesthetic looking circuit layout.

The other two workstations are coupled to the APPLICON 751 computer and enable three dimensional solid modelling of mechanical assemblies to be carried out. Solid models are created by combining, intersecting and subtracting volumetric shapes to form the final assembly design, and at each stage of this process sectional or cut-away views and colour shaded images can be displayed.

The system also produces, with a flexibility that allows for automatic correction of dimensions if one dimension or more is changed, the orthographic drawings from which the assemblies are manufactured

Hard copies of PCB and mechanical assembly designs are available by means of a pen-plot printer or an electrostatic plotter.

#### 2.2.5 Engineering Services

Attending to the Divisional domestic requirements is the Engineering Services Manager whose responsibility it is to ensure that the Division as a whole runs smoothly and effectively. With his staff he provides for the replacement of office furniture and laboratory equipment, arranges for the interviewing of new entrants and, upon occasions, writes sections of proposals for new projects.

The Engineering Services Manager is also responsible for:

- o Technical Publications
- o Computer Aided Design facilities
- o Model Shop

- o Engineering Stores
- o Organisation of cleaners and cleaning sub-contractors.
- o Liaison with Works Engineering Services for maintenance and upkeep of facilities.

#### 2.2.6 Design Office

The Design Office works in close liaison with the Drawing Office and engineers in the Engineering Department. It is responsible for all aspects relating to mechanical equipment design including:

- o Size of equipment to comply with cockpit limitations.
- o Choice of materials to comply with weight restrictions.
- o Thermal Characteristics.
- o Consideration of the environmental parameters to which the equipment will be subjected, for example vibration, humidity, temperature etc.

A further function of the Design Office is to design packaging and containers for the finished hardware, and to ensure that the hardware is adequately protected during even the most rigorous transportation.

#### 2.2.7 Model Shop

Throughout every project there arises a need during design and development for prototype models. The manufacture of these is carried out by the Model Shop. This area is essentially a well equipped workshop with facilities for fabricating all types of metal assemblies and for wiring complicated electronic assemblies and circuits.

Although the models are only prototypes, their quality is

comparable with similar items manufactured in the Production Department and will generally comply with the engineering requirements providing that the originating drawings are adequate.

On certain occasions, the Model Shop assists the Production Department in the production of equipment, although this is not its prime function.

#### 2.2.8 Software

The ADD Software group is headed by the chief Programmer and is divided into functional areas specialising in a variety of software tasks such as:

- o Flight Software Development.
- o Software Test and Validation.
- o Software Test Station Development.
- o Support Software Documentation.

#### 2.2.9 Computing Services

Engineering computer facilities are provided by the Computing Services Department which has at its centre Digital Equipment PDP-11/44 and VAX 11/780 machines.

These computers are used for software development and mathematical modelling with the PDP-11/44 machine acting as a Remote Job Entry (RJE) station to the AMDAHL V7A computer at Great Baddow. Computer terminals are available to the Engineering Department on a time sharing basis and each terminal is able to communicate with other computer facilities such as the GEC Establishment at Great Baddow or GEC Computing Services in Stafford.

#### 2.2.10 Technical Publications

Throughout the development and production of avionic equipment

there is a requirement for adequate in-house and customer support documentation. This is the responsibility of the Technical Publications Section.

This group, under the control of the Head of Technical Publications, processes all types of project documentation, the main technical input for these coming from the Engineering Department. Technical Authors, Writers and Editors receive hand-written or typewritten draft information and from this they produce documentation to the correct specification and format.

Word Processor Operators input and store the data on magnetic floppy disks. The documentation is then printed, vetted for its technical content, signed, copied and distributed. The master document is then stored in the Divisional Library.

The Section is responsible also for the updating of existing documentation in line with hardware, procedural or other changes. This is carried out by approved Change Notices or by a customer's special request.

The Technical Publications Section plays an important role in the raising and editing of Proposals from material supplied by Sales, Production and Engineering. Presentation is important, since this can help in inducing a potential customer to place an order.

#### 2.2.11 ADD Library

The ADD Library is a repository for all drawing and document masters originated within the Division. A Card index system provides a quick and efficient verification of the revision status and, where applicable, the location of all library masters.

By means of Xerox machines copies of any of these masters may be made available to engineering staff at short notice, and masters may be borrowed from the library on a "signing-out" basis. Older documents, ie those which have been superceded but still need to be retained, are micro-filmed and filed, and the originals are destroyed. The microfilms can be enlarged and reprinted as required.

A DYELINE machine, using an ultra violet system of operation, is used to produce copies of full sized drawings where these are too large for the Xerox process.

#### 2.2.12 Eng. Test Area

Complementary to the Laboratory area is the Engineering Test Area, where hardware is assessed, environmentally and functionally, in accordance with the requirements of the relating Test Specifications agreed upon with the customer.

It is here that the design is proved and any unforeseen defects come to light. Each integrated circuit card is put through its paces before introduction into the main unit, and the main unit itself is then functionally tested to a concise schedule.

Laboratories and Test Area thus work in close liaison to produce aircraft equipment to the highest possible standard

#### 2.2.13 On-Site Engineering

The activities of ADD are not confined to factory environs. We have on-site Engineers who represent the Division at RAF stations or other locations where ADD-built equipment is in use. On-site Engineers carry out on-the-spot investigations of defects and ensure the correct working of the equipment when it has been delivered.

They form part of the LOGISTICS Manager's team, and he is responsible for their training and welfare. His other duties include the upkeep of commercial test equipment, the maintaining of spares holdings and the assessment of quantities of equipment needed in the "field".

He controls, through the Post Development Servicing Officer, the modernisation and elimination of defects in existing products of which design and development have been completed. This activity may be only a simple change to improve a performance or it may be an extensive modification to make the hardware conform to more recent requirements.

#### 2.3 GEC Avionics Technical Library

Complementary to individual Divisional libraries is the GEC Avionics Technical Library, housing

technical manuals, trade magazines, and Military and Company Specifications.

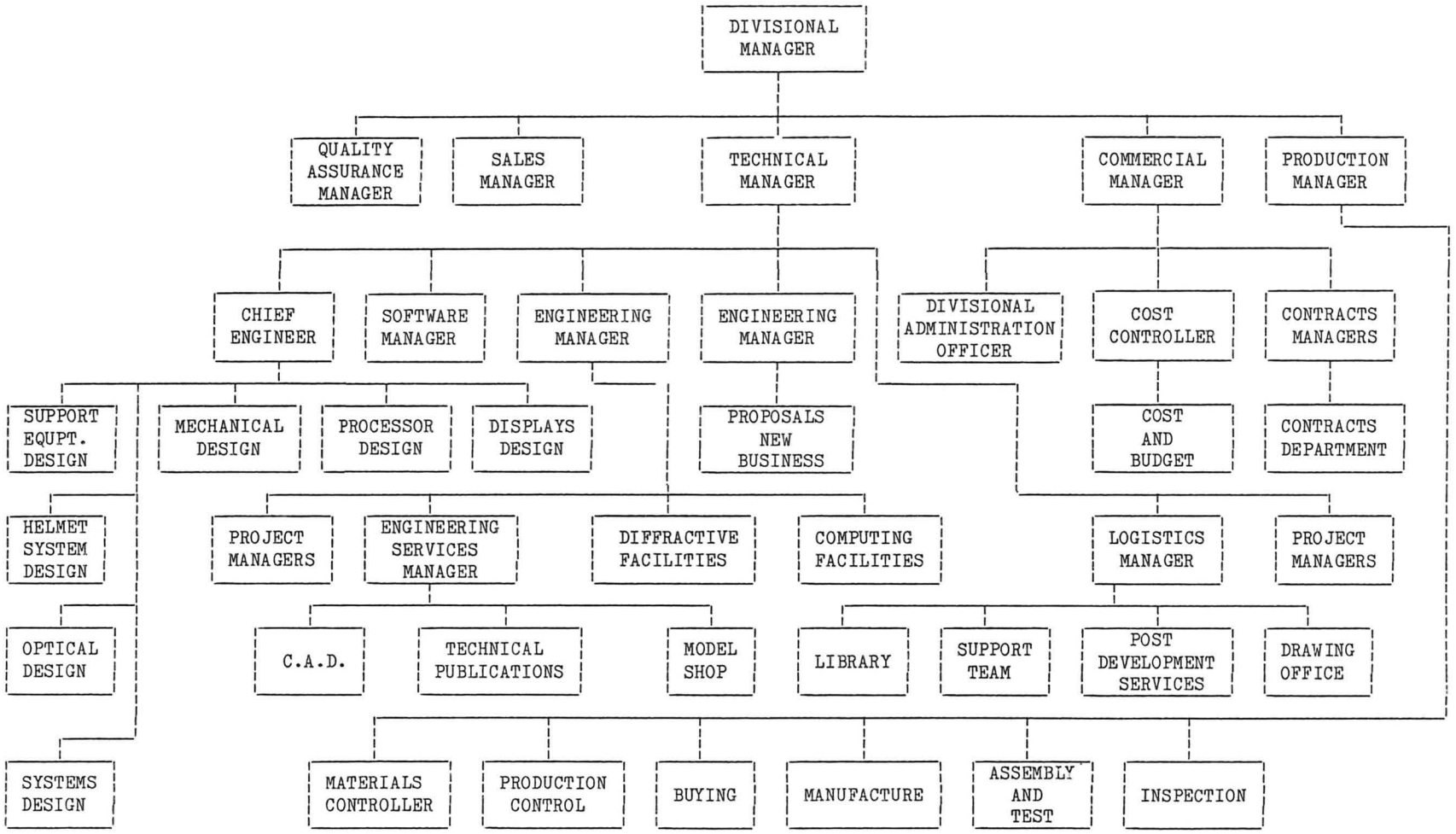
These documents are available to staff from all Divisions, and desks are provided for people wanting to take notes from books on the shelves.

Xerox facilities are available for the copying of text, and the Chief Librarian will order special copies of books if the order is authorised by a Technical Manager.

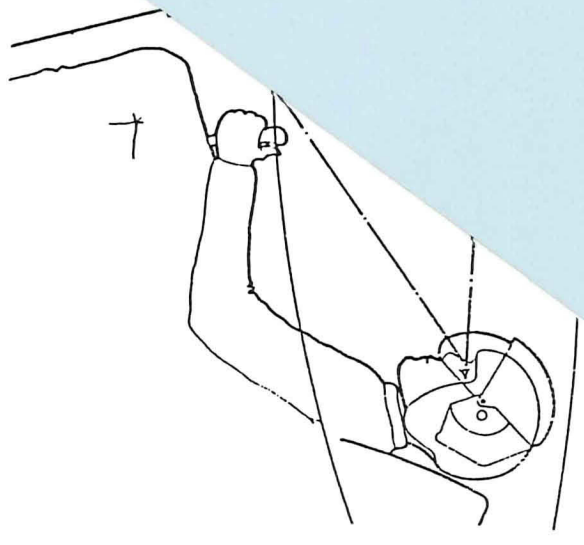
Most of the books may be borrowed from the library but certain classes are for reference only.

Obsolete documents are micro-filmed and the originals destroyed. The film can be seen in a viewer provided, or can be photographed, enlarged and printed.

Figure 2.1 Airborne Display Division Family Tree



HUD and HDD Cockpit Layout



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SECTION 3

EQUIPMENT MANUFACTURED BY AIRBORNE DISPLAY DIVISION

3.1 Head Up Displays

3.1.1 A Head Up Display is a highly complex flying aid which allows a pilot to monitor essential flight information such as Airspeed, Altitude, Heading, Target, Bearing etc., without having to take his eyes off the real world scene outside the aircraft.

3.1.2 Current Head Up Display (HUD) Systems being produced by Airborne Display Division consist of two Line Replaceable Units (LRUs); a Display Unit (DU) and an Electronics Unit (EU).

3.1.3 Display Unit  
(Figures 3.1 and 3.2)

The Display Unit is a cockpit-mounted electronic/optical device for displaying essential flight information into the pilot's forward field of view.

The DU consists of a chassis containing electronic circuitry, an optical module and a control panel. The optical module comprises a lens assembly and a partially reflecting combiner glass.

