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PROFILE

Newspaper of the Royal Ordnance Factories

APRIL 1984

No 43

R & D: SO VITAL TO SUCCESS

by Dr Graham Pearson
Director General of ROF
Research & Development

THE Royal Ordnance Factories need research and development (R&D) because they determine our future products and the health of our business in the years to come. The objectives of our strategy in research and development are to expand and grow from that expertise we already possess.

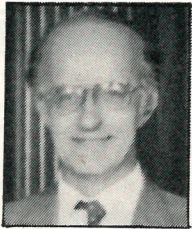
We must be innovative and forward looking and this demands a systems approach to our products, ie one in which every aspect is considered from the way in which it is stored to how it is deployed and used on the battlefield.

We must be able to argue the case for their effectiveness in the battlefield, whether it be in Northern Europe or elsewhere in the world.

And we need to be able to assess the target and our means of defeating it, as well as having a full knowledge as to how to deliver the weapon to the target.

The 1990s will be an era in which, increasingly, weapons will become "smart"; that is, they will need to have on board sensors that can differentiate the target from the background and provide signals to guide the weapon to its destination.

A substantial proportion of our expertise lies in weapons systems containing explosives, propellants or pyrotechnics. We need to build upon this expertise and expand our capability into the electronics technology and to enhance our understanding of the sensors and of the guidance and control needed for the "smart" future weapons systems.



DR PEARSON

In the areas new to the ROFs, we need to be able effectively to direct, control and manage sub-contractors who will provide subsystems and components to us for integration into a complete system. This same philosophy applies throughout the rest of our business.

At the outset of the Trading Fund it was recognised that we were primarily manufacturers of equipment, while the Research & Development Establishments of the Ministry of Defence, notably the Royal Armament Research &

Development Establishment (RARDE), the Military Vehicles and Engineering Establishment (MVEE) and the Propellants, Explosives & Rocket Motor Establishment (PERME) were the designers and often the developers of the equipment that we produced.

In 1974 the role of these R&D Establishments and of the Royal Ordnance Factories was seen as being entirely complementary. The then Managing Director of the ROFs, Mr S. G. Bacon (now Sir Sidney Bacon) and the then Deputy Controller of Establishments and Research and Chief Scientist Army, Mr W. B. Penley, signed on November 28, 1974 an Agreement which declared that the resources of the ROFs and of the R&D Establishments would be applied in a fully integrated way in satisfying MOD's needs.

It was from this agreement that Joint Technical Project Teams (JTPTs) sprang; today there are some 18 JTPTs for a wide range of Ministry of Defence projects. In these JTPTs the R&D Establishment normally takes the chair until such time as confidence in the design has been established, when chairmanship passes to us. These JTPTs have proved effective but have tended to perpetuate the existing way of doing things with applied research and development capabilities for the most part remaining in the R&D Establishments.

In 1980 the then Minister of State, Lord Strathcona, carried out two studies. One study exam-

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As we welcome the staff of PERME (Propellants, Explosives and Rocket Motor Establishment) to the ROF Explosives Division this month's colour feature looks at the work of this major facility. This picture of a Seawolf missile, propelled by its Blackcap motor, introduces the feature which begins on page 6



STUART C. FINN

An F-4 Phantom of No 111 Squadron RAF intercepts a Soviet 'Bear-D', a Tupolev Tu-20 in the Iceland-Faroes Gap. This painting by the Editor introduces a special feature on QRA — the RAF's Quick Reaction Alert capability which keeps fully armed fighters at year-round readiness. See pages 4 & 5



Left: Mr Jim Lavin (former Director ROF Chorley) poses with his wife after receiving the CBE from the Queen and right: Mr Stan Taylor, Chief Training Officer at the Factory, after being invested with the MBE. Full story page 3

Insatiable appetite for hard work has set the pace for Fred Bolton

RETIREMENT for Mr Fred Bolton is just another phase in his career — another of the many challenges he has faced head-on throughout his 43 years' service with the ROFs.

Clearly he is proud to have given this service: "I have had a marvellous career and it has been an honour to have worked in this organisation. I certainly have got something out of it and I hope I have put something in because I believe that you cannot survive just taking out — you must make a contribution and only in this way can the job be rewarding.

"It hasn't been easy. It's been hard because I have made it hard on myself by pushing myself . . . and everybody else!"

Analysing his approach he said: "Yes, I would say I have been a hard man, but my first priority is and has always been to treat people fairly and honestly." But whatever he expects of others is no more, no less than he expects of himself. His driving force has come from always trying to maintain high personal and working standards and squaring up to any challenge or problem. "It doesn't matter what the problem is you just have to set out to beat it and having done so, go on to face the next one," he said.

Direct manner

"I may not always have done it right — I don't pretend to be perfect — but I think I've done my best for the ROFs in my own way and my own style which I have tried to vary according to the circumstances and types of people I have been working with."

There is no hint of self-praise in his sentiments — just the refreshingly direct manner of a man who is well-known for hitting a subject straight on the nose.

Mr Bolton began his career at what was then ROF Wigan in 1941. He became a craft apprentice and obtained virtually all his engineering education at night school. It was a hard life with a commitment to do night shifts, overtime, also fit in his education three nights a week. "The training and apprenticeship we got was nowhere near as good as boys get today. We didn't get the financial assistance that they have available — help with travel costs, books, etc., nor the kind of training. We had to learn by standing beside skilled craftsmen."

It was at Wigan that he first

met Mr Jim Lavin who retires this month as Director ROF Chorley. So began their long friendship.

"Neither Jim nor I could see much future for ourselves at Wigan in the early years. There were so many old hands who had wartime factory experience that promotion possibilities seemed out of reach for us. I don't think we would have believed then that one day we would become factory directors!" he commented.

However, promotions did come his way before he eventually left Wigan to take up a new job at Patricroft, again on promotion, in 1954. His progress at Patricroft took him through the posts of General Works Manager and Assistant Director and finally Factory Director. It was in 1974 that he moved again to take the helm at Radway Green. Unlike his contemporary, Jim Lavin, he has never moved more than 30 miles from Wigan.

New dimension

Taking charge of Radway Green was not just a fresh challenge: "It added a new dimension to my life," he said, "I was fortunate in that the organisation had decided to invest more than £20 million in the factory and when I arrived a massive modernisation plan was starting. Personally I think it is doubtful that the factory would have survived if it had not been for this big investment."

Hand in hand with the improvement in production facilities went a big improvement in working conditions and all this had been reflected in increased productivity and efficiency, he said.

The environment of the workplace is a matter of great importance in Mr Bolton's consideration. "I am almost a fanatic in ensuring that people get good working conditions," he said. "Equally it is essential to provide them with the best tools and equipment. If you get all these things right you have a much happier workforce, tidier in outlook with a greater sense of pride and therefore turning out better quality and operating more safely."

Rewarding

Looking at the change in status Mr Bolton referred to the setting up of the Trading Fund: "That was a big challenge and, naturally there was some fear of the unknown, but people accepted it, grasped it and made it work. Now there is another phase coming — another big change — but I am sure that when all the dust has settled people will respond to the challenge and they will make it work because they are ROF-trained."

While it is natural to feel apprehension in the face of change Mr Bolton remarked that

After almost ten years as Director of ROF Radway Green, Mr. Fred Bolton is retiring this month. In conversation with PROFILE's Editor he spoke about his life in the Royal Ordnance Factories, the forces which motivate him and his plans for the future. His actual retirement date is April 30, but because of some annual holiday he is taking his leave of the factory which has been his pride and joy on April 6.



people did accept change. "In fact change is a good thing. There is nothing worse than the workforce seeing nothing happening — things just ticking over. If changes do not take place things can go downhill instead of moving forward. There's a whole new world which, if people can accept the challenge, could be very rewarding."

Mr Bolton has every confidence in the ROF workforce and in this context he paid compliment in particular to the men and women of Radway Green: "I've never seen a workforce as loyal and dedicated. Morale has been tre-

mendous. They are the factory's greatest asset."

He went on to describe them as "absolutely first class" and praised their responsible and sensible approach and their hard work saying: "All they ask — all they really want is a fair deal and not much beyond that."

Enjoyable

Radway Green has been a particularly enjoyable phase of his career and he drew attention to what he described as a very pleasant, modern factory. He

made no mention of the contribution he has made to this amenity, but as all who work there know only too well, he has diligently encouraged tidiness and cleanliness and a major part in this has been played by his anti-litter campaign as well as a vigilance on safety standards.

A factory director's job could be very lonely, said Mr Bolton. Tapping his desk he went on: "The buck stops here. A director has assistants around him all day to help and give good advice but at the end of the day he has to make the decisions. Certain decisions may mean that someone gets hurt, therefore you have to be a little bit clinical in your approach, but if you're not careful this can stop you being a human being."

While he admits to being a hard man this quality has not diminished his active interest in other people's progress. He has been a member of the MOD Main Career Development Panel for PTOs and Assistant Directors, Chairman of the MOD Sub-Committee for overseeing recruitment, training and standards for all students and graduate engineers within the Ministry and has also chaired the ROFs Sub-Panel for career development of PTO1s within the organisation.

Turning to retirement he said that it would not be without some sadness that he would be leaving the ROFs. It had been a privilege and pleasure to have been associated with the organisation and its people. When asked if he had any hobbies which would fill this gap he replied: "My hobby is work, work and more work!" However, he does have interests which he can pursue in his increased leisure time.

Interests

"In my younger days I played rugby league and tennis and also participated in athletics. Well of course I can't fall back on these at my age but as far as being active is concerned I shall be doing a lot more walking, swimming and playing bowls, as well as watching more rugby league than I have had time to do. Travel is another thing, and there are many places of historical interest at home and abroad that I wish to visit,

"But above all I am looking forward to spending more time with my wife and doing things together. I must say it is always our wives who bear the brunt of our work. They have to put up with us after a hard and demanding day and I am afraid we do tend to take them for granted. I think anybody who is in a senior position or has a big responsibility must be in a difficult situation if he does not have a kind and understanding wife to support him."

He said he would always take an interest in the fortunes of the ROFs and hoped to stay in touch

with old colleagues on a social basis. "But I do agree with Jim Lavin that it is wrong to come back as an interfering former director."

If there is any single factor to which Mr Bolton's insatiable appetite for hard work can be attributed it is probably the Depression: "I came from a humble background, brought up by God-fearing parents who set high standards and taught me the value of self-respect. I saw the ravages of the Thirties and decided that I wanted to do something with my life. Maybe then it is this which has motivated me and that is why I am a doer, wanting to get on with things and see results."

"The important thing is to make decisions, take action. If you make a mistake then you recognise it and put it right early, but it is far better to do things even if you make a mistake than to sit back and not do anything. That, I believe, is what leadership is all about."

Please keep in touch

WHILE a house newspaper or magazine performs its essential role of keeping in touch with the current personnel it is equally important to maintain contact with former members of the workforce who are now in retirement.

We are therefore asking all retired ROF employees to write to PROFILE and let us know how they are getting on and tell us of any interesting experiences they would like to recount.

As people approach retirement their attitudes differ widely from excitement over a new challenge and extra time to develop or expand their leisure pursuits to apprehension at the prospect of "having nothing to do." Those who fall into the latter category would, we are sure, find it most helpful to learn how others who are retired spend their increased leisure hours and what hobbies and pastimes they have taken up.

So, even if your retirement is a very busy one, please find a few minutes to write to the Editor from time to time. Your letters, and even short articles on any subject of your choice will be most welcome.

● FROM PAGE 1

ined the role of the MOD Establishments and laid down the policy that, wherever possible, they should reduce the work that they did on design, development, project support and post design services work, as well as some research, as part of a continuing policy of putting such work into industry. The R&D Establishments' role would be one of carrying out concept studies, basic research and the acceptance and evaluation of equipment.

The second study by Lord Strathcona was into the status of the ROFs. That study considered all possible lines of future development for the ROFs and identified a number of constraints, not least of which was that our applied research, design and

development were carried out in the MOD R&D Establishments separate from the Royal Ordnance Factories.

Today's situation

In moving forward towards Companies Act company status, the need for the ROFs to have their own Research & Development as well as Sales & Marketing capabilities have been fully recognised. Various possible ways in which we could increase our expertise were considered throughout 1983. Decisions were made early in 1984 to set up the new Divisional structure under a Holding Company and to transfer

the Westcott and Waltham Abbey South Site to our new Explosives Division of the Royal Ordnance Factories. The Royal Small Arms Factory Enfield has for some years been the source of the Ministry of Defence's R&D into small arms weapons and ammunition. Consequently, of the four divisions two (the Explosives and the Small Arms Division) already have a comprehensive R&D capability.

The other two divisions, the Ammunition and the Weapons & Fighting Vehicles Divisions, have been concerned traditionally with the later stages of development and manufacture of products which began their development at

RARDE and MVEE. The Procurement Executive Management Board of the Ministry of Defence has declared that responsibility for ongoing development tasks in the ROF product area currently being carried out at RARDE and MVEE shall be transferred to the Royal Ordnance Factories in the period between April 1 and October 1, 1984. The ROFs will in turn subcontract back, as appropriate, to the R&D Establishments.