Flight information (Symbology) is generated and displayed on the face of a Cathode Ray Tube inside the DU. The lens assembly provides an image of the CRT display which, when viewed through the combiner, is brought to a focus at infinity. This eliminates pilot's eye fatigue when viewing the horizon.

3.1.4 Electronics Unit

The EU receives signals from other systems on board the aircraft and converts them into a form that can be understood by the airborne computer or processor, which is the heart of the unit.

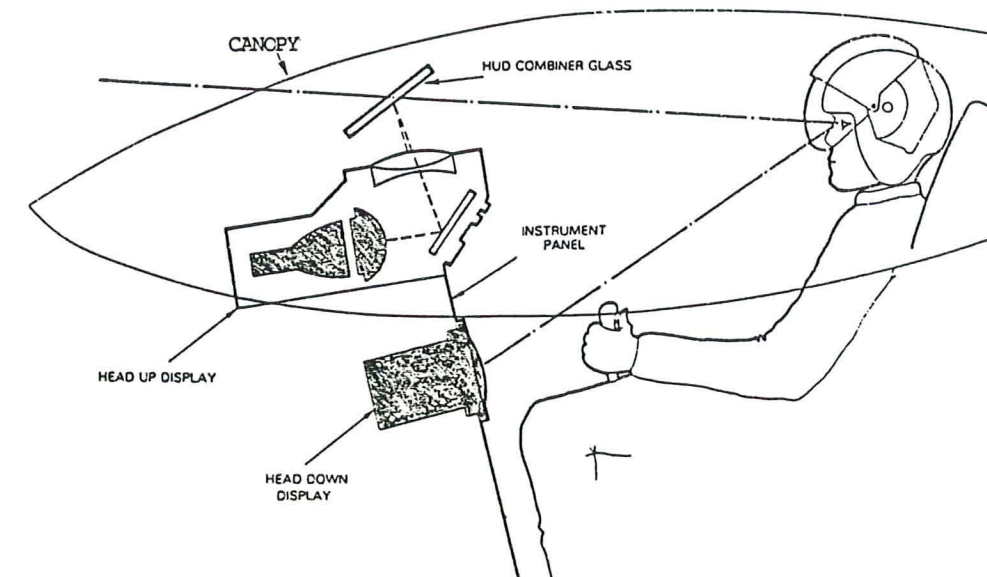


Figure 3.1 HUD and HDD Cockpit Layout

Figure 2.1 Airborne Display Divisi.

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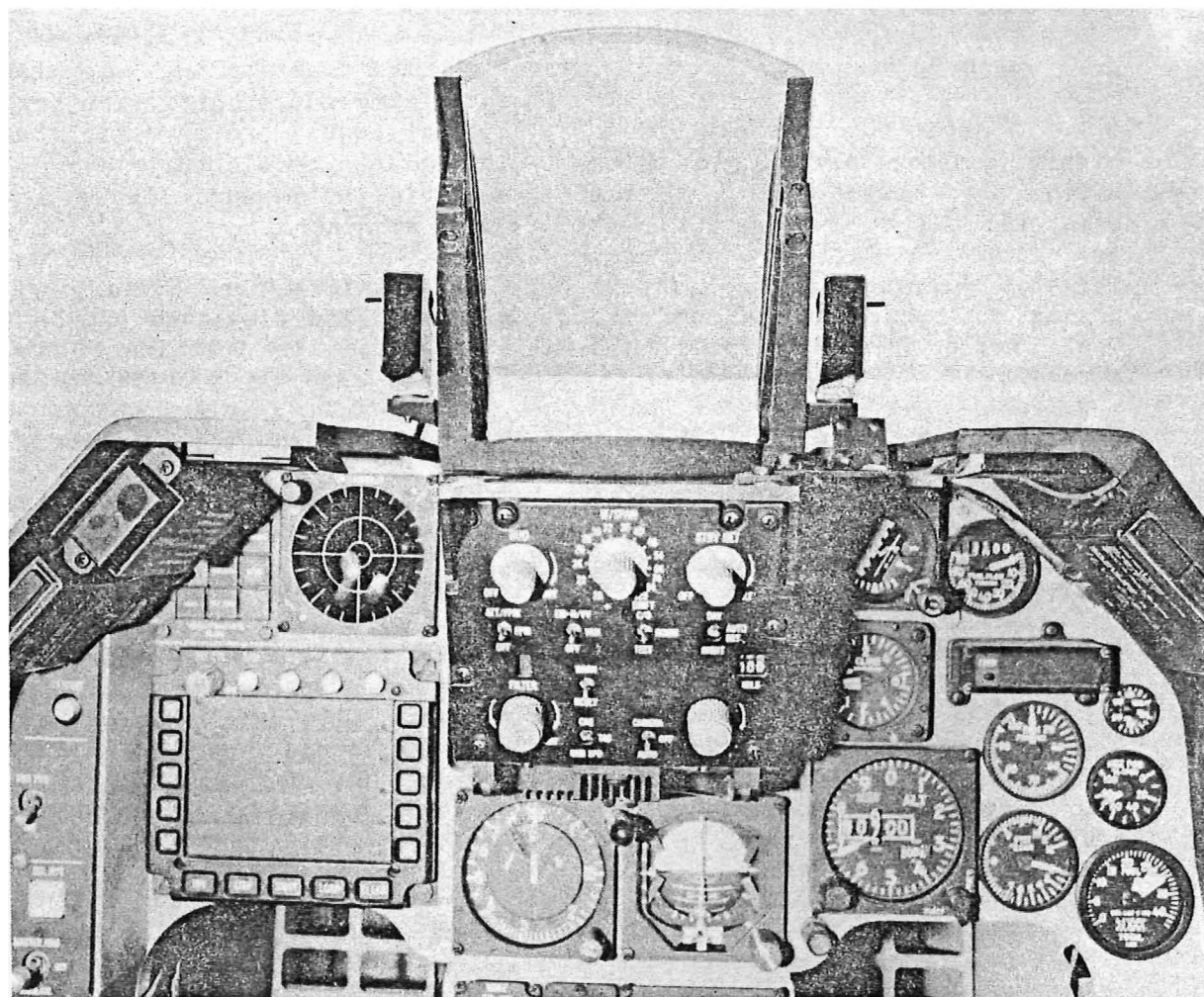


Figure 3.2 HUD Position and Cockpit Layout

The processor uses this data to control the operation of internal systems within the EU. It also provides all the input signals that are required by the DU to generate the display symbology.

The EU can be mounted in any convenient position in the cockpit although it is commonly located in one of two electronics bays situated either side of the pilot.

3.1.5 Figure 3.3 shows typical display symbology after an F16 pilot has selected Navigational (NAV) Mode. Other display modes available

to the pilot are Approach and Air-to-Air/Air-to-Ground weapon delivery modes. Figure 3.4 shows standard Buccaneer symbology.

3.1.6 Over 22 different types of aircraft have been supplied with GEC Avionics HUD systems during the last 20 years. A selection of these which were developed and manufactured in ADD is shown in Figures 3.5a and 3.5b.

### 3.2 Head Down Displays

3.2.1 A Head down Display (HDD) uses a directly viewed Cathode Ray

Tube for the presentation of ancillary information additional to the HUD. The HDD is located away from the pilot's normal line of sight as shown in Figure 3.1.

3.2.2 Major programmes include development and production of such equipment for the Tornado fighter and Nimrod Maritime Reconnaissance aircraft. These all utilise special purpose processors with very high speed operation to allow symbol generation and position computation at raster frequencies. Some of the display units used on these programmes are shown in Figure 3.6.

### 3.3 "Cats Eyes" System

3.3.1 Aircraft pilots are frequently called upon to fly during darkness. They should ideally be

able to glance from the dimly-lit outside world to the illuminated aircraft instruments and back without impairing their "night-vision" capacity by having to wait for their eyes to re-adjust. The GEC Avionics "Cats Eyes" system is designed for this purpose.

The system uses an advanced, new electro-optical technique to amplify and project the residual light from the external night scene on to combiners in front of the pilots eyes. (See Figure 3.7).

3.3.2 The "Cats Eyes" device is of binocular form and is used in association with most kinds of flying or protective helmet. (See Figure 3.8). It will give "see-through" vision without distortion.

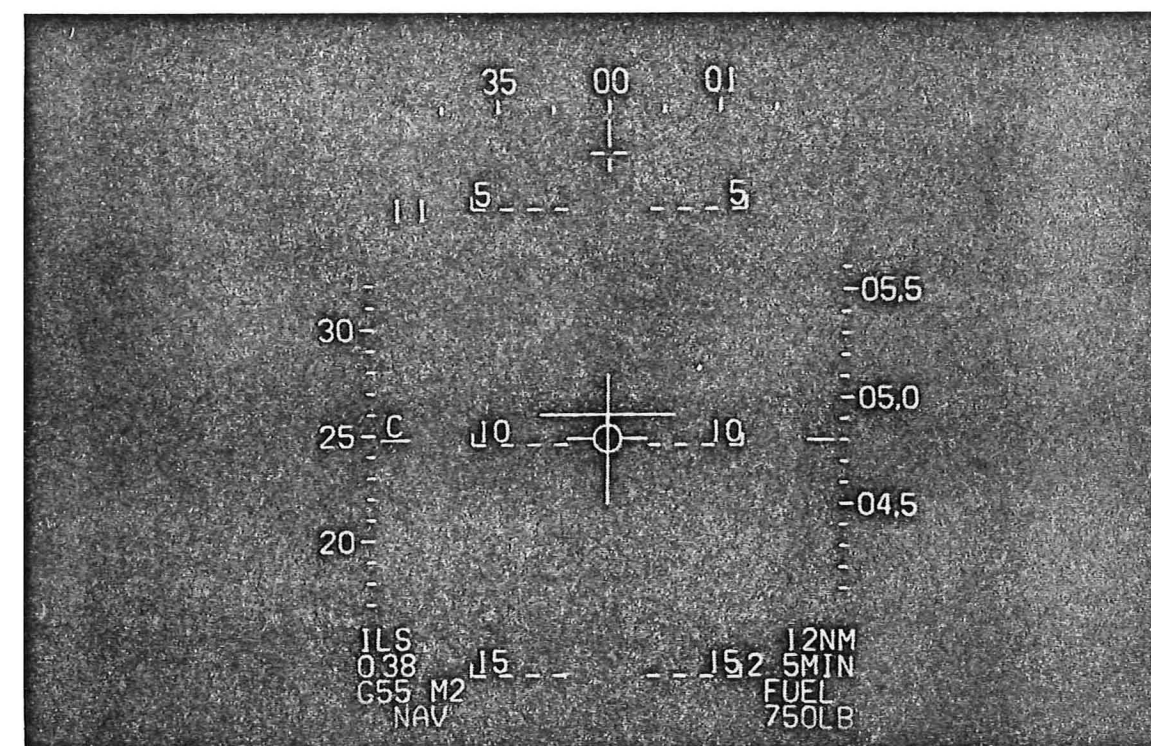


Figure 3.3 F16 Symbology - Navigational Mode

It is of low weight and inertia, and is designed to be used for long periods of time without fatigue to the wearer.

It carries its own battery and will continue to operate if the pilot has to eject from his aircraft.

3.3.3 The "Cats Eyes" system is a self-contained unit, and can also be used by soldiers engaged on infantry night operations, operators on oil rigs, and personnel engaged on anti-terrorist activities.

### 3.4 Waveform Generators

3.4.1 Movement of the electron beam in the cathode ray tube is controlled by electronics within the waveform generator. It is this controlled movement, combined with "bright-up" circuitry, which produces the picture projected through the lenses of the DU into the pilot's field of view. Waveform generators and computers form part of the integrated circuitry used in head up and head down displays. (See Figure 3.9)

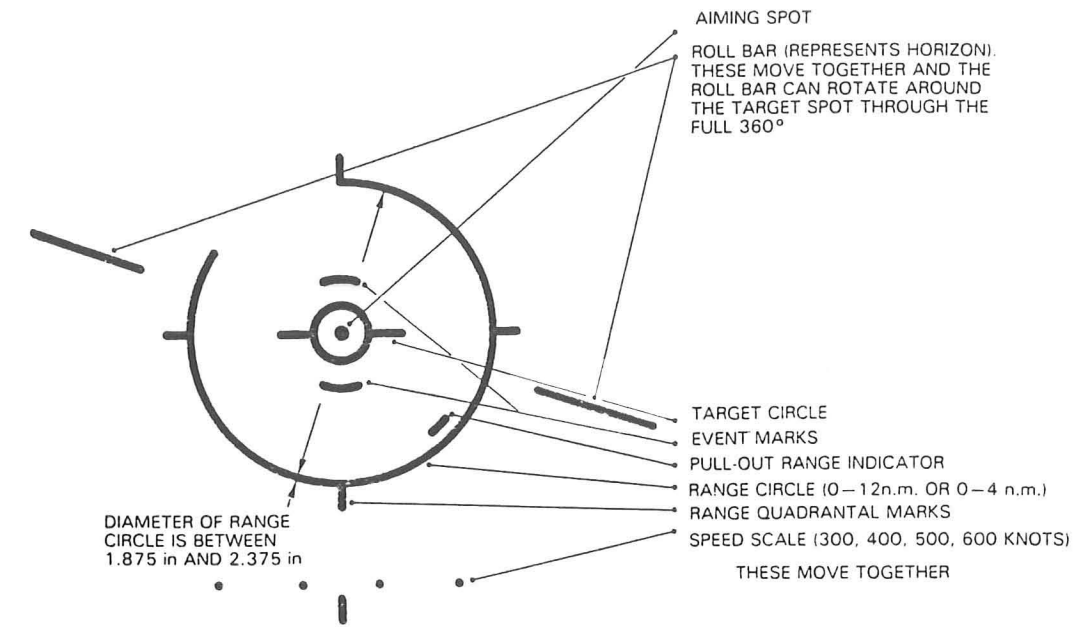


Figure 3.4 Buccaneer Symbology

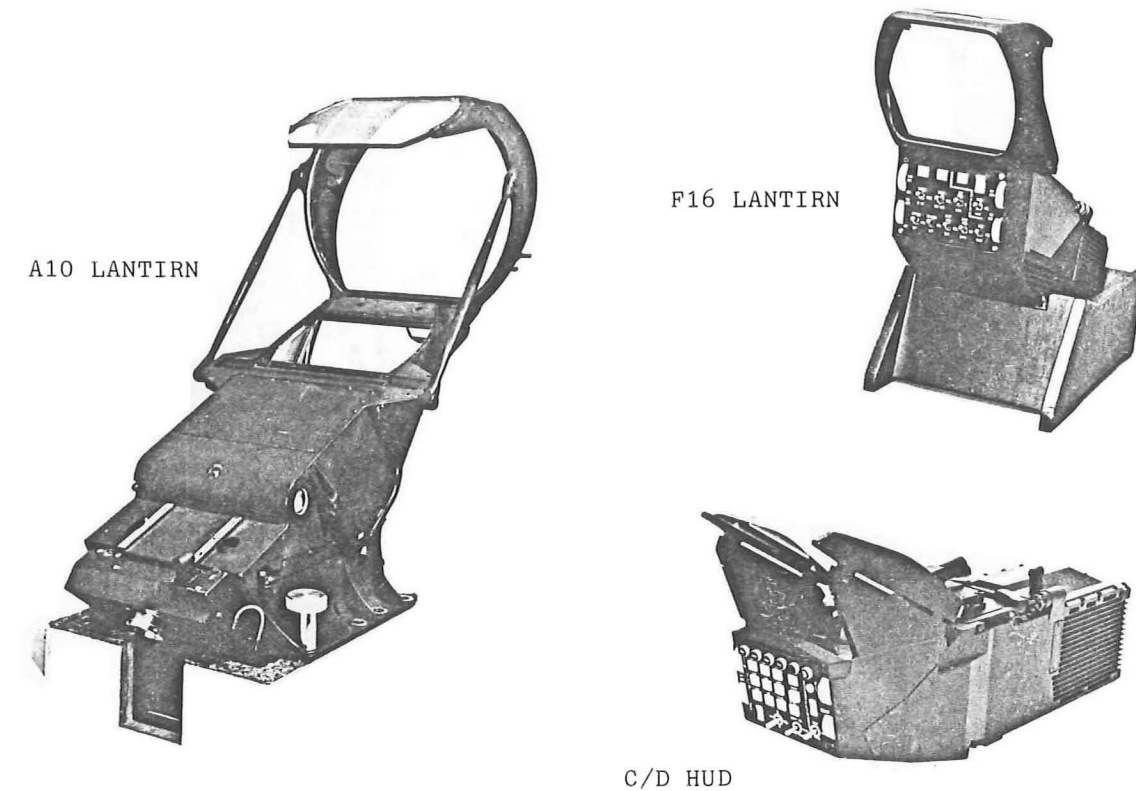


Figure 3.5 a) Current HUD Projects

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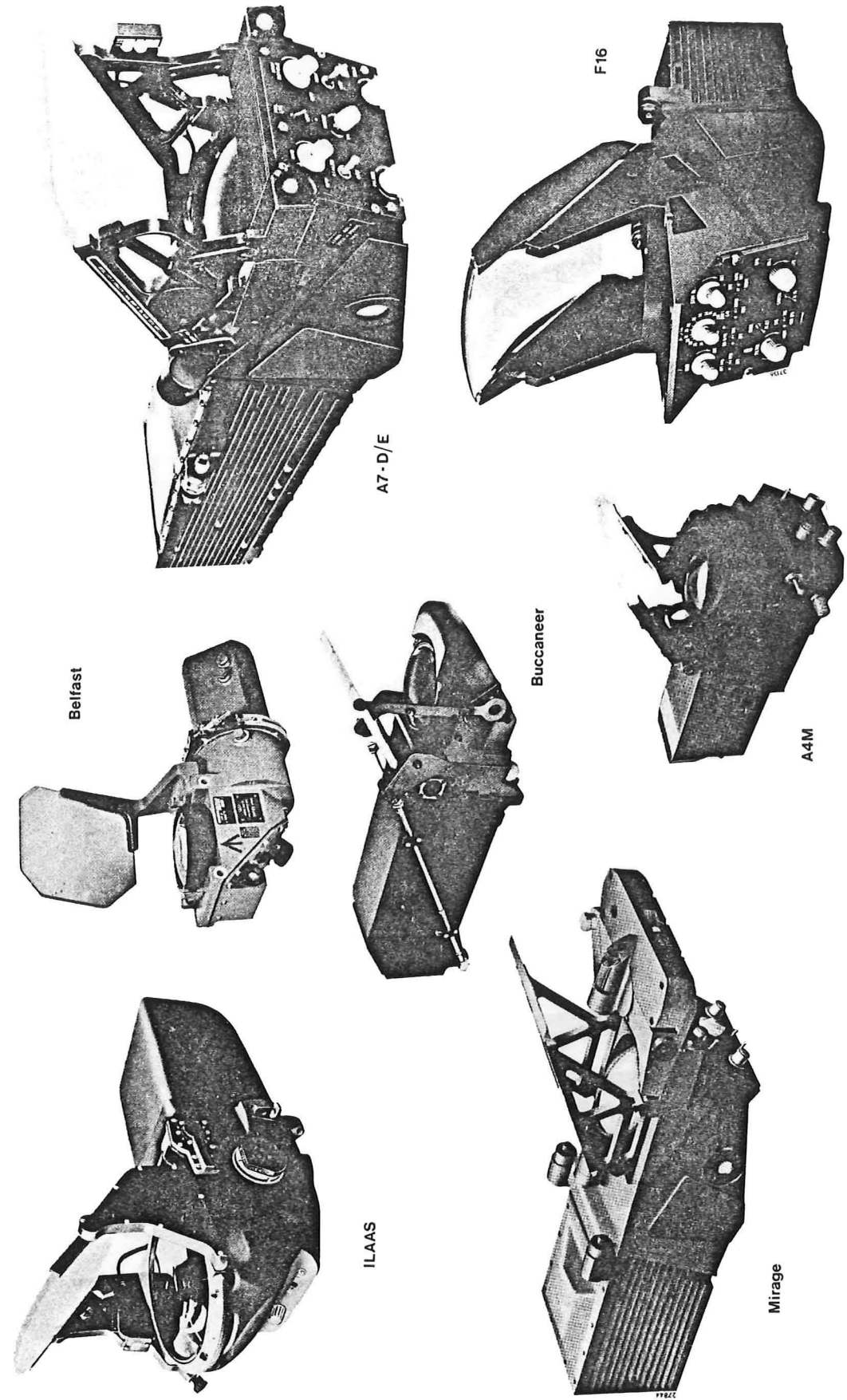