The intention is that, over the next two to three years, the Ammunition and the Weapons & Fighting Vehicles Divisions will expand their capabilities to such an extent that there will no longer be the need to subcontract work back to the R&D Establishments. In parallel the R&D Establishments will complete the transfer

of the design and development functions that they exercise today in our product area to us.

Organisation

The organisation of Research & Development will be one primarily in which the divisions carry out the full development of new products; in Ministry of Defence parlance, from the Staff Requirement stage onwards. It is, however, planned that the Holding Company will establish a Future Systems Group. This will have the ability to develop new system concepts in concert with the operational divisions and with the Sales & Marketing division. It will assess, by using computer simulations, the military effectiveness of new systems in comparison to the products of today.

At all levels of the organisation we need to develop our ideas, to select those with the maximum potential and to develop them into timely products to meet the needs of our customers.

The future

We must be in a position to be able to carry out feasibility studies and to identify new concepts so that we establish and maintain a leading role in markets for our products at home and abroad. We must be forward looking and we must be involved in research — not in pure, academic research, but in the applied research that demonstrates new technology and provides confidence that development projects can go forward with acceptable level of risk. We need to move away from just

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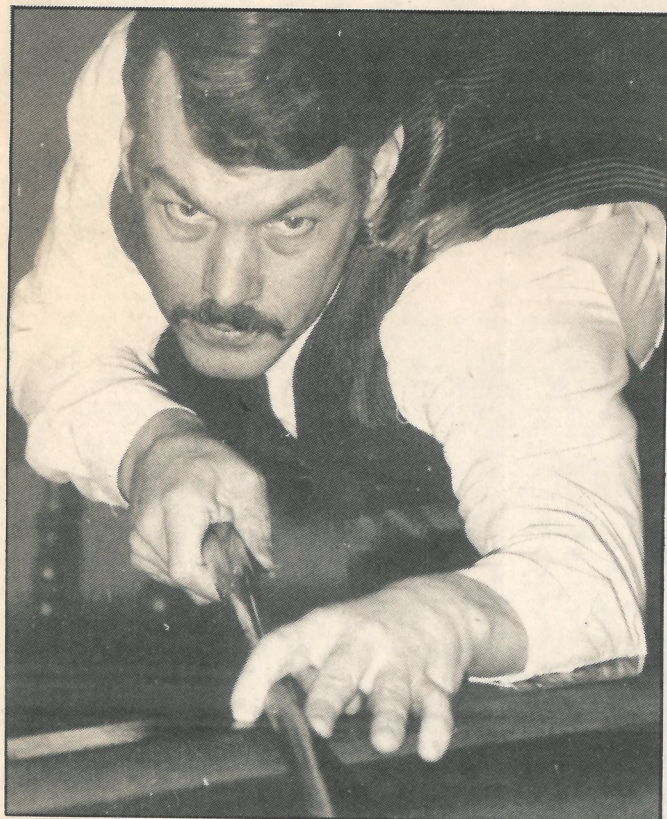
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Glascoed progress chaser Norman James is through to the finals of the Welsh Civil Service Snooker competition. For the third time he out-potted Bill Whale of the Home Office, Colwyn Bay, by three frames to one in the semi-finals. The champion will represent Wales in the National Championships at the end of this month so we eagerly await news of Norman's big match

Design & Development to Applied Research & Development — we must show our customers that we have the ability and the new ideas to win their confidence and their contracts.

What then is our perception of the future battlefield? What will be the role of tanks? Will there be robots? Certainly the threat that we face today will undoubtedly become tougher and harder to defeat. We will need to improve the survivability of our own forces, either through increased mobility or through better armour.

Surveillance

The whole scene of surveillance and target acquisition, as well as of command, control and communications, will, to an increasing

extent, determine the way of the future battle. Surveillance and target acquisition will be enhanced through remotely piloted vehicles, or stand-off radars operating from far behind the Forward Edge of the Battle Area (FEBA) and this information will need to be delivered to the weapons systems in sufficient time for the weapon to be launched so as to reach the target area while the enemy is still there. All of this will enhance the need for "smart" longer range weapons which can identify the targets, home in on them and destroy them.

In the next issue of PROFILE it is planned to publish our interview with Mr Harry Butterworth, MD Ammunition Division.

UPDATE ON THE CONSULTATIONS

By Alan Gibson
Head of OF/Personnel 3&5

IN THE last issue of PROFILE, Alan Draper, Personnel Director, promised that this edition would give details of the discussions that took place with the trade unions during March.

On March 2, a meeting took place with the Non-Industrial Trade Unions about the consultative document on the transfer of Research and Development facilities and staff to the ROFs. This meeting was chaired by Miss Alexa Walker, Head of the MOD Civilian Management (Industrial Relations) Division. Following this meeting, employees at PERME were notified by personal letter on March 20 whether they would transfer to the ROFs on April 1, 1984 or remain with Controller R&D Establishments, Research and Nuclear.

At the meeting on March 2, and at a further meeting on March 7, with both the Non-Industrial and Industrial Trade Unions, the register of preference exercise was discussed. The text of a Defence Council Instruction

was agreed, and has been subsequently published on March 30 as DCI/CIV/73/84. This honours the commitment made in paragraph 23 of the consultative document issued in October 1982 to give all employees in the ROF Organisation the opportunity to register their preference not to transfer to the new Companies Acts Company. Once again, it must be emphasised that while the Ministry of Defence will use its best endeavours, there can be no guarantee that an individual's preference will be met.

At the meeting on March 7 again chaired by the Head of CM(IR) discussions also took place on the security guarding arrangements to be introduced to replace the MOD Police and on the pensions consultative document. On the former, despite

several assurances, the trade unions continued to have misgivings about the planned use of outside contractors, and arrangements have been made for the TU Sides to represent their views to Ministers. On the latter, the trade unions repeated their view that the proposed new pension arrangements represent a worsening of conditions of service. But it was agreed that there would be merit in forming a small working group made up of representatives of both Sides to consider the various elements of this complicated subject. Meetings of this working group were arranged for April 2 and 10.

At the same meeting on March 7, the subject of redundancy was mentioned. A paper setting out the proposed redundancy arrangements and levels of compensation in the ROFs post-Vesting Day was forwarded to the trade unions on March 26. The test of that paper is reproduced on page 10 of this issue of PROFILE.

Meetings with the Non-Industrial and Industrial Trade Unions will take place under ROF chairmanship to discuss the

future company's personnel policies. The first formal meeting took place on March 7 with Mr Bill Meakin, MD/ROFs in the chair. He explained in some detail the structure of the new company, and then answered the various questions raised by the trade unions. In particular, he drew attention to a letter sent to the trade unions on March 1 by Mr Fred Clarke, Chairman ROFs, stating the firm intention that the Personnel Division of the Holding Company would propose, agree, disseminate and monitor personnel policy for the Group of Companies. A discussion then took place concerning principles for personnel management for post-Vesting Day, and it is planned to publish these in the next issue of PROFILE. Future Company rules for personnel and an employee's handbook were also discussed. Finally, it was agreed that a second formal meeting of the Group should take place on April 12.

It is our intention that PROFILE will continue to keep you up to date on developments arising from these important consultative meetings.

Factors that make the difference in Explosives Division

THE new explosives Division of the Royal Ordnance Factories differs from the other three subsidiaries in a number of respects, and in an exclusive interview for PROFILE its Managing Director Mr Trevor Truman outlined these fundamental differences and their implications for management.

Because of the nature of its operations there was, he said, very little in the way of direct sales to the military users: "The majority of our customers will be industry because, in the main, our products are incorporated into other weapon systems. For example, we manufacture explosives, propellants and rocket motors which, in turn, go into bombs, shells, missiles, etc."

"In other words there will generally be another industrial party between Explosives Division and the military end user, and our biggest customer — our largest single outlet — will be ROF Ammunition Division. Other major customers are the Ministry of Defence directly and prime contractors at home and overseas."

Mr Truman went on to explain another major difference: "This division is being created from rather different roots — it is not merely a redeployment of existing ROFs, but a blend of four important components: two Royal Ordnance Factories, a major Research and Development facility, and a large agency factory."

As explained previously in PROFILE, the two ROFs are Bishopton and Bridgwater, the R&D facility is PERME (Propellants, Explosives and Rocket Motor Establishment) which comprises the Westcott complex and the south site at Waltham Abbey. The agency factory at Summerfield is operated by Imperial Metal Industries Ltd, and although the assets are being taken over by ROF the workforce there will continue to be employed by IML.

The differences explained above will be reflected in the structure of the new division, as Mr Truman pointed out: "There is an obvious implication for management in deciding how the separate kinds of activity should be brought together in a way that serves the industrial customers most effectively."

Divisional headquarters will be at Westcott — a decision that underlines the importance of R&D. Mr Truman elaborated on

this point by saying: "Quite a lot of the products of the division are such that the design and the process by which each is made are inseparable and very intimately associated with its performance. It is therefore essential to have a very close relationship between production management and the R&D facility."

Explosives Division also contains Britain's national capability in rocket motor development as well as that of propellants and explosives and therefore taking it over is a major step forward for the ROF organisation. "We want the UK to stay in these techniques — we don't want to be dependent on foreign suppliers — and clearly the division has to forward the right technologies to meet customers' needs," Mr Truman commented.

Research and Development is therefore a major resource which will provide a valuable service to the division's customers. Effective takeover date is April 1 on which Mr Harold Williams becomes Director R&D and, by the same token, Director of Westcott and Waltham Abbey.

Awareness

Also based at Westcott HQ will be the division's Commercial Director (yet to be appointed at the time of going to press). His responsibility will be that of sales and marketing as well as project director roles for the major projects. Obviously marketing will be aimed not directly to end users but to the industrial customers. Said Mr Truman: "The division must see that these customers are fully aware of our competence, product range and skills and know that we are able to make what they want — were are in a good position to respond to their requirements."

"Our marketing aim is to make sure every user knows that we exist and that they will get a good service and product range and at competitive prices."

Looking to the future he went on: "There are challenging times ahead, but then business is always challenging — after all, success doesn't come by accident, it relies on strength of purpose, hard work and a commitment by all to a common goal. We shall succeed because we do things better than other people — that is the only criterion of success worth striving for."

On the potential for diversification he said: "There may be such opportunities in time, but in the early years I expect us to concentrate on existing things. However, where there are sensible areas in which to diversify we shall be happy to consider them and move into new areas where this will benefit the Division."

"There is of course a different kind of diversification which we can entertain and that is selling to industrial customers we haven't dealt with before, and we are already active in developing contacts to this end."

Deeply aware of the effects of change on individuals, Mr Truman had this to say: "We are very conscious of the concerns,

particularly of the PERME people who may have a number of anxieties as they join our organisation."

"My aim is to draw together all the skills, strengths and abilities and build on them using all the talents at our disposal and weld together a united division that regards its success as the common objective."

"I very much welcome all the people who are joining the ROFs and hope they will find our management style positive and constructive. My aim is to integrate them fully. I don't want old divisions and separations to be perpetuated — I hope that everybody in the division will feel they have a positive part to play."

MOD reorganizes 6 R & D establishments

Coinciding with the transfer of PERME Westcott and Waltham Abbey South Site to the Explosives Division of ROF, the Ministry of Defence has reorganised a number of its other R & D facilities.

RARDE, the Royal Armament Research and Development Establishment now combines the present facility of that name with MVEE (Military Vehicles Engineering Establishment) and that part of PERME which was not transferred. Headquarters are at the existing RARDE base,

Fort Halstead and the new amalgamation comes under the directorship of Dr T. P. McLean.

The Admiralty Research Establishment (ARE) has been formed from the Admiralty Marine Technology Establishment (AMTE), the Admiralty Surface Weapons Establishment (ASWE) and the Admiralty Underwater Weapons Establishment (ASWE). Headquarters are at Portsdown and ARE's first Director is Mr I. B. Bott, formerly Deputy Director of the Atomic Weapons Research Establishment, Aldermaston.

Double honour at ROF Chorley

Mr Jim Lavin, who has just retired as Director of ROF Chorley, received his CBE from the Queen at an investiture at Buckingham Palace last month. Mr Lavin, who was accompanied by his wife, was cited in the New Year Honours List and he views the award as an accolade for the ROF Organisation.

This was the second recent honour to be celebrated at Chorley because, at an earlier investiture the factory's Chief Training Officer Mr Stan Taylor attended the Palace, accompanied by his wife, to receive the MBE honour from the Queen.