Figure 3.5 b) Head-Up Display Units Manufactured by Airborne Display Division

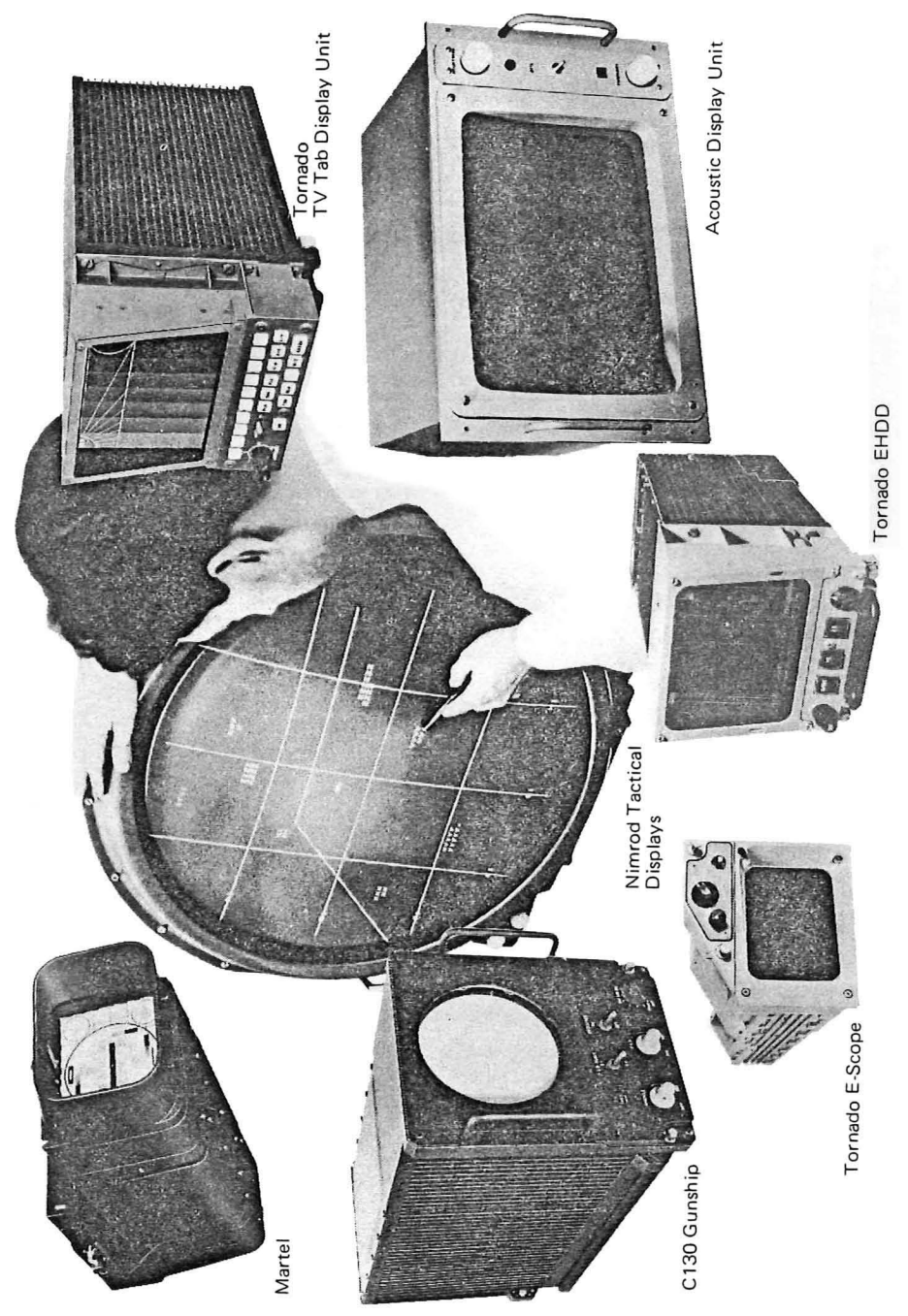


Figure 3.6 Head Down Displays Manufactured by Airborne Display Division

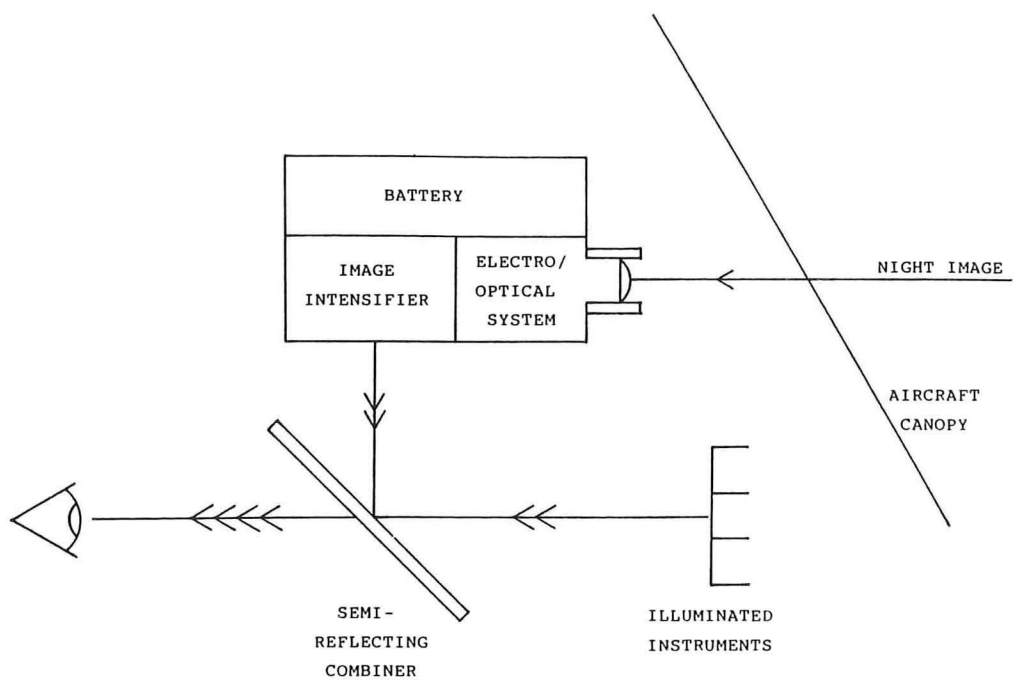


Figure 3.7 Cats Eyes Visual System

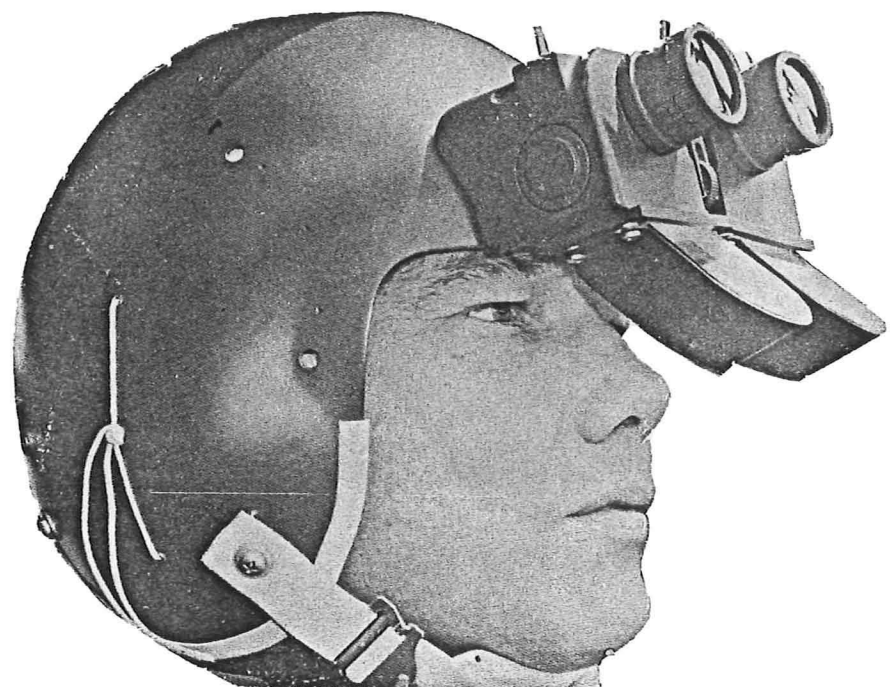
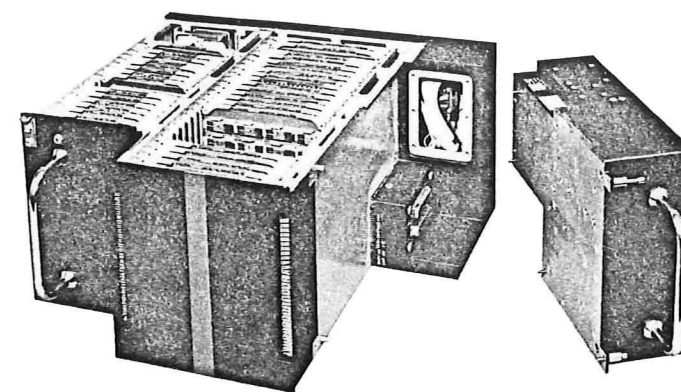
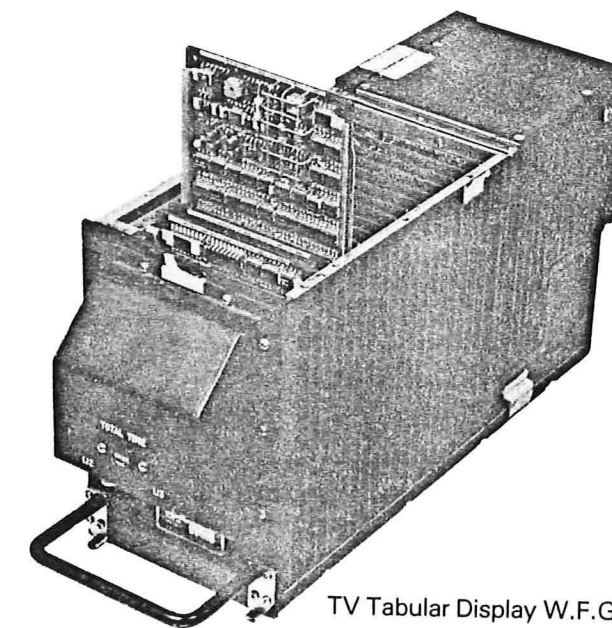


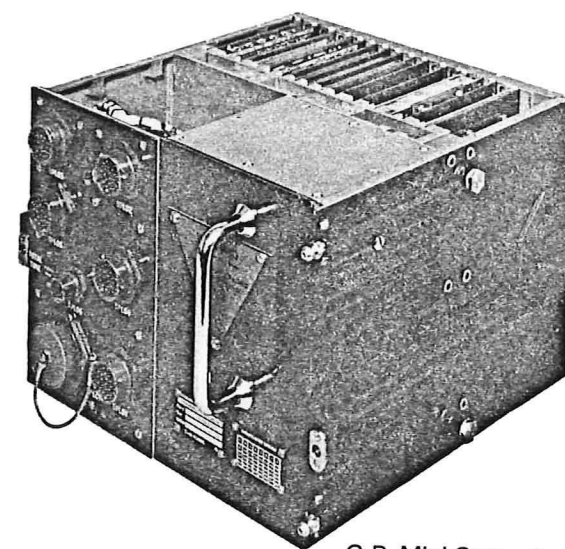
Figure 3.8 Cats Eyes Helmet Attachment



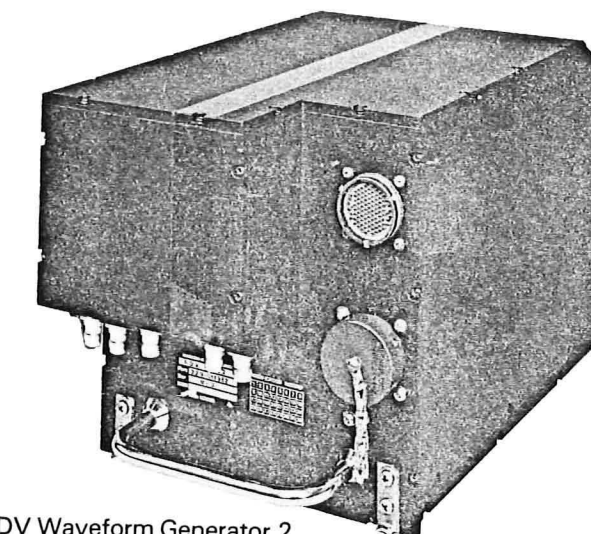
Nimrod Waveform Generator/Processor



TV Tabular Display W.F.G.



G.P. Mini Computer



Tornado ADV Waveform Generator 2

Figure 3.9 Display Processors - Special Purpose

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## SECTION 4

## GEC Avionics/B.P. KENT SOCIAL CLUB

## 4.1 Social Activities

4.1.1 GEC Avionics (Rochester) and B.P. (Kent) have amalgamated to form a social organisation known as the "GEC Avionics/B.P. Kent Club".

The activities of this club are as follows;

<u>ACTIVITY</u>	<u>SECRETARY</u>	<u>CONTACT POINT</u>
Angling	) Derek Waller ) Paul Wakeman(Baliff) ) Nigel Dives(Treasurer)	(Medway 718909) (Medway 271997) PSD/Estimating 642/2926
Amateur Radio	Allan Ralph	AS&R/Customer Training 436/2047
Archery	) Jack Milner ) Reg Bloodworth	ATE/Engs 196/2047 Medway 32961
Athletics	Len Murphy	ADD/Progress 395/2893
Badminton	) Philip Evans ) Bob Telford	ATE MASD/Engs 276/2797
Ballroom	Claudia Ahluwalia	GAv/Admin 500/2768
Bowls	Ernie Langley	12 Woodview Rise, Strood (Medway 718993)
Brass Band	Martin Polley	ADD/Production 620/2885
Climbing	Rob James	FARL/Engs Medway 44433 Extn. 68
Computer Users	Elizabeth Doe	FARL/Engs Medway 44433 Extn. 37
Cricket	Eric Rose	135 Watling St., Strood Medway 718030
Darts & Cards	Gary Cordier(Chairman)	MASD/ D/O 103/2264
Golf	Michael Broome	GSD/Engs 448/2718
Horticulture	) Allan Morgan-Brown ) Eileen Papworth	ATE/Engs 701/2676 GAv Snack Bar 256/2217

<u>ACTIVITY</u>	<u>SECRETARY</u>	<u>CONTACT POINT</u>
Judo	Jim Hinchcliffe	FISHER CONTROL(enrolment at Snack Bar Monday and Thursday Juniors at 5pm, Seniors at 6pm)
Karate	Stephen Packham	GSD/Test (Written applications)
Model Engineering	S A Radley	ATE/Tech Pubs 633/2913
Model Railway	Mark Snowden	ATE/Engs 654/2941
Netball	Jenny Hawker Maureen Hughes(Treasurer)	GAv/Catering 256/2217 Medway 252030
Photography	Kevin Restell	MASD/Production 276/2797
Popmobility	Sue Westrup	GAv/Management 2651/289
Rifle	Larry Vandertak	FARL Medway 44433 Extn 32
Rugby	Martin Weller	CAC/TDO 486/2650
Soccer	) Barry Mason ) Ron L Stevens	GAv/Accounts 442/2546 44 Stangate Road, Strood Medway 721866)
Squash	John Hollands	MASD Cost & Budget 363/2547
Sub Aqua	Raymond Newman	AS&R/Section C 13/2244
Swimming	) Cyril Moffett(Chairman) ) 642/2926 ) Dave Jibb	PSD/Estimating ADD/Engs 626/2907
Table Tennis	Eric Hasker	56 Main Road, Hoo Medway 252118
Tennis	John Rowlands	PSD/Engs Medway 44433 Extn. 58
Yachting	) Pauline Beldham ) Rainham. Medway 33386 ) Eric Fosbeary	88 Bettescombe Road, CACD/Engs
Yoga	Valerie Fennel	GAv/Personnel Records 208/2222

4.2 The GEC Avionics/B.P. Kent Club House

4.2.1 The GEC Avionics/B.P. Kent Club House is situated on the A228 Grain Road, at the Bell Lane/Dean Ridge Crossroads (see map).

Entrance is permitted only on production of a current Social Club Membership Card, (see figure 4.1), or in the company of a Social Club Member, who is allowed to "sign in" a maximum of two guests.

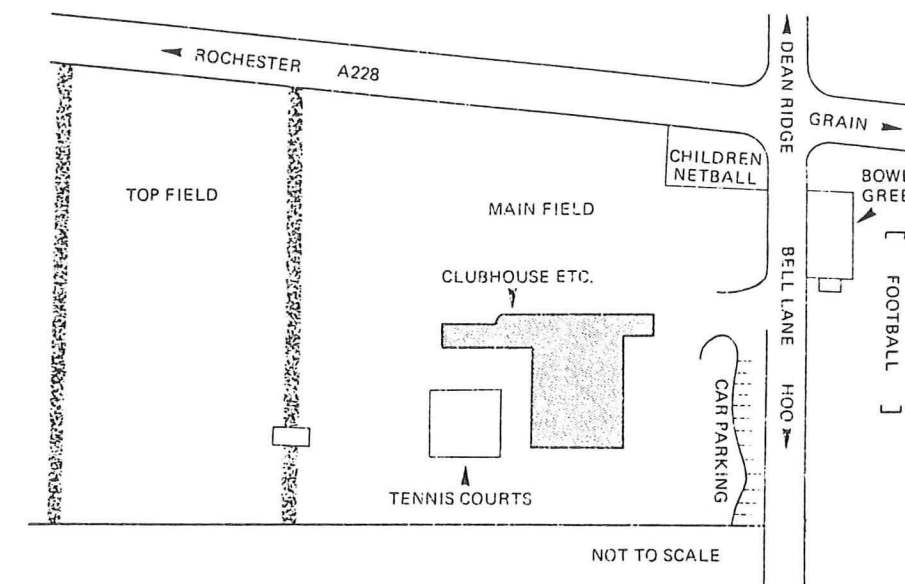


Figure 4.1 Location of GEC Avionics/BP Clubhouse

GAV - BP KENT CLUB	
MEMBERSHIP CARD	
(Full Member)	
Name	<i>Mr. H. H. MOULDER</i>
Club No.	<b>006913</b>
Member's Signature	<i>H. H. Moulder</i>

Figure 4.2 Club Membership Card



SECTION 5

TIME RECORDING

5.1 Time Sheets

5.1.1 Work carried out in any Division is paid for by Direct or Indirect Costing.

Direct Costing covers the time spent and material used by staff when engaged on a customer's contract.

Indirect Costing covers time spent by management and administration, rentals due for floor space and miscellaneous Engineering Services rendered to the Division as a whole.


In order to identify the time spent by Direct staff, Time Sheets (see Figure 5.1) are used.

These also cover indirect costs such as company funded private research and development, training, attendance at seminars, exhibitions etc, or any other activity not chargeable to customer order.

Company funded private venture research and development is covered by an authorisation, known as a 'Development Appropriation' or 'DA', from the GEC Avionics Rochester Management.

5.1.2 All direct weekly and monthly paid personnel submit Time Sheets on a weekly basis. These record the time spent by each employee and the contract to which it should be allocated. The following procedure is adopted:-

TIME SHEET																WEEK ENDING 14/10/83			DIV./DEPT./L CODE 229 / 102		
																CLOCK NO. 99999			00/0/37.50		
																PERIOD 7			WEEK 2		
																NAME COBLEY T M MR			13.11.61		
CLOCK NO.	INT	LAB TRANS DIV.	IND A/C	O T R	CHGE DIV	SERIAL NO.	SUFFIX NO.	SAT	SUN	MON	TUES	WED	THURS	FRI	ACCT INDCR	TOTAL HOURS	P CARD OR WIS NO.	DRAWING NO. OR EVENT NO.	SUPP. CODE	SUPP. HOURS	B.S.
99999	I		863	Z	229						3 3/4					3 3/4	Z 10863		X		
			860	Z	229						7 1/2		7 1/2			7 1/2	Z 10860		X		
			H		229	7551	0123			7 1/2		7 1/2				15	L 22145		X		
			A		229	7600	5221				3 3/4			7 1/2		11 1/4	H 16690		X		
																			X		
																			X		
																			X		
																			X		
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Approved by: 

37 1/2

Figure 5.1 A typical Time Sheet

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- o Each week the Accounts Department will send Time Sheets to the Divisional Cost Office. These are pre-printed with the Divisional and Departmental number, together with the employee's name, classification and clock number.
- o The Divisional Cost Office will distribute the Time Sheets to Departmental Heads, or nominated Supervisors, on each Friday morning.
- o Departmental Heads or Supervisors will distribute the Time Sheets to all Direct employees. Each Direct employee will compile his own Time Sheet to show the time that has been spent on each job or task. Relevant costing data, such as the numbers of the Internal Order (INO), Inter-Divisional Order (IDO), Development Appropriation (DA) should be quoted. Times are rounded off to the nearest quarter of an hour, and are expressed as a fraction. Any time not covered by the above categories should be allocated as directed by the employee's supervisor, and is normally an indirect booking number.
- o Supervisors will sign all Time Sheets to confirm that the information thereon is a true statement of work carried out in response to an authoritative instruction.
- o Supervisors will pass all Time Sheets to the Divisional Cost Office by Friday afternoon.
- o The Divisional Cost Office will check that all weekly and monthly Directly paid employees have submitted their Time Sheets, will pass the white copies to the Accounts Department by mid-day on Monday, and will retain the pink copies for cost analysis.

## 5.2 Time Recording and Variable Working Hours

5.2.1 Employees have the choice of working either contractual hours or variable hours, subject to Divisional/Departmental requirements.

Variable hours of work in A.D.D. are as follows:-

### Hourly Staff (39 hours/week):

Core Time	8.30-3.30
Variable hours	
Mon., Fri.,	7.30-8.30 3.30-5.30
Tues., Wed., Thurs.,	7.00-8.30 3.30-5.00

### Weekly/Monthly staff (37½ hours/week):

Core Time:	9.00-3.30
Variable hours:	7.30-9.00 3.30-5.00

5.2.2 Lunch break starts at 12.30, and may be half an hour or an hour, according to arrangements with the Departmental Head.

5.2.3 To record the hours worked, clock cards are used.

5.2.4 Weekly paid staff use white cards which should be clocked four times daily:

- o on arrival at work
- o at the start of the lunch break
- o at the end of the lunch break
- o upon leaving work at the end of the day

These cards must be left in the rack after each clocking and are collected by a Time Clerk each week to support payment of wages.

5.2.5 Monthly paid staff working to variable hours will use white clock cards marked "MONTHLY", and will also clock as in 5.2.4. These cards need not be left at the clocking station, but must be signed by the Departmental Head at the end of each week when 37½ hours have been worked. Monthly staff on contractual time will sign a time book upon arrival at the place of work, and will not use clock cards.

## 5.3 Overtime

5.3.1 The working of overtime is covered by Procedure Instruction 1-05-01/03 of the GEC Avionics Instruction Manual, which states that overtime should be carried out when necessary and should not be allowed to develop into an accepted practice. Advance authorisation is necessary, and on specific jobs is given by the Joint General Manager upon application by a Divisional Manager. Overtime is recorded on the employee's clock card, and is authorised by a Supervisor's signature.

5.3.2 Monthly paid personnel work to a pre-authorized "Planned Overtime" system, and the clock card showing hours extra to 37½ is attached to a separate overtime sheet and sent to the Cost and Budget Office. The overtime is paid only after a minimum of one hour in any one period, and thereafter in multiples of a half hour. This is applicable to personnel up to Scale 7.

5.3.3 For personnel of Scale 8 and higher, payment for overtime is made in special circumstances only, and with prior approval from the Divisional Manager. Usually an ex-gratia payment is paid in lieu of overtime.

5.3.4 For monthly staff who work contractual hours, overtime is recorded on a white clock card as for variable hours. (Blank

cards may be obtained from the Administration Office).

5.3.5 Time off in lieu of overtime worked is permissible by arrangement with Departmental Heads.

5.3.6 Additional guidance on detailed procedures associated with various types of overtime is given in Divisional Instruction 229-910-3, which is available to Departmental Heads.

## 5.4 Holidays

5.4.1 Holiday entitlements vary according to the date of enrolment of new employees.

For the first year:

Employees joining the Company in January are entitled to 20 days holiday.

Employees joining the Company between February 1st and June 30th are entitled to 13 days.

Employees joining after June 30th are entitled to no holiday, apart from public holidays.

Employees with more than one year's service are entitled to 25 days holiday.

5.4.2 The public holidays to which all staff are entitled are:

- New Year's Day
- Good Friday
- Easter Monday
- May Day
- Spring Bank Holiday
- Late Summer Bank Holiday
- Christmas Day
- Boxing Day

5.4.3 Staff may choose their holiday dates freely, but must give their Supervisors at least five days notice. Weekly and monthly staff may apply for holiday on a

"Notification of Leave" form (see figure 5.2) which will be authorised by their immediate supervisor.

This form must then be returned to the Technical Manager's secretary for recording.

5.4.5 Weekly staff, when applying for a week or more holiday, use a special blue form (see figure 5.3) so that their holiday pay for that week can be included in the wage packet due the week before their holiday.

5.4.6 Employees are expected to take two consecutive weeks holiday during the summer period, and to allocate up to four days of their holiday entitlement to the Christmas close-down period. Remaining holidays may be taken as the employee wishes, subject to the needs of the work load and to other employees' absences.

5.5 Absence through Sickness

5.5.1 Notification of sickness must be given on the first day of absence before 1.30 p.m., by phoning the Surgery directly (Medway 826124).

NOTES:

1 SICKNESS DURING HOLIDAY - The holiday period must continue as previously booked. Surgery must be notified on the day work should have been resumed, and sick absence begins on this day. Holiday time, once started, cannot be converted to sick absence.

2 SICKNESS BEFORE HOLIDAY - Surgery must be notified at the commencement of the sick absence and a return to work made at the end of this time pending a re-booking of the holiday period. A prolonged absence will be regarded as a continuing sick absence and not as part sick/part holiday.

3 SICKNESS IMMEDIATELY FOLLOWING HOLIDAY  
See Note 1.

4 SICKNESS BEFORE BANK HOLIDAYS  
Surgery must be notified at the commencement of the sick absence, and the Bank Holiday/week-end period will be included in the six day period.

5 SICKNESS AFTER BANK HOLIDAY  
Surgery must be contacted as soon as the works re-open, and sick absence begins on this day.

5.5.2 Upon return to work, the employee must collect and complete a Self Certification form from the Divisional Administration Officer. (For A.D.D. Engineering Staff located in the Towers, the Self Certification form may be collected from the Technical Manager's Secretary). The form must then be passed to the Departmental Head who, if satisfied with the entries made by the employee, will sign a panel on the form.

5.5.3 The Self Certification form is then sealed and returned to the Divisional Administration Officer. If the employee has been absent for more than six days a doctor's certificate is necessary. In this case the employee does not complete the Self Certification, but reports to the surgery upon return to work.

Sick Certificates are forwarded by the D.A.O. to Personnel Records, who, after noting, transmit them to the National Health Offices.

**GEC AVIONICS NOTIFICATION OF LEAVE**

From: ..... Date: .....

To: ADMINISTRATION OFFICER

Please note that M ..... Clock No. ....

has permission to take ..... days leave entitlement

From: ..... To: .....

R 1259/84	Entitlement Already taken (excl. above)	Days
	o/standing	

Approved by .....

Copy to originator: .....