Neil Kinnock at Blackburn

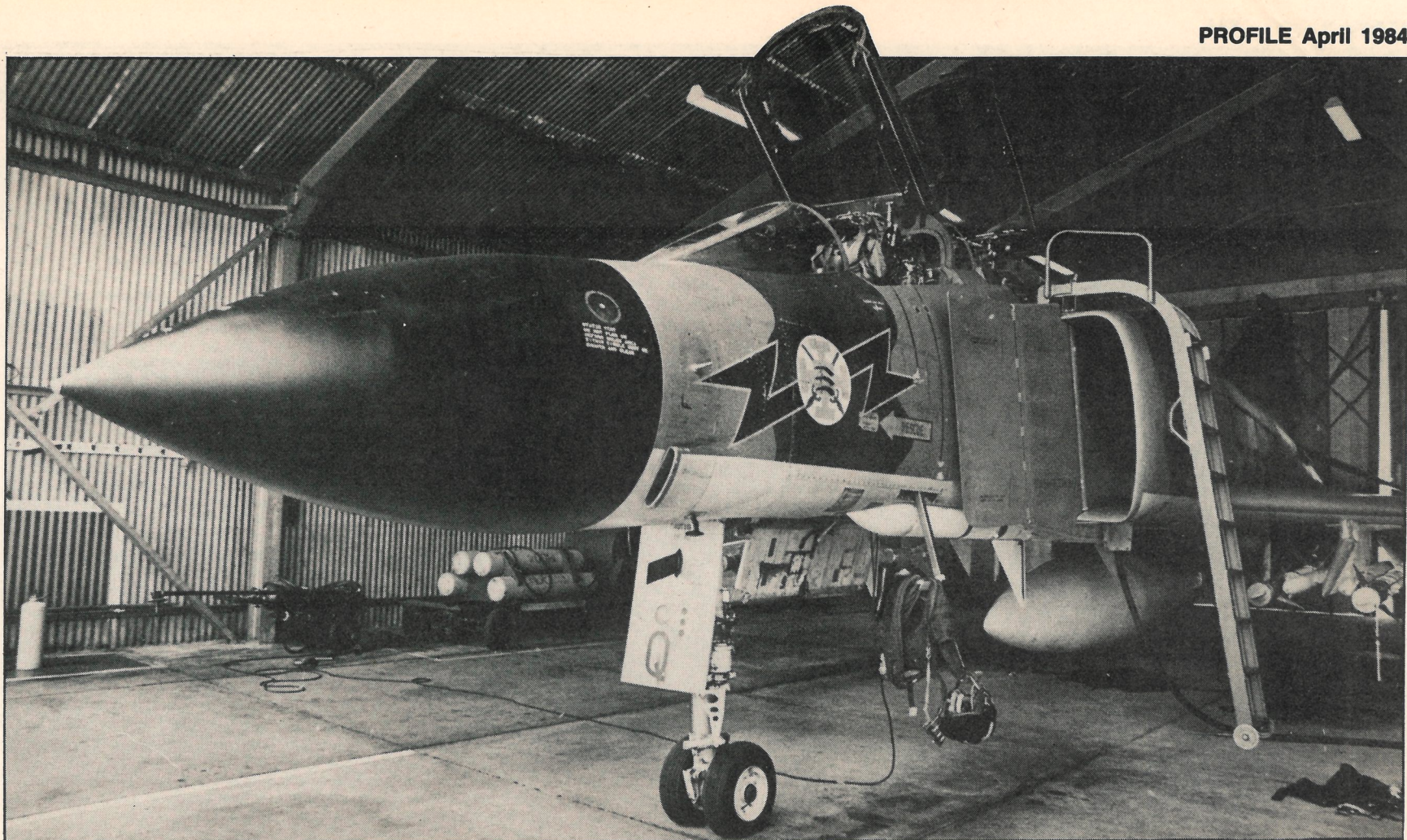
Leader of the Opposition, Neil Kinnock MP visited ROF Blackburn on Friday, March 30, accompanied by MP for Blackburn, Mr Jack Straw and MP for Burnley, Mr Peter Pike who is also a member of the Select Committee which is considering the Ordnance Factories and Military Services Bill.

Also present was Mr Harry Butterworth, Managing Director of the Ammunition Division, as Mr Kinnock was taken on a tour of the factory where he signed autographs and posed for photographs. There was also a large party of Press reporters and photographers covering his visit.

Every day of the year, without exception, the Royal Air Force has at least four air defence fighter aircraft at permanent readiness to defend the airspace that is Britain's responsibility.

Fully armed with live missiles they are the "teeth" of a rapid response system and are scrambled on average six times a week to intercept intruding Soviet reconnaissance aircraft.

From Britain's northernmost air defence station, RAF Leuchars, the Editor reports on the way this vigil is maintained. . .



A Phantom of 111 Squadron sits at readiness in its special hangar at RAF Leuchars in Scotland. When the picture was taken, this aircraft was yet to be repainted in the new overall light grey camouflage scheme. Note the pilot's life jacket and helmet at the foot of his access ladder, ready to put on in the event of a scramble

Quick Reaction Alert

IN THE grey hangar-like shed near the end of the runway two F-4 Phantoms sit at permanent readiness awaiting the urgent tones of the alarm which will herald another scramble. When that bell rings the building becomes a hive of rapid, well-practised activity as ground crew personnel perform their allotted tasks while the pilot and navigator strap themselves into the cockpit and prepare for a no-delay take-off.

The hangar doors slide open and the aircraft's engines are started up. Within minutes the Phantom is surging forward to begin its rapid taxi to the runway where the pilot pushes the throttle levers fully forward to engage reheat. With a deafening roar the twin Rolls-Royce Spey turbofans thrust the 25-ton fighter forward, off the runway and into a fast climb — the drama heightened by the two 30-foot tongues of flame, created by the after-burners, streaming out from the tail pipes.

So begins another Quick Reaction Alert (QRA) mission to deter intrusion of Britain's aerospace.

QRA is a vital instrument in the continuous monitoring of air traffic — a watch on the skies that is maintained for two fundamental reasons: preservation of flight safety and also defence considerations. By means of the RAF QRA force four fighter aircraft are kept at the highest state of readiness 24 hours a day, 365 days a year.

In the south this duty is shared between the squadrons based at RAF Binbrook and RAF Coningsby in Lincolnshire, and RAF Wattisham in Suffolk. Binbrook is unique in that its aircraft are exclusively Lightnings while those at the other two stations are Phantoms.

The northern QRA is maintained at RAF Leuchars in Scotland and shared between No 111 (Treble One) Squadron and No 43 Squadron — the Fighting Cocks, so named because of the cockerel motif in the squadron badge. Leuchars, therefore, is unique in that its QRA commitment runs throughout the entire year without a break.

Monitoring of the airspace is achieved by ground based radar systems of the UK and Nato with close liaison with the civil air traffic organisation. Complementary cover is provided by airborne systems such as those carried in the RAF Shackletons which, after many years' service, are to be

How the RAF keeps the bear at bay . . .

replaced totally by the AEW (Airborne Early Warning) versions of the Nimrod.

When the monitoring systems detect an aircraft which cannot be identified by normal routine procedures it is necessary to obtain a visual sighting to establish its identity. This is the role of the QRA aircraft which have to respond in rapid time in order to maintain the validity of the alert system.

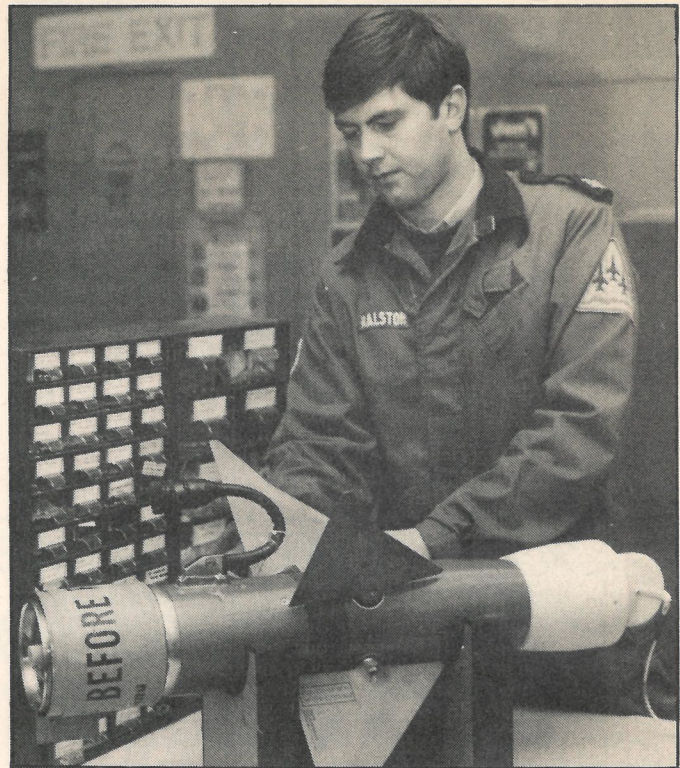
It is quite common for there to be as many as six such scrambles in a week during busy periods, and in most cases the plots appear up in the South Norwegian Sea and in the Iceland-Faroes Gap. They turn out to be Soviet military aircraft of the reconnaissance type and therefore it is essential that our air defence squadrons are seen to be fully capable of rapidly intercepting these flights. By so doing they are demonstrating our vigilance and determination to defend our airspace and therefore the message they carry is one of deterrence.

Obviously it is not only speed in getting an interceptor fighter airborne that is essential. Equally vital is the ability to carry through this impetus right up until the moment of interception and so a full back-up organisation exists to direct the fighter towards its "target", provide command and control and to ensure that air-to-air refuelling tanker aircraft are on station to replenish the fighter when and where required.

Not surprisingly, because of its geographical location as Britain's northernmost air defence station, Leuchars boasts a high proportion of intercepts by its two squadrons. Situated near one end of the main runway and some distance from the main station buildings is the QRA complex. This comprises a hangar-like building sufficiently sized to accommodate comfortably two Phantoms. Attached to this hangar, or "Q-Shed" as it is known, is a single-storey building which provides living quarters for aircrew and ground crew as well as working accommodation.

Each squadron holds the QRA commitment for three weeks at a time, during which two of its Phantoms are kept fully armed and ready for start-up in the Q-Shed. A single crew comprises pilot and navigator and two such crews are constantly committed at the exclusion of all other duties. The task is rotated throughout the squadron and each crew is on duty for a full 24-hour period in which they live in the QRA complex, and, even when sleeping, they wear full flying kit. Likewise groundcrews are drawn from the same squadron and they live in their own purpose-built quarters in the complex. Each team's duty period lasts for one week, and a team comprises a senior NCO and six airmen.

The two aircraft and their crews are at a constant ten minutes'



readiness but this does not necessarily mean that both will be scrambled in response to a single incident. They are designated as QRA-1 and QRA-2 in the order in which they will be deployed and there is also a back-up aircraft, QRA-3, which stands outside the shed while its crew remain at home close to the telephone at a 60-minute readiness state.

A Soviet aircraft does not suddenly appear on mainland-based British radar—its progress will have been tracked for many miles by other systems (such as those based in Norway) which will have fed continuously updated information to the RAF. The actual decision to scramble an interceptor is taken at the UK Regional Air Operations Centre at RAF High Wycombe. The QRA complex is on a direct communications link with its Section Operations Centre, which, in the case of RAF Leuchars, is situated at RAF Buchan.

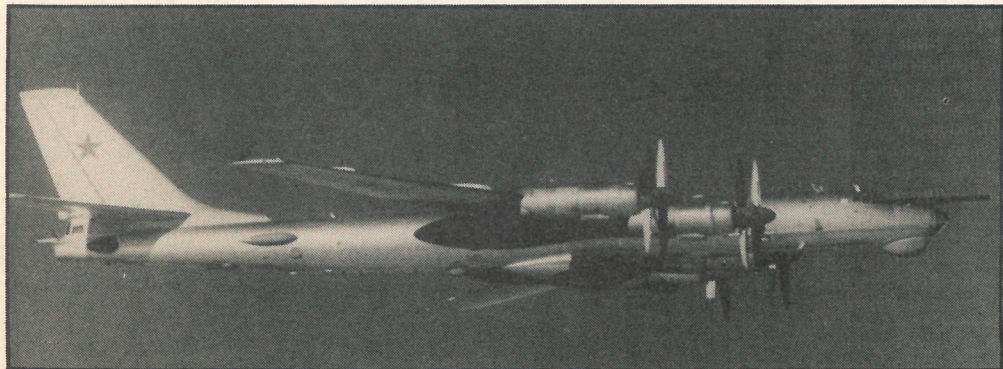
As soon as this message comes through the alarm is sounded and as the aircrew dash to their

Locking the forward fins into position on the nose section of a Sidewinder missile in preparation for its underwing installation on an RAF F-4 Phantom. Four such missiles are carried on QRA missions, together with four Skyflash

Phantom the ground crew personnel go into action to complete the final tasks necessary to launch the mission. These include removing safety locking pins to arm weapons, removing pitot tube covers and undercarriage pins and finally withdrawal of ejection seat arming pins.

The hangar doors in front of and behind the aircraft are opened — the latter to allow escape of jet efflux because the engines are actually started inside the building. The close proximity to the runway reduces taxiing time, but in any case this transit is achieved at a faster rate than on routine (non-QRA) operations.

The fact that the aircraft is kept at constant readiness reduces the pre-flight checks to a minimum and an advantage in keeping it



A Soviet "Bear-D" — the Tupolev Tu-20 (sometimes known by its design bureau's designation Tu-95). The type first entered service in 1955 as a long-range strategic bomber, and this mark is now used for reconnaissance and surveillance duties with an endurance rate of 24 hours. It is powered by four turboprops incorporating contra-rotating propellers

under cover is the fact that its radar and other avionics systems warm up in a very short time. Also contributing to the speed of response is the priority that a Q-sortie has over all other movements on or in the environs of the airfield.

Once airborne the pilot sets course on the vector given in the scramble message and establishes contact with his control whence he will obtain updated information on the latest position of the unidentified plot.