Figure 5.2 Notification of Leave Form

Personal Details	Commencing Date of Holiday	Day	Month	Year	Personal Details
	Number of Consecutive Weeks				
<p><b>THIS APPLICATION FOR HOLIDAY MUST BE IN THE POSSESSION OF THE WAGES OFFICE AT LEAST 12 DAYS PRIOR TO THE COMMENCING DATE OF HOLIDAY</b></p>			<p>Signature of Employee</p> <p>Approved by:</p> <p>For Divisional Manager</p>		<p>Please note that your holiday pay will be included in next week's pay packet.</p>
<p>NOTES: 1. Where holidays are split, a separate application should be completed for each week. 2. In very exceptional circumstances where it is necessary to change the date of a holiday already approved, a holiday amendment card should be completed by the employee. Cards are obtainable from the Foremen. 3. Do not detach the counterfoil. This will be returned to you in your wage packet in the week prior to the payment of holiday pay. 4. If you do not receive the counterfoil in the week prior to your holiday, please contact wages office immediately to ascertain the reason.</p>					
					<p><b>COUNTERFOIL</b> (Do not detach)</p>

R.1129 10.47A

Figure 5.3 Application for Holiday Wages Form

SECTION 6

ACQUISITION OF MATERIALS

6.1 Purchase of Goods and Services

An employee requiring materials or a service essential to work, should compile a Purchase Requisition containing the following information:

- o Name of originator
- o Full details of proposed purchase
- o Estimated Cost
- o Possible sources of supply
- o Appropriate Cost Code Number
- o Delivery or completion date required

NOTE: Not more than 6 items should be entered on any one requisition.

6.1.2 The form R3111.4.78 is self-copying in triplicate. It is made out by the originator as shown in Figure 6.1.

6.1.3 For details to be entered in the boxes in the lower half of the form, reference should be made to the appendices in the PROCEDURE INSTRUCTION MANUAL as follows:

PROD  
GROUP App. 3 Pages 3-06-07,08,09

NOM OR  
IND A/C App. 10 Page 3-06-19

OTR App. 4 Page 3-06-10

CHG  
DIV App. 5 Page 3-06-11

SERIAL )  
OR )  
DEPT ) See relating INO  
SUFFIX )

WORK  
TYPE App. 6 Pages 3-06-12, 13

6.1.4 The completed form has to be authorised by the Manager of the Project concerned. The originator will then retain the pink copy and forward the white and yellow copies to the Divisional Buyer for further processing. Once the order has been raised in Purchasing, the Buyer will return the yellow copy to the originator for filing.

6.1.5 No instruction must be given to the supplier by the originator. All communication must be through the Purchasing Department.

6.2 Store Requisitions

6.2.1 A Material Requisition form (See Figure 6.2) is required for withdrawal of components from stores. The form must list the Part Number and Description of the item required and must quote the appropriate Divisional INO number.

Stock Control will make a data entry into the computer, which will then give details of the transaction, the number of items remaining in the store and the bin number. The requisition is then taken to stores and the required item issued.

6.3 Direct Purchase of Urgent Material

Where a purchase is urgent or sufficiently trivial in value not to merit Purchasing procedure it is permissible for an employee to purchase the item locally and claim the cost by Petty Cash Voucher. (See 9.3). The PVC claim, in addition to bearing the normal authorisation, must in this case also be signed by the Chief Buyer. The limit of value for any such PCV purchase is £25, and a receipt and the supplier's VAT number must be obtained.

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PURCHASE REQUISITION		ORIGINATOR	DATE	TO	OFFICE	PURCHASE REQUISITION NUMBER							
		J. D. SIMPSON	9/5/83	MR. T. BILLINGS	237	634363							
RECOMMENDED SUPPLIER		SUPPLIER'S ADDRESS											
1 HEAT DEVICES LTD		222 HIGH ST											
2		ANYTOWN											
3		MONESHIRE											
4													
Supplier Code													
White: Die Purchasing Copy													
Yellow: Return to Authoriser													
Pink: Originators Copy													
Item	Quantity	Description	Drawing/Reference No.	Unit	Quantity	Date	Unit	Per	Total				
1	3	THERMOMETERS TYPE THL			3	3/6/83							
2	6	HEAT INDICATING PRINT CODE 22			6	10/6/83							
3	1	CUT-OUT 60°C TYPE F22			1	17/6/83							
Your Question Ref.		Special Conditions		Contract No.		DUTY FREE/DUTY PAID							
Date		Product		Requested for		Authorised by							
D/A Inspection Requirements		NIL		LAB WORK AND TEMP TESTS		B Smith							
A1		729 A (3)											
ITEM	PROD GROUP	HOW OR IND AC	DIR	CHG DIV	SERIAL OR DEPT	SUFFIX	W/S & ACTIVITY	QUANTITY	AT UNIT PRICE OF	TOTAL COMMITMENT	PLANNED ESTIMATED PRICE EACH	TOTAL ESTIMATE	PURCHASE ORDER NUMBER AND DATE
1	D 88	401	H	229	7846	0501	W10012	3			£3.50	£10.50	
2	D 88	401	H	229	7846	0501	W10012	6			£3.25	£19.50	
3	D 88	401	H	229	7846	0501	W10012	1			£6.10	£6.10	

Figure 6.1 Purchase Requisition

MATERIAL REQUISITION		COST REF.		PROD. GR. CODE OR IND. A.C. NO.	ORDER TYPE REF.	CHARGEABLE DIVISION	SERIAL NO.	SUFFIX NO.	604/78	
				S	229	0080	0105	R.172.612		
ISSUE BATCH NO.	SIN NO.	PART NO.	DESCRIPTION				QTY. REQD.	QTY. ISSUED	UNIT COST	TOTAL COST
1917		CROSBY101X	CERAMIC MONOBLOCK CAPACITOR 101K				10	10	0.278	£ 2.80
/										
AUTY: ISSUING SIGNATURE AND DATE TO BE INSERTED IMMEDIATELY FOLLOWING LAST ITEM										
ISSUED BY	SIGNED	Bollan		DATE	27/6/78	TOTAL COST	£ 2.80			
RECEIVED BY	SIGNED	H. S. Coates		DATE	27/6/78	STOCK RECORDS ENTERED	SIGNED	Bollan		DATE

Figure 6.2 Material Requisition Form



SECTION 7

PATENTS

7.1 Introduction

7.1.1 Electronic development within the Division may lead to ideas and inventions which have commercial value. Such ideas should be considered for patent protection and subsequent patent renewals.

should consult his supervisor, who will then take the matter to the Technical Manager. The Technical Manager will notify the Patents Officer of all good ideas, and will specially recommend those which he thinks may have direct Company interest.

7.2 Procedure

7.2.1 An employee who thinks his idea may have inventive merit

7.2.2 The employee should be aware at this stage that, under the terms of his contract, inventions originating as a result of his work belong to the Company.

SECTION 8

TECHNICAL ARTICLES

8.1 Introduction

8.1.1 The Company encourages the publication of technical articles of good quality which are likely to enhance its reputation, and will give a financial incentive by offering payment of a fee to the author of an article published in an approved journal, or a paper published in the proceedings of a Professional or Learned Society. All such publications require the prior approval of the Management of GEC.

8.2 Procedure

8.2.1 A prospective author who intends to prepare for publication an article which would be identifiable in any way with the Company, must first discuss a synopsis of the proposed article with his Head of Department before preparing a full text. The author must also ensure that adequate time is available for preparation and approval of the text before the planned date of publication.

8.2.2 Provided that the Head of Department is satisfied that the proposed article is likely to be of sufficient quality and significance to justify submission for publication, he will obtain the agreement of his Divisional Manager for the preparation of the full text and will then pass a copy of the synopsis to the Market Development Executive for preliminary consideration.

8.2.3 The Market Development Executive will advise the General Manager of the intention to prepare the article. Should publication be deemed to be contrary to GEC policy, the Head of Department will be notified that the proposed article is not allowable.

8.2.4 If agreed by the Divisional Manager, the author should prepare the full text and submit it to the General Manager for review.

8.2.5 The General Manager will satisfy himself that publication would be in the interest of the Company, and that the Company has adequate patent protection where this is required for any product or process described in the article.

8.2.6 If the paper is suitable for presentation to a Professional or Learned Society, and is approved by the General Manager, the author will be advised and will then submit the text directly to the appropriate society.

8.2.7 If the article is suitable for publication in a technical journal, and is approved by the General Manager, the Market Development Executive will normally arrange for publication.

8.2.8 After publication, the author may claim, through the Divisional Manager, for payment of a fee by the Company. This claim must be supported by a copy of the journal in which the article appears.

NOTE: The scale of fees is defined in Financial Instruction No.23.

8.2.9 The claim for payment must be authorised by the appropriate General Manager, who will pass it to the Personnel Manager for instruction to Accounts Department to pay in accordance with the established scale of fees.

NOTE: The payment will be made to the author through the payroll and subject to normal deductions as made from salary.

## SECTION 9

### OUTGOING VISITS, USE OF PRIVATE CARS AND RECOVERY OF EXPENSES

#### 9.1 Outgoing Visits

9.1.1 An employee who finds it necessary to arrange a business visit outside his own establishment should inform his Project Manager of the proposed visit as far in advance of the date as possible.

9.1.2 For long-distance journeys where rail travel is most convenient, the employee should apply to the Technical Manager's Secretary for an "APPLICATION FOR RAIL FACILITIES" (see Fig 9.1). When completed, this form should be returned via the employee's Head of Department to the Secretary, who will then arrange for it to be authorised by the Technical Manager or his deputy and submitted to GEC Avionics for the issue of a railway ticket or warrant. The ticket or warrant is then passed to the employee.

9.1.3 Where rail travel is not practical, (i.e. for visits to isolated areas) and the destination is distant but reachable by car, the Head of Department will send an Internal Communication to the Technical Manager asking for special hire car facilities. When authorised, this application is passed to the Transport Manager, who will arrange to hire a car for the period required and make this available to the employee.

9.1.4 Groups of individuals who need to travel to a far destination on a business visit may apply to the Technical Manager for air passage if this proves more practical or cheaper than car/train travel involving an overnight stop.

This is nearly always the case where the visit is to an overseas site, or to a site located in Scotland where to travel by other means imposes an avoidable extra expense, or incurs ineffective time.

The air travel may be by Rochester-based Company plane, or by commercial plane from an airport such as Gatwick or Heathrow. In certain circumstances the Technical Manager may authorise the transportation of the groups to the airport by a chauffeur-driven Company car.

9.1.5 An employee who has returned from a business visit should compile a report at the earliest opportunity. A sample first page is shown in Fig. 9.2 and this should be followed by pages headed "DETAILED REPORT" giving an account of the investigations carried out and any proposed future actions which will arise as a result of the visit. A Visit Report number is allocated from a register held by the Secretary and the report is more acceptable in general if it is typewritten.

9.1.6 For visits which will require discussion of security-classified matters or to MOD establishments, persons who have not previously made such a visit on the same topic should advise the Divisional Admin. Officer well in advance, in order that the necessary security arrangements can be made. In such cases, confirmation that the visit will be in order should be obtained from the D.A.O. before departure.

#### 9.2 Casual Use of Private Cars on Company Business

9.2.1 Where the occasional use of an employee's private car may be

expedient, an employee can apply to be put on the list of authorised car users. The Technical Manager's Secretary will provide a "Casual Car Users Authorisation Form (See Fig. 9.3) which should be filled in by the applicant and returned to the Secretary. If the application is approved by the Divisional Manager, Accounts will be informed and will note details of the vehicle and insurance cover. Employees who use their car on Company business may subsequently claim a refund of expenses in accordance with established scales. These scales depend on the engine rating of the car and the total mileage travelled on Company business each year.

The applicable mileage rates are stated in a circulated copy of Financial Instruction No. 29(1), which is displayed on Company notice boards.

9.2.2 An employee who is an authorised car user and has need to make a business visit must apply through the Project Manager for permission to use his car on behalf of the Company. The following conditions must be met:

- o The car insurance must cover use of car for Company business and must cover liability for passenger injury.
- o If the car is a "hatchback" or estate it must have a 'C' licence before it can be used for carrying Company goods.
- o Any Company goods carried must be insured by the Transport Manager.
- o The maximum mileage (there and back) for private car journeys is 100 miles. For journeys beyond this, a hire-car may have to be applied for, and this is at the discretion of the Technical Manager.

9.2.3 An employee using his car on Company business may carry a

passenger not so engaged providing that no additional mileage is incurred because of the passenger.