To give the QRA aircraft optimum range as well as loiter capabilities it is essential to ensure that it always has sufficient fuel. This is where the RAF's Victor tankers play their part in the alert system. In transit to its probable area of interception the Phantom will sometimes rendezvous with one of these flying filling stations for replenishment in what, to the layman, surely seems a remarkable feat of organisation and navigation. The tanker continues to the operating area to provide further top-ups later in the mission.

Searching

The Phantom continues on course to home in on the target — a particularly busy phase of the mission as, with the aid of the aircraft's radar system, the navigator diligently searches on bearings calculated from the information passed from control. He is not only seeking the "target" but aiming for perfect timing and the optimum position to which he must direct the pilot so as to execute a text-book interception.

As already pointed out, the Soviet aircraft which are subjects of these interceptions are flying in international airspace, but while they are outside Britain's sovereign boundaries they are within that area allocated by Nato to the UK as being our responsibility — the United Kingdom Air Defence Region (UKADR). Usually they are practising their war roles of surveillance and reconnaissance as well as anti-submarine, anti-shiping warfare and simulated attack against the British mainland and air defence radar sites.

The most frequently encountered intruders are the various marks of Tupolev Tu-20, code-named in Nato reporting parlance as Bears. These four-engined giants have distinctive paddle-bladed, contra-rotating propellers which appear to be turning so slowly that it is possible to actually see the individual blades in flight. Other aircraft which are common subjects of interceptions are the Tu-16 Badgers and occasionally the M-4 Bisons and Il-18 Coots venture far enough out to provide some "business" for our fighters.

It must be borne in mind that the QRA aircraft are fully armed with live weapons: four Skyflash or Sparrow radar-guided missiles and four heat-seeking Sidewinder missiles. A mere flick of the

pilot's master arm switch and a squeeze on the trigger are all that are required for a missile launch so flying a QRA mission is obviously a job of immense responsibility.

Thankfully the intruders are on peaceful missions but every track must be considered as potentially hostile until its identity and behaviour have been investigated. As one pilot pointed out: "Every time you take off on a Q mission there is that chance in a million that this one could turn out to be the real thing."

Responsibility

He went on to say that this thought was not something the crews dwelt upon and indeed, once a mission had begun there were too many immediate things to occupy their minds. It is enough that they are fully aware of their responsibilities and the awesome task that they might have to perform one day. What makes that fateful day unlikely is the overall policy of deterrence (in which QRA plays a part) which has maintained peace in Europe for three decades or more.

What of the strain that QRA places on the crews? While the actual missions impose a burden on the crews this is the work for which they are trained and qualified. It is probably true to say the actual waiting is a greater strain. It doesn't follow that a crew will be scrambled during their 24-hour duty period, nor does it mean that if they are scrambled they will actually perform an intercept because the intruder may leave the UKADR before they reach his position.

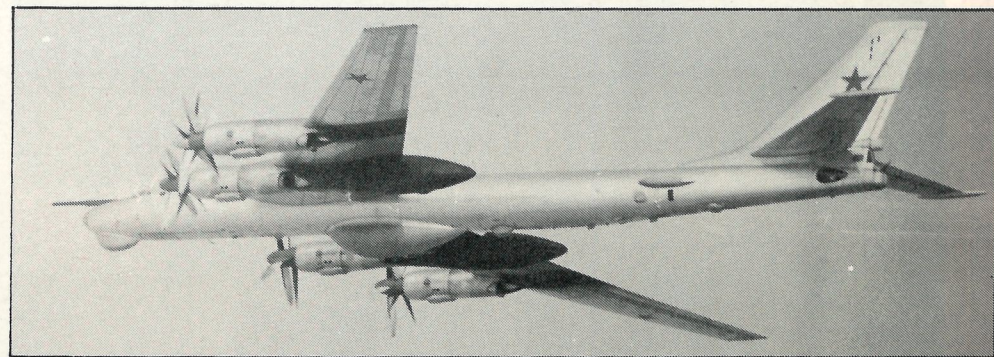
Waiting time

While efforts are made to ensure that the QRA accommodation is far from spartan spending a full 24 hours wearing flying kit is not the most comfortable way to pass the time. The only items of clothing they do not wear constantly are their life jackets and helmets. Individual pilots and navigators find different ways to spend the waiting time. Some may manage to catch up on some paperwork or studying if they are involved with such pursuits as the Open University, but others find that the situation in which they are expecting the telephone to ring at any moment is not conducive to full concentration so they ward off the boredom by reading or watching video films.

Probably the worst time to be scrambled is in the night when, awakened from a peaceful sleep, a crew faces the prospect of a long flight — some missions can involve a round trip of up to eight hours or more. Equally the Soviets are no respecters of public holidays and it is quite conceivable that as we tuck in to our turkey lunch on Christmas Day a QRA Phantom could be speeding at high altitude to an intercept point 500 miles or more from its base.



This dramatic view of an F-4 Phantom of 111 Squadron clearly shows the armament of four Skyflash and four Sidewinder missiles as well as its three external fuel tanks for increased range. The aircraft is painted in the new all over light grey low visibility camouflage with pink and light blue roundels

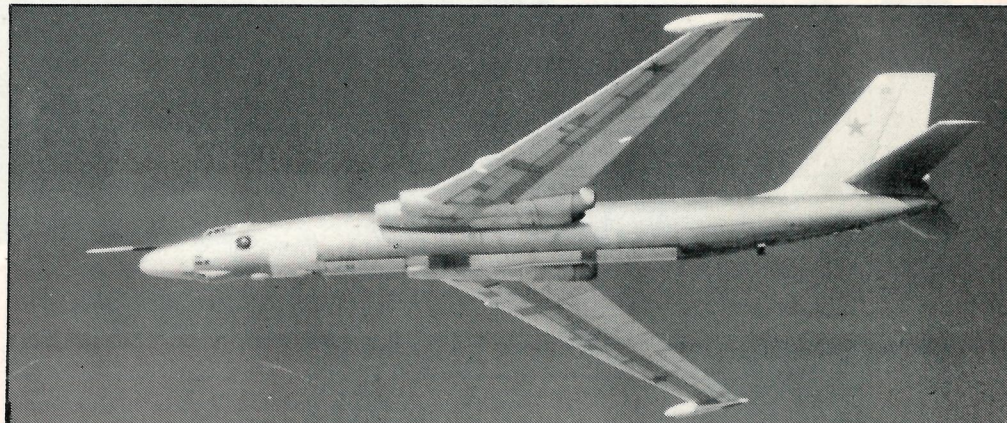


Above: Another shot of a "Bear-D" taken during a QRA interception. Below: A Soviet "Badger-C/D" — the Tupolev Tu-16 which began service life in 1955 as a strategic bomber. In various marks it has served as a missile platform, air refuelling tanker and of course a surveillance and electronic intelligence gathering (Elint) aircraft

Apart from the areas of ocean already named in this article, Soviet aircraft have been known to come quite a distance south into the North Sea. Bears tend to operate in pairs or larger numbers but in certain instances singletons are encountered and they are generally in transit to or from Cuba.

It is thought that forays into the UKADR by the Soviets are not solely to test our speed and determination in response. This testing probably comes as an additional bonus on a flight which has been scheduled mainly to practise the surveillance role.

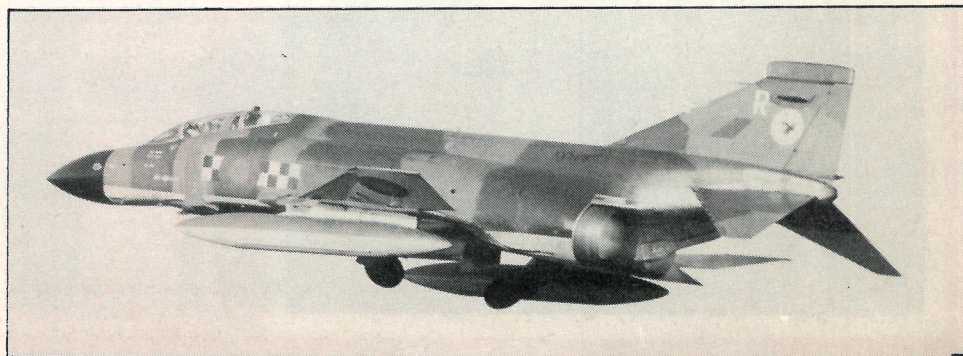
From our own point of view it provides a real-time, non-exercise practice which continually proves the reaction capability, keeps the system on top line and demonstrates our determination to defend national and Nato interests come what may. In short, QRA is what air defence is all about.



Above: A "Bison-B" — the Myasishchev M-4/201 equipped for long-range reconnaissance and Elint. Below: A Phantom of 43 Squadron at RAF Leuchars is pictured before introduction of the new camouflage scheme



To avoid damage missiles are stored without their fins attached. This Skyflash is now required for installation on a Phantom therefore a weapons technician is securing the forward fins as part of the preparations for its deployment



FOCUS

The R&D work of the

embraced by the Explosives Division PERME is Britain's national capability in rocket propulsion and gun and small arms propellants — an advanced field of science in which the establishments conduct extensive research, exploratory development, project development and, in some areas, actual production.

It comprises two complexes: Westcott in Buckinghamshire, about ten miles from Aylesbury and some 50 miles north west of London, and Waltham Abbey (south) in Essex, 16

miles north east of the capital and not far from the Royal Small Arms Factory, Enfield.

Rocket motor work is concentrated at Westcott while Waltham Abbey has the responsibility for rocket and gun propellant and explosive work. Both are very closely inter-related, of course, and the entire establishment, in very simple terms, takes the results of research into the development stages and through to production and therefore finally presents to the particular production factory where the product is to be made a "recipe" comprising a list of ingredients and the method or detailed description of the production process.

The immense importance of research cannot be stressed too

greatly. It is the stage where technology must achieve its advances and where all innovation must come for only by means of the research programme can development capability be maintained. Indeed, innovation is not welcome at the later development states because here the product should be set on course, free from any delays caused by a need to back-track into research.

As the gap between the introduction of two generations of product grows technology advances at a considerable rate but this great advantage is not without its problems. To be specific, how do you demonstrate the current state of the art to customers without a product that embodies these advances? The answer lies in the Advanced Technology Demonstrator

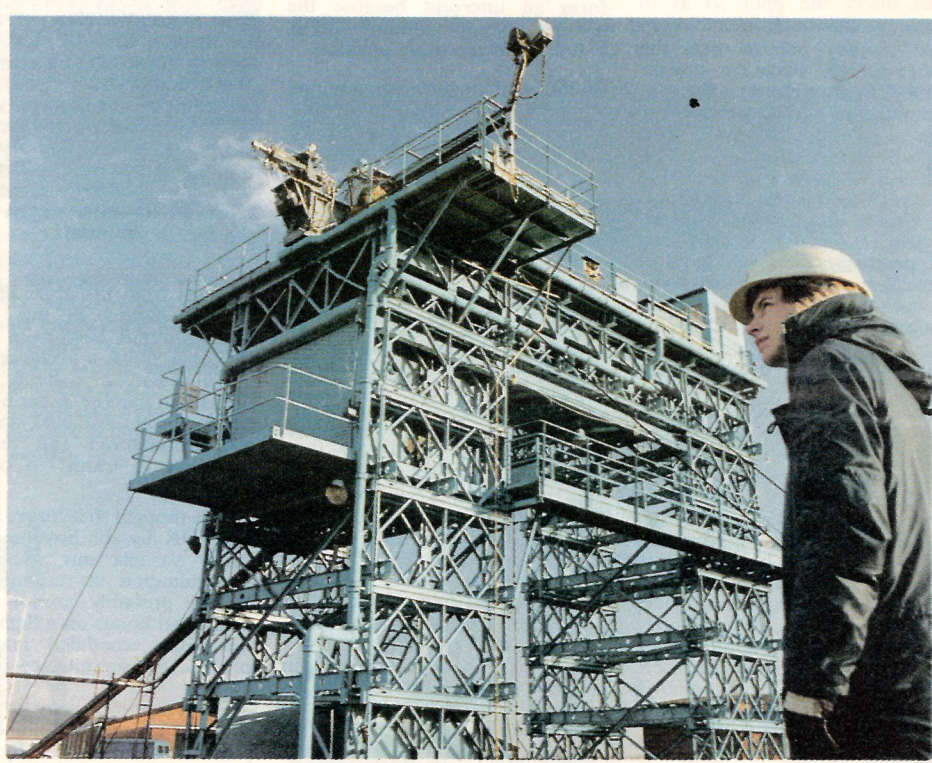


Top: Dramatic shot of the Falstaff flight test vehicle being propelled by its Stonechat motor. All PERME-designed and developed rocket motors are named after birds.

Above: Stonechat motor being prepared for installation in a rocket.

Left: Preparing equipment in Westcott's liquid propellant section.

Right: Westcott has a full test firing facility for rocket motors of which this is the control room.



This tower at Westcott provides a mounting for certain rocket motor test firings, e.g. for measurement of exhaust plume structure.



VISION ON PERMIE

Propellants, Explosives and Rocket Motor Establishment

(ATD). Many of the advances that the research programme has made possible have been built into a single rocket motor, the Oyster Catcher.

In other words, staff have put these technological features through a quasi rocket motor development to produce something tangible with which to show the customer that the advances have been proven. The ATD therefore incorporates the very latest ideas both in hardware and propellant which have emerged from Westcott and Waltham Abbey.