9.2.4 An employee using a car hired by the Company must not carry an unauthorised passenger, since this passenger will not be covered by the insurance clauses.

9.2.5 As a general rule, Company goods for delivery or collection should be carried by the Company transport, arranged through the Transport Manager. This does not include carriage of "tools of trade", i.e. oscilloscopes, meters, or other appliances, which may be needed by an employee to carry out the work to be done.

9.2.6 Employees are responsible for ensuring that the car register is maintained up-to-date by notifying Accounts Department of any change in circumstances. The employee should show Accounts Department the Certificate of Insurance whenever a new Certificate is issued, and the new Registration Book whenever a car is exchanged.

9.2.7 If the use of the car is not to the advantage of the Company, the claimant will be allowed to charge only an amount equal to the fare by public transport.

Employees who frequently make the same kind of journey or who may be called upon to travel at short notice may be given overall approval for such journeys without being expected to request approval on each occasion. Such overall approvals will be reviewed from time to time in the light of the claims that have been made.

No claims for expenses will be considered for journeys that could have been made using the Company's bus service.

#### 9.2.8 Expense Claims

Claims for payment of expenses should be made by means of Petty Cash Vouchers. The car registration number and its engine rating (capacity in cubic centimetres) must be entered in the spaces provided. Claims will be rounded up to the nearest whole penny.

For each journey the following must be stated:

- o Name of firm or organisation visited.
- o Location
- o Mileage
- o Mileage rate ) Financial
- o Overhead rate ) Instruction 29/1

9.2.9 Employees should maintain a record of the cumulative mileage travelled on Company business from 1st April onwards in each interval of twelve months, and will be held responsible for claiming expenses at the appropriate mileage rate. Such claims are subjected to sample audit from time to time.

Payment of an expense claim will not be made unless Accounts Department has registered the car as in 9.2.1 and has recorded that a current Certificate of Insurance is held.

#### 9.3 Petty Cash Vouchers (See Figure 9.4)

9.3.1 Petty cash vouchers are required from all Divisional personnel who incur expenses on behalf of the Company. Certain expenses require special approval in addition to normal Division approval, and these are fully discussed in the appropriate section of the Company Procedure Instruction Manual.

It is essential that all personnel should understand what is acceptable before any expense is incurred on behalf of the Company.

In general terms expenses which are incurred by employees and for which

they expect to be reimbursed must be incurred wholly, necessarily and exclusively in the execution of Company business.

9.3.2 Cash reimbursement of expenses authorised by the Company and incurred on its behalf are payable by the Cashier only on presentation of a Petty Cash Voucher (PCV), which has been clearly filled in without alterations, signed by the claimant, and properly approved as described below.

All expenses incurred must be fully itemized, giving adequate detail of the expenditure incurred, together with reasons for expenditure, and the total amount claimed must be expressed both in words and figures.

All major items of expenses such as meals and hotel accommodation, and purchases of material, must be supported by receipted bills, which should be attached to the relevant Petty Cash Voucher. VAT numbers should be shown.

Appropriate cost codes must be provided for the guidance of Accounts Department.

NOTE: In case of difficulty the Divisional Cost and Budget Officer should be consulted.

Petty Cash Vouchers must be approved by an official of the Company senior to, and responsible for, the activities of the person incurring the expense.

9.3.3 Purchases of material should not normally be made for cash. In circumstances where small quantities of material not exceeding £25 in value per PCV are urgently needed, claims for reimbursement may be made by means of a Petty Cash Voucher, but the Chief Buyer must countersign the PCV in addition to the person authorising the purchase.

Such purchases will be approved only

by persons authorised to approve Petty Cash Vouchers and who have satisfied themselves that the expenditure is reasonable and has been properly incurred.

Petty Cash Vouchers must be submitted for approval preferably within one week of the expense being incurred, and always within one month.

#### 9.3.4 Compilation of Petty Cash Vouchers.

To permit automatic processing of Petty Cash Vouchers data it is essential that the headings of the forms should be completed comprehensively and in a uniform manner. The correct method of entry for each 'box' of the heading is shown in Figure 9.4.

Job Title of Claimant - The appropriate job title as recorded in Personnel Department records.

Name of Claimant - Claimant's surname (followed by initials), all in capital letters, as given on the claimant's payslip.

NOTE: Experience has shown that hand-written entries are liable to be misread when preparing data for analysis by computer, unless capital letters are used.

Car Engine Capacity - For registered car users, the engine rating (capacity in cubic centimetres) of the car registered by them with Accounts Department.

Car Registration No. - For registered car users, the official number of the car registered by them with Accounts Department.

Date - The date of compilation of the Petty Cash Voucher expressed in figures: day/month/year (last two digits)

Reference should be made to GEC Avionics Procedure Instruction Manual Volume 1, Part 3 pages 3-06-03/09 for filling in the boxes PG, OTR, etc., but the general rules are as follows:

PG - The Product Group must always be entered. The entry must consist of one letter followed by two numerals for all Direct Expenses (Order Type Reference other than D,C and Z), and a single zero for all Indirect Expenses (Order Type Reference Z).

OTR - The Order Type Reference must always be entered. Permissible Order Type References are - A,J,H,S,B,K,L,N,D,Q,C,R and Z. The Cost and Budget Department should be referred to where any doubt exists regarding the reference to be used.

Chg Div - The Divisional number of the Claimant's Division must always be entered.

Serial/Dept No. - The method of entry depends on the classification of the relevant expense:

- (a) For Indirect Expenses strike out 'Serial number' and enter the Claimant's departmental number.
- (b) For Direct Expenses, strike out 'Departmental number' and enter the Internal Order number.
- (c) For Direct Expenses chargeable to an Inter-Divisional Order, enter the Divisional number of the ordering Division, a diagonal stroke, and the Inter-Divisional Order number.

Suffix No.- For Direct Expense claims only, enter the number of the appropriate sub-division of the Internal Order or Inter-Divisional Order.

Personnel No.- The number shown as 'Clock number' on the Claimant's payslip must always be entered.

#### 9.4 I.O.U. Vouchers

9.4.1 Where expenses are likely to be incurred by an employee acting on behalf of the Company, the employee may raise an I.O.U. for a cash advance. The I.O.U. should show the amount required, the date by which the loan will be repaid, and, on the back, the reason why the loan is required. The completed I.O.U. is signed by the employee and given to the Technical Manager's Secretary to forward for approval and payment.

One cash advance only can be made to an employee at any one time.

I.O.U. Vouchers must be repaid as soon as possible and in any case not later than the promised clearance date. They can be repaid by the presentation of a Petty Cash Voucher backed by a cash balance where this is due.

#### 9.5 Cashing of Cheques

9.5.1 Accounts will exchange for cash cheques made out by the drawer to "GEC Avionics Ltd" up to a value of £50.

The drawer must write his Section and Division on the back of the cheque. No further approval is needed, and the cheque may be presented at the petty cash counter in Accounts.

APPLICATION FOR RAIL FACILITIES

MARCONI  
AVIONICS

To: Mrs L. C. McPake, MAV(R) From: .....

---

Name .....

Date ..... Return Date .....  
(if different from outward journey)

From ..... To .....

1st or 2nd Class ..... Ordinary or Day Return .....  
(Day return = arrival in London after 10 a.m.)

Chargeable No. .... Authorised by .....

R3471-11-83

Fig. 9.1 Application for Rail Facilities

AIRBORNE DISPLAY DIVISION  
VISIT REPORT NO: 229/ENG/FB/. . /123

Name: F. Bloggs Distribution:

Date: 4th/5th December 1979 Mr. . . . Tech. Manager  
Mr. . . . Proj. Manager  
Mr. . . . QA Manager  
Mr. . . . Prod. Engineer  
Mr. . . . Ch. of Test  
Mr. . . . RTO (Nav)

Place Visited: AFSF  
E E Squadron  
RAF Anywhere

Persons seen: Sqn. Ldr. . . .  
F/Lt. . . . .  
Ch. Tech. . . .  
and other technical  
staff.

Summary:  
The visit covered a period of two days and was made to finalise certain actions resulting from investigations into Buccaneer problems in general.

Brief Description of Visit  
Discussion between the Firm and the RAF included the following topics:

- 1.1 Inadequacy of setting-up instructions for the Display Test Panel.
- 1.2 Clarification of points relating to the failures of VT1 and VT2 in Panel A of the Display Waveform Generator.
- 1.3 To further discuss non-compatibility between certain Pilots Display Units and Display Waveform Generators.

Fig. 9.2 First Page of Visit Report

AUTHORISATION FOR CASUAL USERS CAR SCHEME REGISTER  
SECTION A (AUTHORISATION BY DIVISIONAL MANAGER)

(THIS SECTION IS NOT APPLICABLE TO EMPLOYEES ON ANNUAL CAR ALLOWANCE SCHEME)

TO: THE CASHIER

NAME: ..... DIVISION: ..... DATE: .....  
 (BLOCK CAPITALS)

Please add the above-named employee to the register of authorised car users.

He has been instructed to produce his car log book and current insurance certificate with this authorisation.

He \* WILL/WILL NOT be required to carry Company goods and samples.

\* Delete where not applicable.

Approved: .....  
 Divisional Manager

SECTION B (TO BE COMPLETED AND SIGNED BY EMPLOYEE)

1. My Insurance Policy covers me for the following:-

- (a) Third Party Liability.
- \* (b) Any possible claim made by passengers travelling in my car.
- (c) Use in connection with my employer's business.
- \* (d) Use for carrying my employer's goods and samples.
- \* (e) Use for carrying advertising material and soliciting orders.

I undertake to maintain the above cover whilst I am an authorised car user.

\* Delete where not applicable.

2. (Delete the relevant parts of this paragraph if para. 1(b) (d) or (e) applies)

My Insurance Policy does not cover me for:

- (a) Possible claim by passengers travelling in my car and I am aware that in no circumstances may I carry passengers whilst travelling on Company business.
- (b) Carrying my employer's goods and samples and I am aware that in no circumstances may I carry such goods and samples.
- (c) Carrying advertising material and soliciting orders and I am aware that in no circumstances may I carry such material or use my car in connection with soliciting orders.

3. I understand that all subsequent insurance certificates (including cover notes) issued to me have to be shown to the Cashier immediately and, if the insurance cover expiry date shown on the car register is exceeded I AM LIABLE TO BE AUTOMATICALLY REMOVED FROM THE REGISTER.

4. I understand that if I change my car the new car log book has to be shown to the Cashier immediately.

Signed: ..... Date: .....

Fig. 9.3 Authorisation Form for Casual Car Users

**Example of Indirect Expense Petty Cash Voucher**

Job Title of Claimant PROJECT ENGINEER		Surname (IN BLOCK CAPITALS) JONES		Initials F	Voucher No. (Accts use only)
Date 13-3-86	P.G. O	OTR Z	Chg Div 229	Serial/Dept. No. 100	Suffix No. -
Personnel No. 54003		CC of Car 1118	Car Registration No. EFA 22K		

**Example of Direct Expense Petty Cash Voucher**

Job Title of Claimant PROJECT ENGINEER		Surname (IN BLOCK CAPITALS) JONES		Initials F	Voucher No. (Accts use only)
Date 13-3-86	P.G. P11	OTR A	Chg Div 229	Serial/Dept. No. 1192	Suffix No. 010006
Personnel No. 54003		CC of Car 1118	Car Registration No. EFA 22K		

**Example of Direct Expense Chargeable to an Inter-Divisional Order**

Job Title of Claimant PROJECT ENGINEER		Surname (IN BLOCK CAPITALS) JONES		Initials F	Voucher No. (Accts use only)
Date 13-3-86	P.G. P11	OTR L	Chg Div 229	Serial/Dept. No. 275/1160	Suffix No. 01
Personnel No. 54003		CC of Car 1118	Car Registration No. EFA 22K		

Item	Date	DETAILS	Item Amount £	Nominal A/C
	12-3-86	Phatham and return for purchase of urgently needed art materials for ADD Tech. Pubs.		
		MEDWAY CRAFT CENTRE receipt attached (VAT 205173792)		
		ROWNEY OIL COLOURS	7	45
		BLACK COLOURING		78
		Total mileage = 5		
		Petrol @ 5.5p/mile		28
		Overheads @ 14p/mile		70
State Total in words			NINE Pounds TWENTY - ONE Pence	TOTAL 9 21
Approved by: <i>[Signature]</i>		Received by: <i>[Signature]</i>		Paid by:

CHIEF BUYERS SIGNATURE  
*K. Buxley*

Fig. 9.4 Petty Cash Voucher

SECTION 10  
EMERGENCY EVACUATION  
PROCEDURES

10.1 Introduction

In the interests of their own safety, and to facilitate the work of rescue services, personnel must evacuate the building as soon as the alarm is sounded.

There must be no delay caused by collection of coats or personal belongings, and equipment must be left unattended, whether it is switched on or not. Personnel not at their place of work at the time of the alarm must go directly out of the building and not return first to their own area.

Recognition of the alarm signals and the orderly evacuation of affected areas is part of the Company Safety Policy, and details of the procedures can be found in the Divisional Safety Manual, Section 2, Page 2.1. The Safety Manual should be read by all personnel at the earliest opportunity and should be specially noted by newcomers to the firm.

10.2 Alarm Signals

Fixed to the side of each exit from a main working area is a framed notice stating the type of alarm applicable to that area and the assembly point to which personnel should evacuate.

This information is detailed below:

TOWER 1	2 tone siren
TOWER 2	Continuous siren
TOWER 3	Continuous single tone siren

Assembly point for all towers:  
N/E corner of playing field.

CORSAIR	Electric bell
RST AREA)	
VAX COMP)	Single tone siren
ROOM)	

FALCON	Electric bell
TECH PUBS )	
PROGRAMMERS)	Continuous siren

Assembly point for all above:  
Car park, N/W corner of airfield.

10.3 Invalids

Invalids need special assistance in an emergency, and arrangements will have been made to assist any invalids to get clear of the building.



SECTION 11  
SAFETY AT WORK

11.1 GEC Avionics in general

11.1.1 Section 2(3) of the HEALTH AND SAFETY AT WORK ACT 1974 requires an employer to prepare, and revise when necessary, a "Statement of Health and Safety Policy", and to organise a means of implementing this policy and bringing it to the notice of all employees. To comply with this, all newcomers to the Division should be issued with a copy of the GEC Avionics Statement of Safety Policy Document Appendix A.

11.1.2 The Health and Safety Act is described in GEC Avionics Procedure Instruction Manual Volume 1, Section 1.18.

This section gives the requirements of the Act and lists the penalties for infringement (ie non-compliance).

It defines the responsibilities of staff at different levels, and the framework within which supervisory staff have to implement the Act.

In Appendix 1 the section sets out the "Statement of Company Policy and responsibilities" referred to in 11.1.1 above and in Appendix 2 it defines the duties of employers and employees in maintaining hazard-free working conditions.

These duties are listed below:

a) GEC Avionics

The management of the Company is responsible for deciding the Health and Safety Policy, keeping it updated and ensuring that it is properly communicated and implemented.

b) Divisional and Departmental Managers

Divisional and Departmental Managers are responsible for all matters pertaining to Health, Safety and Welfare in their area of responsibility, and for providing safe working conditions.

c) Supervision  
Supervisors have similar responsibilities for the area under their control and must encourage safe working habits and practices among their staff. They must attend promptly to matters which constitute a danger, and ensure that their staff understand the safety rules and procedures.

A Supervisor's main safety duties are:

- o To immediately warn staff if a dangerous situation arises.
- o To take action to remove the danger.
- o To train subordinate staff in "safe" ways of carrying out their duties.
- o Good housekeeping, i.e. ensuring that working conditions are congenial and secure.
- o Ensuring that adequate safety equipment and clothing is at hand.
- o To familiarise themselves with the alarm signals and the procedures to be used in emergency evacuation.

- o To report all staff injuries to surgery, and, if essential, to administer first aid pending the arrival of medical assistance.

d) Employees

The Company has always been mindful of the welfare and safety of its employees and has a first class record. This record can be further improved if employees remain alert for hazards noticed and encountered in the course of their duties. Unsafe equipment should be reported and work areas should be kept clear and tidy. Incorrect or faulty tools should never be used, and any safety instructions relating to a task should always be observed.

Employees therefore have a duty to co-operate in the operation of this policy as follows:

- o By working safely and efficiently
- o By using the protective clothing or equipment provided and which is available from the Model Shop, Production Stores and Engineering Stores.
- o By reporting incidents that have led or may lead to injury or damage
- o By adhering to Company Procedures, jointly agreed on their behalf, for securing a safe workplace
- o By assisting in the investigation of accidents with the object of introducing measures to prevent a recurrence
- o By remembering that, under the law, an individual is responsible for his own safety, and for the safety of those subordinate to him

e) The Safety Officer

The Safety Officer has an advisory responsibility for assisting line management who are ultimately responsible for safe working conditions as described above.

Employees should always raise matters affecting their health, safety and welfare with their supervisor in the first instance. If specialist advice is required, supervisors (or Department Managers in serious cases) should consult the Safety Officer. His responsibilities include: (See H&S 05-2.75)

- o Providing up-to-date information on Health and Safety Procedures
- o Analysing and controlling all reports of accidents
- o Advising on suggestions for new equipment, processes, substances, etc.

f) Safety Committee

The Committee is elected from employees and is chaired by the Works Engineer. The purpose is to develop and implement measures to ensure the health and safety of all staff, and to deal promptly with any threat to these requirements.

11.2 ADD in particular

11.2.1 Divisional requirements arising from the Health and Safety Act are defined in the "Divisional Safety Manual", which all ADD employees are required to read and understand.

11.2.2 The Manual covers, in detail, the following subjects:

- o Statement of Safety Policy
- o Framework of Responsibilities
- o Safety and Security regulations
- o Notification of accidents

- o Emergency evacuation procedures
- o Safety in various sections of the Division
- o Disposal of dangerous substances
- o Handling of hazardous components
- o Action to be taken in case of fire.

Below is a summary of the salient points of the "Divisional Safety Manual" (Page Prelim. 20)

- o Failure to comply with the requirements of the Act is a criminal offence.
- o We are each personally responsible in law for the safety of all those we supervise.
- o We are equally responsible for the safety of all visitors to areas under our control.
- o If convicted of failing to meet the requirements of the Act we will face a fine of an unlimited amount and/or a prison sentence of up to two years.
- o The surest way to be convicted is to ignore an "Improvement Notice" or a "Publication Notice" issued by a Safety Inspector.
- o If an employee under a Supervisor's control fails to take the precautions specified by the Division, the Supervisor may still be liable (in whole or in part) if the employee is injured as a result.
- o In addition to providing safety guards and equipment, Supervisors must use all reasonable persuasion and propaganda to induce the employee to use the equipment.

- o The burden of proof will rest with the Company and we must be able to demonstrate that all reasonable, practicable steps have been taken.
- o Written proof is better than a statement that people have been told of possible dangers.

All accidents must be reported to a Supervisor. Accidents resulting in personal injury must also be reported to the surgery, and the appropriate form completed in all cases.

All potential hazards and/or defective safety equipment must be reported to a Supervisor.

Each Supervisor is responsible for co-ordinating action within his department to eliminate any hazard; he must also keep the Divisional Manager informed on the status of safety matters within his department.

Each Supervisor is responsible for reporting defective safety equipment to the Safety Officer and notifying the appropriate authorities, external to the Department, of action required to eliminate hazards.

Because of the possibility of any individual being subject to accident or sudden collapse, there must be, as far as possible, never less than two people working in any area. Providing simple precautions are taken, e.g. staff are aware of each other's presence and occupants of offices leave their doors open, an area may be considered to be as large as a complete floor of a building. Overtime must always be arranged so that at least two people, preferably three, are present.

### 11.2.3 Safety Audits

Periodical audits of the Division are carried out by a Q.A. representative to check general safety and to highlight possible dangers or hazards. Formal reports are submitted to the Divisional Manager, who will take action where necessary.

11.2.4 The Q.A. representative will also be responsible for carrying out an audit of Divisional Safety Instructions in conjunction with the Q.A. audit function. He will then report the results of his audit to the Chairman of the Divisional Safety committee at each monthly meeting. A safety audit will be carried out on one department per week using check lists issued by the Company Safety Office.

### 11.3 WHAT TO DO IN THE EVENT OF FIRE

1. Call on the nearest person to ring security (internal 2300) or notify the security officer direct.
2. Use extinguisher suitable for type of fire;  
Oil, Petrol - extinguisher marked FOAM  
  
Wood, Paper - extinguisher marked SODA ACID or WATER GAS  
  
Electrical - extinguisher marked CO<sub>2</sub>.
3. If the fire is serious, leave by the nearest exit

### 11.4 WHAT TO DO IN THE CASE OF ACCIDENT

1. Sudden collapse or serious accident - ring the main surgery (2240) or mezzanine surgery (2539), or if the emergency is outside normal hours, ring 2281.

This is the Security key-box office, and a first-aider will be on duty.

2. Less serious accidents - visit either surgery, or if outside hours, visit the Security office. It is essential that minor accidents are reported to the surgery.

### 11.5 Special Notes

#### 11.5.1 Crossing the Airfield

It is tempting to 'take a short cut' but it must be emphasised that to encroach upon the apron of the airfield is a hazardous business and risks prosecution by the police.

The Company has been requested to cooperate in any prosecutions which may follow contravention of these rules.

#### 11.5.2 Handling of Cathode Ray Tubes

The Divisional Safety Manual emphasises the correct handling of Cathode Ray Tubes. These may implode violently if subjected to mechanical stress, with resulting injury to unprotected persons because of flying glass.

The following points should therefore be observed:

- (a) When not in use, tubes should be stored in the manufacturer's carton and not left lying on the bench.
- (b) Protective clothing should be used when handling tubes, and if possible the tubes should be handled in a screened area to reduce damage to other equipment if the tube does implode.
- (c) Personnel should be warned to stay clear while the tube is being moved. The tube should

never be lifted or carried by its neck.

- (d) The tube face should not be scratched or grazed as any residual mechanical strains in the glass will migrate towards the scratch and link up.
- (e) When standing a tube on its face, the surface on which it rests should be grit-free.
- (f) Old tubes are more fragile than new ones and should be treated very carefully.

- (g) If a tube breaks, gloves must be used when handling the glass to avoid contamination of the hands by toxic fluorescent material. The inhalation of dust from the tube face should be avoided.

The hands should subsequently be thoroughly washed and any cuts covered by a surgical dressing.

The broken glass should be firmly packaged and labelled 'Glass - Broken Cathode Ray Tube' before disposal. (Reference - Internal Communication from H.R. Staff dated 16 February 1977).

## Falcon Building

The Falcon Building was constructed specifically for the design and manufacture of holographic optical components for use in various optical systems. Most of the work has to be carried out in clean room conditions and it is not possible to admit visitors to the clean room itself. There is a small viewing gallery from which some impression of the clean room can be gained. The size of the viewing area is only sufficient to accommodate 6 people simultaneously.

Therefore, although the Falcon Building is open, the number of visitors is restricted. If you have a particular reason to want to visit the Falcon Building please give your name to the receptionist at Towers Reception. You will be issued with a ticket for admission at a particular time. It is hoped that this will avoid delays and congestion.

The holographic components manufactured in the Falcon Building are not the holographic pictures with which most people are familiar. They are specialist optical reflectors which are able to reflect a very closely defined wavelength (colour) of light received at the hologram from a particular angle. All other wavelengths of light and light of the particular wavelength arriving from a different angle passes directly through the filter. These holographic reflectors are used in the F-16 Head Up Display and samples can be seen in the Engineering Department.

The manufacturing process is rather like that of processing a film. A layer of light sensitive gelatin based material is deposited in a glass plate and exposed to laser beams in a carefully defined layout. The laser beams interfere with one another to produce closely separated areas of high and low intensity which are recorded in the gelatin as in an undeveloped photograph. The gelatin is then processed after which the optical characteristics are visible for the first time, although the gelatin is still wet and swollen. The gelatin is then dried (baked) in a carefully controlled series of ovens until the correct wavelength characteristics are reached. After baking, the gelatin layer, now containing the holographic reflector, is covered by a glass cover plate to ensure protection from the environment.

**GEC** AVIONICS

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**Airborne Display Division**

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