Improvement

Looking more closely at the work carried out at each site, Westcott is concerned with all aspects of the design and development of both solid and liquid propellant rocket motors. In respect of the former the operation also includes power cartridges and gas generators and with Waltham Abbey is responsible for complete design, development of motor filling techniques and formulation of the complete procedures for production. It has its own production capability for small scale runs where the procedures are proved.

Among current projects is a propellant improvement for the Skyflash missile which is referred to in the feature on the RAF's Quick Reaction Alert on pages 4 and 5 of this issue. Other topical projects are the Nuthatch motor for the new ALARM (Air Launched Anti-Radiation Missile) which has recently been chosen for the British inventory; the motor for the Army's Blowpipe anti-tank weapon; LAW-80 and of course boost motors for the Royal Navy's Seawolf and Sea Skua missiles.

In addition to military rockets, motors have also been developed for various high altitude space research rockets such as Skylark, Petrel and Skua.

Part and parcel of the establishment's work is assessment and extension of the service life of rocket motors and their ability to operate reliably and safely and perform their required roles. To achieve this there is an extensive range of test facilities which can simulate all manner of Service environments. Motors under test are stored in these various conditions, which include hot and cold climates, for specified periods before thorough examination to detect flaws and then subsequent firing. Even rough handling can be simulated to test how robust they are. Data collection from in service surveillance of rocket motors has established that most have a greater expectation of useful life than was previously predicted.

Comprehensive

In research on rocket motors no stone is left unturned and the work covers igniters and motor cases as well as actual propellants, with parallel programmes covering power cartridges and gas generators. Those engaged on the research operation do not perform their tasks in a cocooned or cloistered environment but are very cognisant of the real world. The sheer importance of research in laying foundation stones for the future is reflected in the continual feedback which is maintained from future product users.

On the liquid propellant side Westcott activities are focussed on development of packaged motors to meet current requirements and on establishment of design and performance criteria for improved motors to meet coming generation guided weapon propulsion requirements.

In addition to R & D the

establishment has production facilities which enable liquid propellant motors to be filled and sealed so that the end user can store them ready for immediate use. This avoids the cost, delay and messy operation of pre-launch filling and therefore is an attractive proposition in military circles.

The liquid fuel is a combination of red fuming nitric acid and a blend of amines. The ability of the packaged motors to withstand shock, vibration and extremes of temperature has been proven, but bearing in mind the rugged environment of military service sensitive detection equipment has been developed to give early warning in the remote possibility of leakage.

So comprehensive are the facilities at Westcott that a rocket motor can be taken from a paper study all the way through to actual production on the same site. However, production is con-

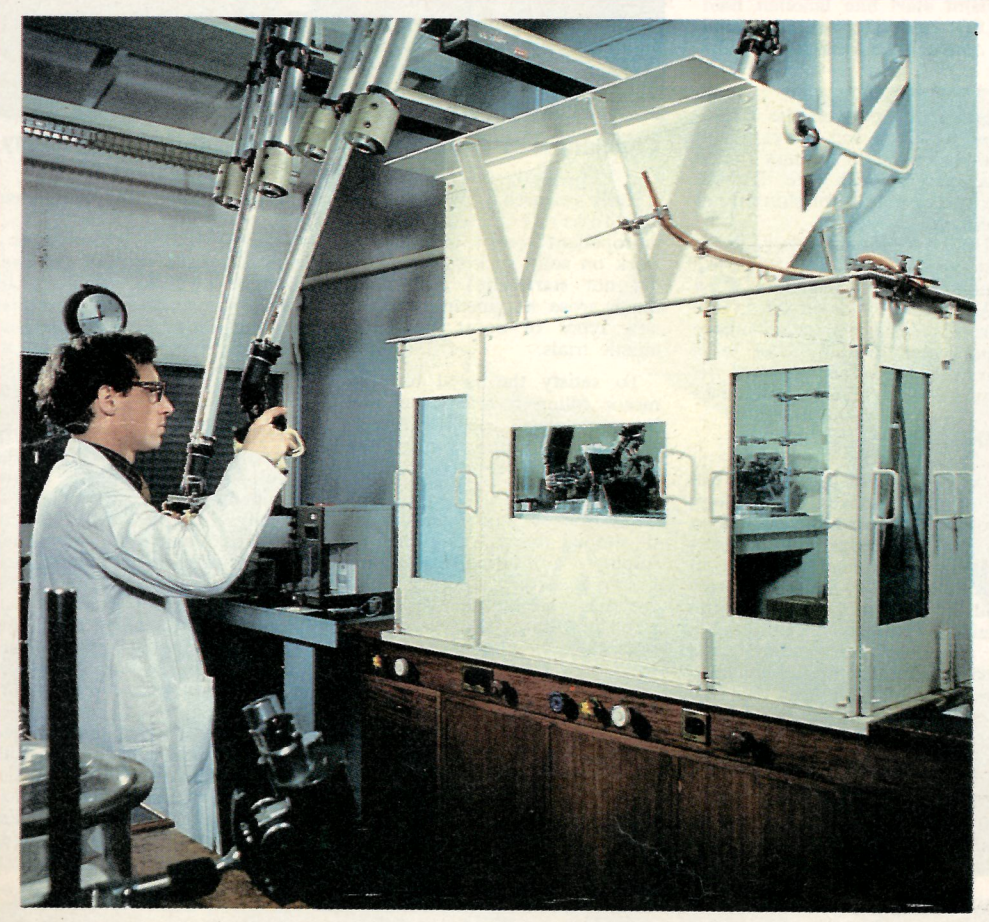
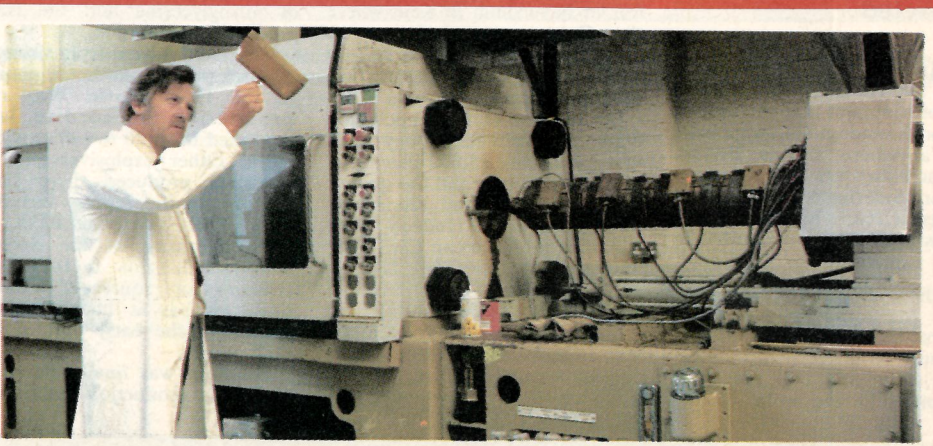
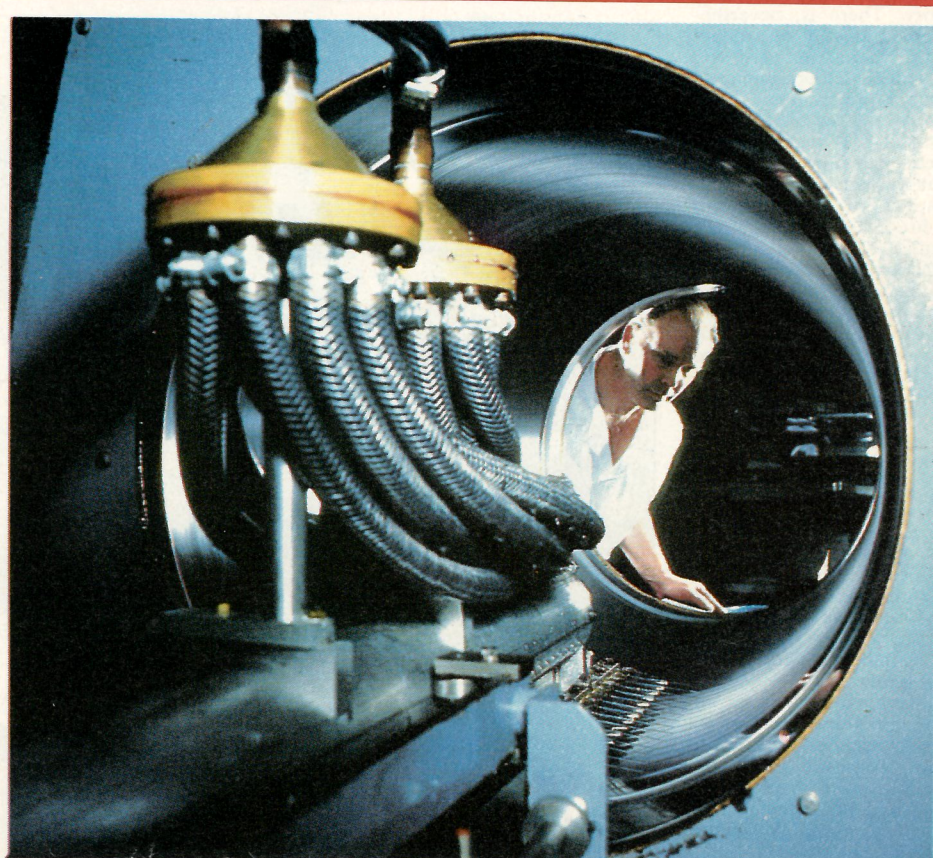
● TO PAGE 8

Above right: Preparation of aligned short fibre mats at Waltham Abbey where much research is carried out on a variety of plastics and composite materials

Right: Preparing apparatus for solid propellant gas analysis at Waltham Abbey

Below right: Dr Dave Simms carries out an examination in Waltham Abbey's plastics materials testing section

Below: Remote preparation of sensitive primary explosives using a master slave unit, at Waltham Abbey



Research and Development at PERME

● FROM PAGE 7

fined to bringing to fruition the results of a developed project for proving and testing before large scale manufacture goes ahead at the factory. There is, nevertheless, a limited amount of production work where runs are too small to be included economically in a factory's programme.

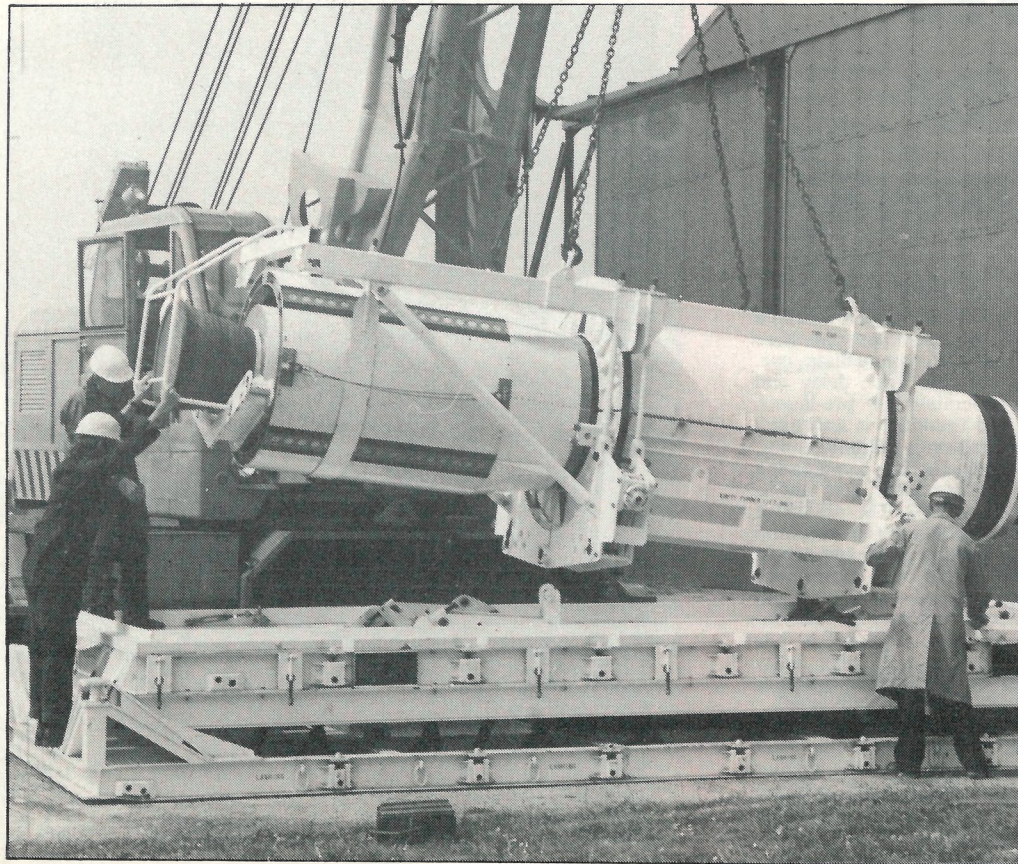
An important factor at Westcott is its full-scale testing facilities which enable rocket motors to be put through every conceivable aspect of scrutiny and actually fired.

Naturally all Westcott's operations require the support of complex and advanced equipment and the site boasts sophisticated instrumentation as well as on-line computerised data acquisition and analysis. Non-destructive inspection is vital in the production of rocket motors and therefore the modern techniques employed include radiography, ultrasonics and holography.

Turning now to Waltham Abbey, the speciality here is research, development and production process formulation of both gun and rocket propellants, initiatory explosives and certain plastics and rubber components used in conjunction with propellants and explosives.

Here again research is an immensely important area which responds to new Service requirements for weaponry in an ongoing quest for formulations of explosives and propellants which will meet the most demanding specifications.

Development of formulations for specific products follows through and includes establishment of processes for their production. In conjunction with this research into and development of actual equipment to be used in production. Some items of plant are actually designed at the establishment while others are modified and adapted from existing industrial machinery.



Above: preparing a rocket motor for measurement of exhaust plume structure on the special test firing tower at Westcott

Left: Lifting Stonechat, the biggest rocket motor to have been made at Westcott

As at Westcott there is at Waltham Abbey great emphasis on the safety factor of handling and storing propellants as well as evaluation of their serviceable life expectancy in a very wide range of environmental storage and usage conditions.

A field in which Waltham Abbey is heavily engaged is polymer research which explores

the kinetics of the formation and degradation of polymeric materials. Here the quest is for a continually increasing understanding of the long term physical and chemical behaviour of explosives and propellants. All the analytical work carried out here is supported by such techniques as chromatography, mass spectrometry, nuclear magnetic

resonance, X-ray crystallography and optical spectroscopy.

Both sites are fully equipped also with design offices and well appointed engineering workshops. In all PERME is an advanced, self-sufficient facility that employs the highest level of scientific capability to maintain Britain's impetus in the field of propellants and rocket motors.

The wartime airfield and the centuries-old gunpowder mill

The history of both PERME sites makes interesting reading, covering as it does a number of milestones in rocketry and gun propellants. By far the older of the two is Waltham Abbey and while its very early days are somewhat clouded in conjecture it is clear that gunpowder was being produced there in 1561. In the State Papers for that year is a letter to one John Tamworth of Waltham Abbey concerning a contract for the supply of saltpetre and sulphur.

Converted

A hundred years later the local vicar, Dr Thomas Fuller made a written comment that the mills in his parish made more gunpowder than anywhere else in Britain. The activities on the site were further underlined in the parish register of 1665 which records the burials of two workmen killed by a mill explosion.

In those days the powder mills were horse-driven but their owners, the Walton family, subsequently converted them to water power. It was in 1787 that John Walton sold the mills to the

Government for the princely sum of £10,000 and a major part in this transaction was played by Lieutenant-General Sir William Congreve whose programme of improvements there was furthered by his son William who is best known for his development of the rocket for military purposes.

Napoleonic

Although Waltham Mills laid claim to being the oldest gunpowder manufacturing plant, the oldest Royal Gunpowder Factory was at Faversham in Kent where the Government took over a privately owned powder mill in 1767. Faversham remained in production until 1934.

By the time of the Napoleonic Wars the Waltham Abbey mills were producing 25,000 barrels of gunpowder a year and the quality of the powder was recognised around the world. Indeed, both sides in the American Civil War drew on the experience and expertise of the factory. The United States Ordnance Manual of 1862 actually made mention of the fact that nobody could make better powder than the British.

Gunpowder was the sole pro-

duct of Waltham Abbey for several hundred years until the second half of the 19th Century when the manufacture of other explosives began.

In 1872 a plant was established there for the production of gun-cotton but it was soon found to be inadequate. As a result the first land on the South Site was acquired for a new gun-cotton factory in 1885. Under the presidency of Sir Frederick Abel in 1891 the newly-appointed Explosives Committee took a decision which resulted in the erection of further plant for the manufacture of nitroglycerine and the first production of cordite.

The factory went from strength to strength and at the beginning of the First World War the production of cordite was increased from 26 to 140 tons per week. Other explosives and ingredients produced there since the turn of the century included tetryl, TNT, picrite and RDX. At the beginning of the Second World War this factory was Britain's sole source of production, just as it had been for cordite in the early part of the First War.

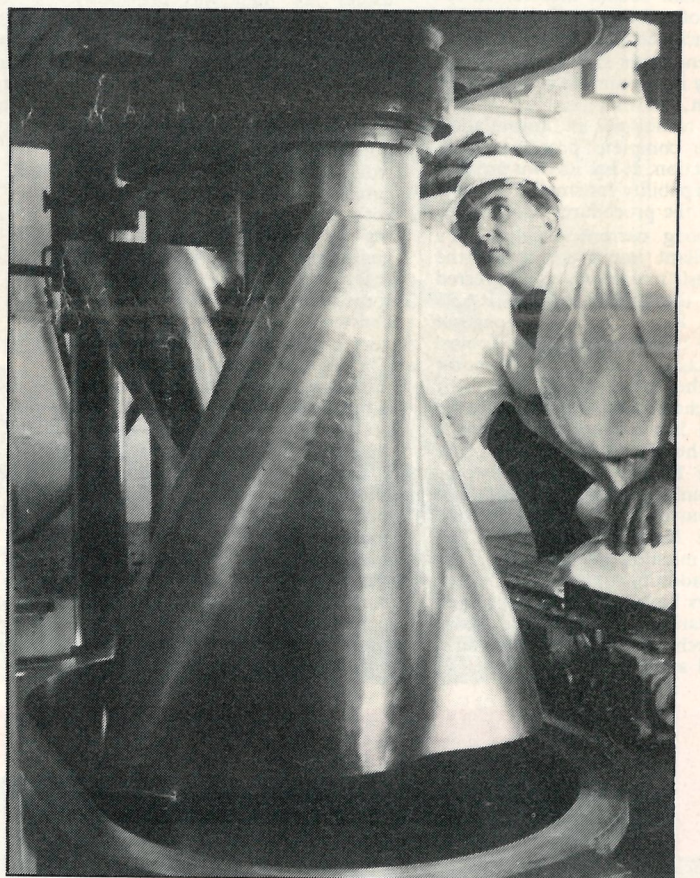
Waltham was finally closed in 1945 as a production centre and

subsequently became the Explosives Research and Development Establishment. In January 1973 it was merged with the Rocket Propulsion Establishment at Westcott.

Unlike Waltham Abbey, Westcott was never a production centre. Instead it began life as an RAF station and served in the Second World War as a bomber Operational Training Unit — in fact its runways and many of the features of an airfield still exist.

Rocketry

At the end of the war British interests in rocket technology took a leap forward, spurred on by the knowledge and progress that Germany had achieved in this field. In 1946 Sir Alwyn Crow and Sir William Cook set up the Guided Projectile Establishment at Westcott for research and development in ground-launched guided missiles. A year later the establishment became the Rocket Propulsion Department of the Royal Aircraft Establishment with its field of interest clearly defined and limited to propulsion only. Work on other aspects was transferred to the RAE's Guided Weapons Department.



Checking over propellant mixing plant at Waltham Abbey

Early research at Westcott was concentrated on liquid bipropellant rocket engines and work on solid rocket propellants did not start until 1949 when there arose an urgent need for new types of boost motor for missile trials.

To satisfy the need for new motor filling techniques created by new plastic propellants an experimental filling factory was built and this was completed in 1952.

As rocket motor technology developed during the Fifties the importance of supporting research grew accordingly and so new facilities were built at Westcott to accommodate this aspect of operations. In this era the establishment was engaged on a number of important projects some of which became household names. One example was the propulsion unit of the Blue Streak ballistic missile which required facilities capable of handling thrusts greater than any so far encountered. A special test bed was prepared and between 1958 and

1960 more than 500 firings had been made.

Blue Streak was cancelled as a ballistic missile in 1960 but was given a new lease of life in its development as the launch vehicle for the Europe 1 rocket and Westcott continued work on its RZ engines.

Another significant contribution was made in support of Britain's Upper Atmosphere Research programme with the development, in 1955/56, of the 17-foot long Raven motor for the Skylark Upper Atmosphere Research Vehicle which reached altitudes of more than 100 miles.

Westcott's link with the Royal Aircraft Establishment was severed in 1958 when it became the Rocket Propulsion Establishment. Just over a decade later, in 1971, it became the responsibility of the Procurement Executive of the Ministry of Defence and then in 1973 came the merger with ERDE Waltham Abbey. It was in 1977 that ERDE/RPE was renamed as the Propellants, Explosives and Rocket Motor Establishment.

Combined service of 195 years honoured in ISM ceremonies

REVIEWING recent Imperial Service Medal awards we learn that four members of ROF Bishopton's personnel have been honoured for their long service to the organisation.

Peter McCabe, who retired last year, had joined the factory in 1951 and spent all but three months of his time there in the Guncotton Section. The short three-month break was at the beginning of his career when he worked in the laundry.

James Pringle Percy, who also retired last year, spent 34 years at the factory. He joined in August 1949 after having served in the Royal Scots Fusiliers, and his first job was as a process labourer in the Nitroglycerine Section. On retirement he was working as a craft auxiliary.

Francis McColl is an Examiner II with 32 years' service. For 20 years he was engaged on a variety of jobs in the Cordite Section, then came three years on Rocket Propellant before he moved to his present area of operation — the Quality Department — in 1975.

Finally, Henry Brady has the distinction of having joined ROF Bishopton twice! The first occasion was in 1949 when he took up a job as a process worker, but he left again in 1951 to become an engineer's mate at a shipyard. However, the call of

Bishopton lured him yet again the following year and he stayed until his retirement last year. For his last 19 years he served as a messenger in Administration after having spent three years as a process worker on Blending Section and eight years as a glazier's mate.

ISM's have also been presented to three Birtley employees who have notched up a combined 96 years' service.

Lawrence Iredale who retired last year after 29 years had served his apprenticeship at Vickers before his military service in the Royal Signals. He joined Birtley in 1951 but unfortunately was made redundant in 1956. Three years later, however, he returned and began work in the Medium Shell Shop where he remained for all but six months of his time.

John Martin, BEM, spent 41 years at the factory as a telephonist and it is often said that he knows more about the switchboard than any telephone engineer. Known to friends and colleagues as Jack, he has perfected the skill of communication with others and those who know him speak of his kindness and constant readiness to be helpful. Now he has retired he will have more time to devote to his musical interests and, having bought a new electronic organ, he will undoubtedly take the opportunity to entertain others with the

same enthusiasm that he put into his work at the factory.

Ambrose Atherton, better known as Tommy, joined the factory in 1953 and served for 26 years. He was made redundant in 1956 but rejoined in 1959. It was in 1965 that he joined the factory's staff. A keen traveller, Tommy will have more time to devote to his enjoyment now that he also is retired.

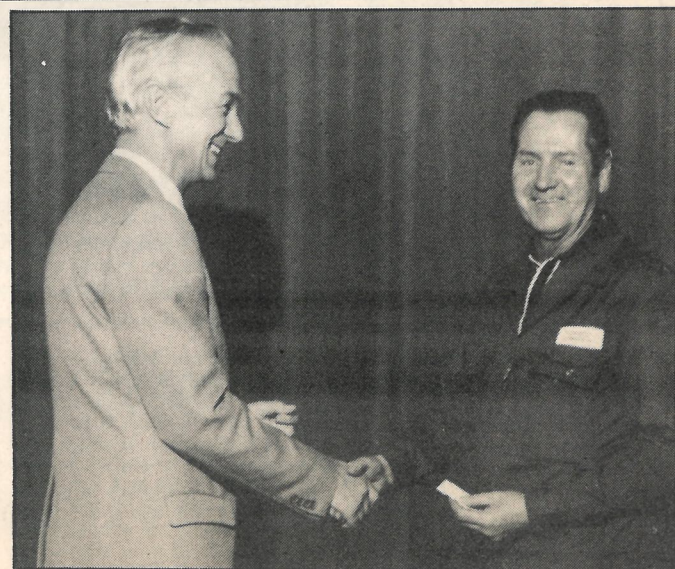
Well done the MT drivers of ROF Bishopton whose consistent high standards have earned them RoSPA awards ranging from an Exemption Certificate and New Entrant badge for John Weir, to a 21-year Safe Driving lapel badge for Alec Young.

The awards were presented by

Proud record as drivers receive RoSPA awards



Factory Director John Quillin and the top photograph shows the recipients with Bill Coyle, AM / Transport seated extreme left and Dave Milliken, FM / Transport, seated extreme right. Pictured right is Alec Young receiving his 21-year badge from Mr Quillin.



ROF Bishopton Director John Quillin (centre) with ISM recipients (left to right): Henry Brady, Francis McColl, Peter McCabe, James Percy. Seated are Mrs Brady (left) and Mrs McCabe



ROF Birtley director John O'Donovan with Lawrence Iredale, Jack Martin and Ambrose (Tommy) Atherton to whom he had presented ISMs. Also pictured are the recipients' wives

Sixth win in a row slips just out of reach

RUGBY

PROCUREMENT EXECUTIVE 10 INLAND REVENUE 16

AMID scenes of tension and disappointment the MOD Procurement Executive side failed to win the Civil Service Rugby Cup and so, by six points, were denied a sixth consecutive victory.

It was especially heartbreaking for the ROF Glascoed contingent as this was their last appearance in the competition because of the ROF's forthcoming change of status.

One consolation — it has been a fantastic achievement to have reached the final on the last six occasions and to have shared the victors' rewards on no less than five.

But let us take no credit from this year's winners, Inland Revenue. They went into the game as underdogs and their plan of denying the PE backs any possession, which was reminiscent of the Pontypool eight at their best, worked wonders and the likes of Paul Turner and Nigel Haines were unable to show their true potential.

It is perhaps fortunate for rugby that one side does not dominate all the major trophies as the game would become too predictable. A classical example of this recently was Scotland winning the Triple Crown, the first time since 1938, and the Grand Slam — an achievement last gained in 1925.

A special mention must be made of the ROF Glascoed members. No fewer than 30 players have donned the PE jersey in the last six seasons and this in itself is a tremendous achievement. What other department can claim such success?

From the talents of Paul Turner, a present member of the Welsh Rugby Squad to the honest endeavour of Smudger Smith, known to the rugby fraternity as

one of the Donkeys, but nevertheless important a member of the team as the next. Well done, Glascoed, let's hope that we can challenge the best of MOD next season under our own steam.

A fitting note to finish with would be a brief pen picture of all who have represented PE this season.

Nigel Haines (Pontypool Unt.). Played last season for P E either at full back or wing. A versatile player in either position and scorer of a number of points.

Alex McGhee (Cwmbran). First season with PE for this talented centre who was unfortunate to miss the final because of a broken nose.

Charle Davies (Brynmawr). First season in Rugby for a man whose main interest is athletics. He is a wing three-quarter who performed more than adequately when given his chance.

Paul Turner (Newbridge and Welsh squad member). Played for last six seasons and has been a top points scorer in each. A talented, elusive player who enjoys the free-running game. If he could improve his defence qualities he could be sure of a bright future.

Leighton Powell (Newbridge). A scrum-half for whom this was the first season with PE. A competent, aggressive player who gives his outside-half a good, quick service.

Lee Jones (Abertillery). This hooker has notched up six seasons with PE and has also represented British Civil Service. Aggressive player with good all-round ability.

Smudger Smith (Girllings). Another who can boast six seasons with PE. This prop is a good, solid scrummager who never moans and groans but gets on with the task.

Hwyel Hopkins (Talywain). Similarly six seasons with P E but he has never realised his true potential. Brilliant two-handed

jumper on his day, but lacks motivation.

Paul Green (Pontypool United). A flanker in his first season with PE. Aggressive player who thrives on physical contact. Good defensive player with ability to attack.

Steve Lane (Abertillery). He played as a Number Eight in this his sixth season with PE. Talented, all-round player who likes to run and handle the ball. Could have made a big impact on Welsh rugby if more dedicated.

John Appleby (Cwmbran). Second season with PE for this flanker who struggled to gain a regular place initially, but when given the opportunity never looked back. Strong physical player.

Tony Bates (Newbridge). Prop or lock. Six seasons with PE. Suffered an illness that looked like finishing his rugby career, but came back as good as ever. Able to play well in either position.

Wayne Mogford (Blaenavon). Another Number Eight who has three seasons with PE to his credit. Not a regular in the side, but when given a chance has never let the team down.

Steve Clark (Risca). A scrum-half who has played for PE through four seasons. Good, strong, aggressive player who has failed to command a regular first team place this season.

Graham Reynolds (ICI). Three seasons with PE. Strong, aggressive player but, due to abundance of flankers, unable to command regular position.

Finally, Eddie Jones (selector). The man everyone looks to for guidance. In his own mild manner he gives the pre-match talk, somewhat reminiscent of the great Ray Prosser of Pontypool. He is also there to give the occasional massage when players are injured. His knowledge will surely be missed by PE.

A.O.

ENGINEERING IN MINIATURE

HOW many times have you been faced with the task of repairing or making something that really requires precision engineering equipment, but in miniature? Now there is an answer to all these problems in the Unimat 1 — an amazing and versatile machine construction kit which is becoming more widely available in Britain this year.

In fact the Unimat 1 is not just one machine but three. It comprises a number of basic modules which can be assembled in the configuration to suit a particular operation — as a lathe, a vertical drilling machine or as a horizontal or vertical milling machine. Drive is provided by a six-volt motor which can operate on battery power or be hooked up to an appropriate transformer. And the additional bonus is the fact that the equipment can be used to work wood, soft metal and plastic.

Although this is miniaturised engineering the dimensions give plenty of scope. For instance, in its lathe configuration it gives a distance between centres of 135mm with a 25mm centre height and cross slide travel of 30mm while longitudinal slide travel is 50mm. Set up as a drilling machine it has a table size (cross slide) of 85mm x 50mm and a distance capability from cross slide to spindle nose between 0 and 135mm. Stroke is 25mm. As a milling machine it offers in the travel of its slides 50mm longitudinal and 30mm cross.

A special drilling table is available from a range of accessories which includes a dividing attachment, a tool grinder assembly (complete with grinding wheel), sanding disc and papers, and a four-jaw lathe chuck. The kit actually includes a three-jaw chuck.

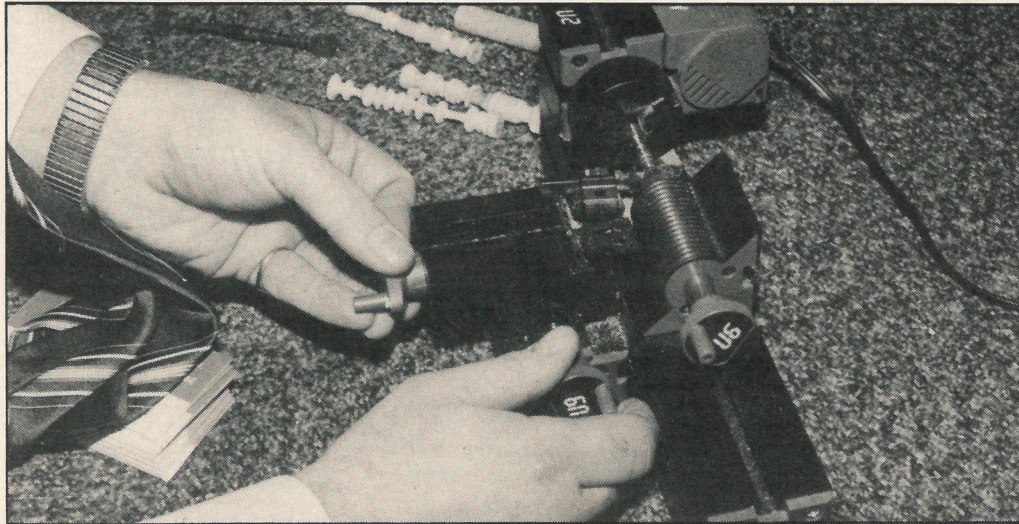
Another useful accessory is a jig-saw attachment which includes a saw table and two blades. Additional blades are available separately.

It is even possible to cut gears on the Unimat 1 and a gear milling head complete with two cutters is listed among the accessories with two special cutters as an additional order item.

This remarkable equipment kit is manufactured by the Austrian firm Emco-Maier & Company and sole UK distributors are E.M.E. Ltd. of NW London.

It has a fine pedigree coming as it does from a company well known for their range of industrial plant which includes computerised numerically con-

Unimat gives you three machines in one system



The Unimat 1 assembled in its lathe configuration showing the intricacy of work which it is possible to carry out in wood, plastic and metal. The standard three-jaw chuck is deployed in this picture but a four-jaw version is available from a range of very useful accessories

trolled machines. EME are wisely seeking to develop Unimat's sales potential by reaching the toy and model trade outlets, and as part of this policy they displayed and demonstrated it at the British Toy and Hobby Fair at Earls Court earlier this year.

It is not a toy, of course, but it has immense value in introducing youngsters to basic engineering and woodworking skills and encouraging them to take up and develop handicraft interests. Naturally its use is not confined to that age group — it is an invaluable system for adults and has countless uses in support of a wide range of hobbies as well as household repairs.

It is not uncommon to have to abort an attempt at repairing a product merely because a small part is damaged or worn and a replacement cannot be obtained. The owner of a Unimat 1 can give that unserviceable product a new lease of life by making his own replacement part — a boon when it comes to repairing the kids' toys which seem to demand attention with irritating regularity!

Of the hobby uses modelmaking is probably the most obvious and this equipment opens up possibilities for some very ambitious projects whether

they be in static display or working models. Indeed, the radio control enthusiast would find it indispensable, and the fact that gear-cutting is possible opens up untold potential.

There are many other hobbies which involve handicraft skills and would benefit, and there are probably a number of other pursuits, which although less obvious, could well make use of this facility.

One attractive possibility that presents itself is actually earning some spare time cash with the Unimat by producing items for sale. These could range from doll's house furniture to ornaments or costume jewellery.

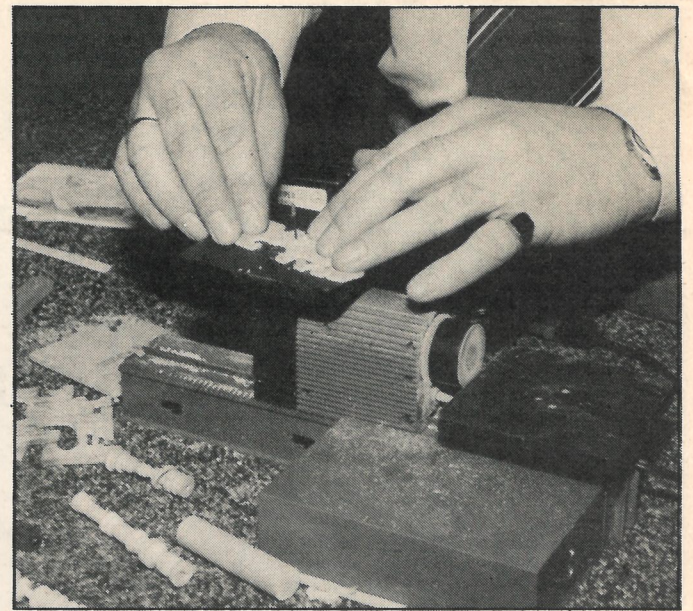
The Unimat 1 is lightweight, the modules being moulded in tough plastic which compensates for the weight of its metal parts, but it does not have to be bolted to the workbench — it remains fully stable when in operation. Safety is incorporated in its design so that if a finger should get in the way of moving parts they will stop turning without even causing a scratch.

Unimat 1 is priced at £80 retail (£92 including VAT) which, although a large single outlay, is really quite a bargain considering it represents three separate

machines — not to mention the economy it could achieve if used in a way which taps its full potential. A service parts set is also available at £3.91 (inc VAT).

The baby brother of this system is the Playmat which similarly comprises modules enable it to be assembled as a lathe, jig saw or drilling machine. It is confined to use with wood and plastics and is aimed at the younger child as an educational system with which he (or she) can learn the basic woodworking skills and develop them by making anything from toys and models to serious items such as chess sets. Again it can be operated by a six-volt battery or via a transformer connected to the mains and has built-in safety features.

Playmat retails at £48.30 (inc VAT) and its service parts set is priced at £3.80 (inc VAT). For owners who do not already have an appropriate transformer Emco produce one which is compatible with both products and is available at £25.30.



Playmat is the junior brother of the Unimat 1 and is pictured here in its jig-saw configuration

A farewell to remember ...



Lawry Farrell will certainly remember the day he retired from ROF Birtley because colleagues arranged for their message of good luck to be delivered by a scantily-clad "Kissogram" girl! Lawry joined Birtley in 1967 but was previously in Government service from 1952 when he came out of the RAF

Redundancy scheme and levels of compensation

Here is the text of the paper sent to the trade unions by the Ministry of Defence on March 26, 1984:

The Consultative Document on the Future of the ROFs issued in October, 1982, indicated in paragraph 15 the requirement for compensation for future redundancy for employees who have transferred to be the subject of company provisions after vesting day. At present Civil Service redundancy compensation arrangements are contained in the PCSPS. Employees who are transferred out of the Civil Service cannot remain in that pension scheme and will therefore cease to be subject to the provisions it contains. The purpose of this letter is to provide the basis for discussion of the main features of a redundancy compensation scheme which would apply after the ROFs move to Companies Act Status. The scheme will apply to persons transferred to the Company from the Civil Service and to employees recruited after

vesting day. For ease of reference these are referred to as transferees and new entrants respectively. This letter sets out proposals for procedures to be applied before declaring a redundancy, the determination of the field of redundancy, the reckoning of service, the rates of compensation and the period of notice.

The present collective agreements on redundancy, which now appear at Chapter 19 of the MOD Manual 11 and Chapter 15 of MOD Manual 9, will need to change where they contain provisions that cannot be applied outside the context of the Civil Service or where changes may be necessary to accord with the coming change in structure and status of the ROFs.

Special Arrangements for Transferees

In accordance with ministerial assurances, transferees (including those recruited as civil servants) will retain entitlement to redundancy compensation assessed in accordance with current or future Civil Service rules, and based on

past service with the Civil Service: after vesting day, service with the Company will be taken into account.

Action Before Declaration of Redundancy

The company will make every effort to minimise compulsory redundancy. Where it is clear after a review of current and future workloads that a surplus of employees is unavoidable at any location the following possibilities will be explored, not necessarily in order of priority:

- Voluntary transfer of employees to suitable vacancies elsewhere.
- The consideration of voluntary early retirement in the location where the redundancy is likely to arise.
- The possibility of retaining employees in their existing grade for a limited period against possible future vacancies in the location.
- A review of retirement practices.
- Re-training of staff for vacancies in other skill areas.

Fields of Redundancy

If, despite the Company's best efforts to absorb surplus employees, it becomes necessary to declare a redundancy, we propose, subject to discussions with the Trade Unions, that the field of redundancy will cover all members of the grades concerned in the location. Employees will be selected in accordance with revised collective agreements in which the Company will reserve the right to retain employees whose skills, qualifications or experience are of particular value.

Reckoning of Service

Reckonable service for transferees will include reckonable service in the Civil Service prior to transfer and subsequent service with the Company. Service for new entrants will reckon from the date of appointment to the Company.

Rates of Compensation. New Entrants Post Vesting Day

Employees under age 60 with a minimum of one year's service will receive levels of compensation as follows:

- Each year of service between age 18 and 21 — 1 week's basic pay.
- Each year of service between age 22 and 40 inclusive — 2 weeks' basic pay.
- Each year of service between age 41 and 60 inclusive — 3 weeks' basic pay.

Employees aged 50 or over at the date of redundancy, and having the necessary amount of qualifying service for a pension, may elect to retire early with pension assessed in accordance with the rules of the New Entrants Pension Scheme. In these circumstances, the redundancy lump payment would be correspondingly reduced. For employees aged 57 or over at the date they are made redundant the compensation will be reduced by one-sixth for each half year, or part of half year, of service completed between the ages of 57 and 60.

Rates of Compensation. Transferees

Transferees will also receive a lump sum payment calculated on

the basis of the rates set out in para 7, service with the Company reckoning from Vesting Day onwards. They will also receive the difference between that and their entitlement based on the application of Civil Service rules to the aggregated periods of service.

Periods of Notice of Redundancy

Transferees who are currently entitled to 6 months notice, or more, will retain that right. New entrants' notice will be not less than 3 months. These notice periods will not apply to employees recruited on period appointments or on a casual basis.

The Company will reserve the right to amend the rates of compensation as set out above in the light of the Company's financial position, or of particular considerations that may apply at any time. Any changes that the Company may wish to make to the collective agreements will be introduced only after consultation with the TU interests involved. Any such changes would not affect the total entitlement of transferees.

★ MODELSCENE ★ MODELSCENE ★ MODELSCENE ★

Continuing the theme of guidance for beginners (begun in the March issue) we now turn our attention to the actual construction of models from plastic kits.

Essential to success in this hobby is an understanding of the properties of plastics and what you can and cannot do with them. Kit mouldings are made from high impact polystyrene. Unmodified polystyrene is a hard, brittle plastic and is to be found in kits as the transparent mouldings for cockpit canopies and vehicle windows etc, but it is unsuitable for the other parts of a kit. To overcome the brittleness a measured amount of rubber is added to the basic polystyrene to soften it and introduce resilience and some flexibility and thereby modify it into high impact material.

By the way, don't confuse this plastic with the stuff ceiling tiles and some protective packing is made of. That is a foamed material correctly known as expanded polystyrene. It is in the form of polystyrene beads which, because they have been chemically treated, react with heat by expanding and fusing together into a single entity which takes the shape of the mould in which it is being formed.

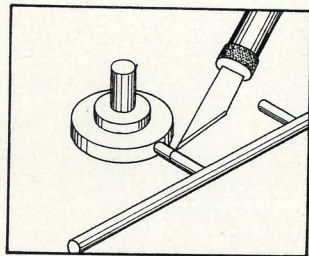
Expanded polystyrene has a useful application in modelmaking, particularly for producing hills and other terrain features. It can be cut with a "hot wire" or very sharp scalpel and is easily carved. Never use polystyrene cement to bond it as this will cause it to melt — instead use white PVA glue.

A plastic kit is made in a two-part metal mould. When these two halves have been locked together molten styrene is injected under pressure. It is delivered to the individual component voids via a series of small diameter tunnels and it is these which create the frame known as the "sprue" to which the parts are attached. Depending on the size or complexity of the model a kit will often comprise a number of sprues.

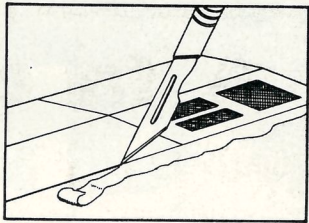
Injection-moulded kits are the most common but there are several specialist makes of vacuum-formed kits on the market. In these the parts have to be cut from a single sheet before assembly begins and they frequently require extensive scratchbuilding techniques to prepare them for construction. As these are for the advanced modelmaker we shall postpone consideration of them until a later issue.

Back to injection-moulded kits and the first stages of assembly. It is vital to follow the sequences laid down in the kit's instruction sheet and as you do so it will be necessary to remove individual parts from the sprue only as you need them. Clearing an entire sprue can lead to problems later when you are faced with the

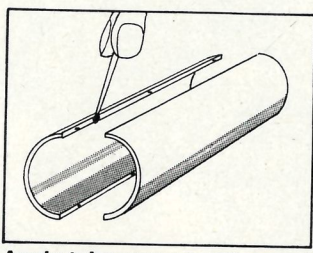
BEGINNERS' GUIDE, PART 2 Assembly and getting to know the materials



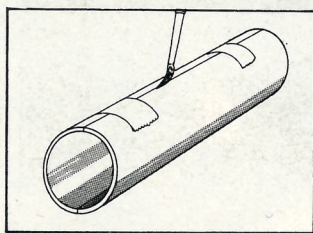
Leave a stub of waste plastic on each part when detaching from sprue and clean it off afterwards



Trim off any flash with a sharp scalpel and similarly clean off raised moulding lines



Apply tube cement with a cocktail stick to the faces of one part only and spread it evenly afterwards



Dry fitting of parts using Sellotape to secure in position as an aid to brushing liquid cement along the joint lines

dilemma of identifying components that have been detached from their reference numbers which are moulded on small "flags" on the sprue.

Removal of parts should be done carefully with a heavier duty craft knife rather than a scalpel whose blade can easily break when trying to cut through thick plastic. You will often find small clippers useful also for this operation. When detaching parts be generous by leaving a small stump on each, thereby avoiding damage to the parts. The stumps can be cleaned off with a scalpel afterwards and finished with fine wet and dry paper.

A familiar sight on most kit parts is a fine raised moulding line created by the molten styrene having seeped into the joint between the mould halves. In extreme cases where a mould has been used many times and has sustained wear the moulding line develops into a thin film sometimes as much as an eighth of an inch wide. This is known as "flash" and is the result of the plastic having crept even further into the joint line. It can be shaved off with a scalpel just as moulding lines should be. Cleaning up can be achieved with needle files followed by fine wet and dry.

Only the smallest parts are moulded as solid pieces while the larger ones are usually produced as shells. This is not merely for economy of materials but because the plastic will shrink somewhat

as it cools and large solid items can suffer surface collapse which manifests itself as dents or depressions. Such collapses are encountered from time to time on small solid pieces and so as not to spoil a good model these should be filled. Several model fillers are to be found on the market but I prefer to use cellulose putty which can be obtained at most garages and motor accessory shops.

Rough up the surface of the dent and if it is particularly deep drill several small holes with a fine drill bit. These techniques will provide a good key for the filler which should be applied in thin layers allowing each to dry before applying the next. Some form of small spatula should be used for this application and for getting into the tightest corners a blunt but well polished scalpel blade is ideal.

Always leave the filler proud and then sand with wet and dry paper (used wet) once it has set hard. Use progressively fine grades until the surface is smooth and of the correct contour. Cellulose putty is easy to apply and doesn't harm the styrene. Its edges can be blended into the existing plastic so that after sanding no trace of a ridge is present. It sets hard and readily accepts model enamel paint.

While on the subject of cleaning up, some kit parts feature small, flat-topped discs which often stand just proud of the surface. These are caused at the moulding stage by release pins

which assist removal of mouldings from the mould. They are necessary and unavoidable but they should not feature in the completed model so a little shaving off and sanding is required.

Often, to ensure perfect location of parts, mating surfaces have pins and corresponding holes. Both may need a little preparation to achieve a good fit and while the pins are easily dealt with, albeit carefully, the holes may benefit from the attention of a small drill bit or the point of a round needle file.

A useful tip when assembling parts is to dry-fit them before using cement as a poor fit can be remedied so much more easily at this stage.

Cementing calls for extreme care, especially when using the tube-type. As advised in the last issue, squeeze a small drop on to a piece of cardboard and apply it to the workpiece with a cocktail stick. The tube cement is a solution of polystyrene in chlorobenzene or acetone and can only be used on styrene itself. It achieves a bond by actually melting the mating surfaces and creating a weld when they are brought together. This underlines the importance of using it sparingly as excessive amounts can seriously damage surfaces, especially when it oozes out from a joint when two parts are pressed together.

As it is not an impact adhesive it allows parts to be slid around until a perfect alignment is achieved, providing you don't overdo it. It should be applied to the face of one part only and as an even coating. Once the joint is made moderate pressure must be maintained until it has set. This is where such aids as rubber bands, Sellotape or masking tape can be brought into use so as to leave the hands free to get on with the next task.

Tube cement is especially suitable for joints that demand great structural strength and because it is a messy substance this is the use to which I tend to restrict it. For all other cementing operations I prefer to use the liquid type which is solvent without the addition of polystyrene (unlike the tube variety). It has the consistency of water and therefore flows easily, so it can be used to bond parts that have already been brought together because it runs into a joint by capillary action.

Indeed, some parts do present problems in cementing. Because of its very length a fuselage is one of the worst assemblies. By the time you have finished applying

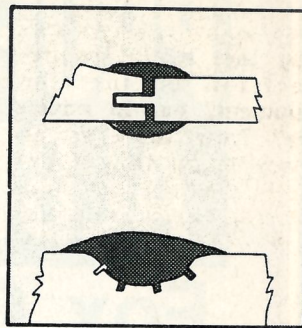
cement it has dried or evaporated at the end where you started. Far better, then, to dry fit the halves and secure them together with Sellotape. Apply the liquid cement with a small paint brush along the joint line where it is not covered by the tape. When these sections have set, remove the tape and repeat the operation along the remaining sections.

By their very nature some joints are left with unsightly gaps. A common example is where an aircraft wing joins the fuselage — if the underside joint is close fitting the upper side does not necessarily meet. This has no effect on the strength of the bond as this is assisted by locating tabs. Such gaps in joints need to be filled and here again the cellulose putty comes into its own. Home made filler is another possibility and can be produced by dissolving pieces of scrap styrene in liquid cement or methyl ethyl ketone (MEK). Cut up sprue is a prime source of such scrap and the small pieces should be left in the solvent in a small, tightly secured jar overnight. The result is a plastic paste which can be applied just like filler and will dry hard once exposed to the air. Its consistency can be adjusted to requirements by altering the ratio of plastic to solvent.

Incidentally, another version of liquid cement which was not mentioned in the last issue is Plastic-Weld. Not only does it bond polystyrene but also acrylic and ABS plastic. ABS stands for Acrylonitrile Styrene — the material from which a special range of moulded components under the trademark Plastruct are made. These items, produced for the scratchbuilder, including angle strip, square, round and rectangular tubing and miniature beams such as H-shaped girders.

Some younger modellers soon lose interest in the pastime because, having built a model they find it difficult to paint individual parts and some are totally inaccessible. In fact the only way to achieve satisfactory results is to paint as you go. All sub-assemblies and many individual parts need to be painted during the construction stage — items such as vehicle engines and transmission, plus their compartments, interiors, aircraft cockpits (including all parts and detail), undercarriage legs and bays, vehicle suspension members, exterior parts such as the equipment with which armoured fighting vehicles are festooned and the pylons, missiles and pods which go under aircraft wings and fuselages. We shall look at preparation and paint finishing in greater detail in the next issue.

During construction it is essential to give due consideration to the weight and balance of a model. If a tailwheel aircraft is exceptionally heavy at the nose it will need counterbalancing at the tail to ensure that it sits correctly. A quantity of Plasticine is very often sufficient for this purpose, but where space is limited a better



Poor joints require filling which should be left proud and then sanded when set (top). When filling dents and depressions scratch and drill surface to provide a key for filler (bottom)

weight for quantity ratio can be achieved by pressing lead shot into the Plasticine. Obviously this counterweight will have to be installed before bringing the fuselage halves together.

Similarly vehicles look rather silly if all four wheels do not touch the ground and again you may need to assist the distribution of weight. However, in conjunction with this it may be necessary to adjust the positions of suspension members and axles as their location points may not always be true. This is yet another example which underlines the importance of dry-fitting all components and sub-assemblies before cementing.

In becoming conversant with the properties of polystyrene it is essential to bear in mind that, like all plastics, this material can be affected seriously by heat so never be tempted to place a model over a radiator to dry cement or paint quickly. By the same token models should not be displayed on window sills where they will be in direct sunlight. The result would not only be faded paint but a serious case of warping!

From the safety point of view no modeller will be unaware of the hazardous nature of tools such as scalpels etc, but we do need to be reminded from time to time of the dangers inherent in the materials we use lest familiarity breed contempt. Instructions and warnings on paint and solvent containers should always be heeded. When using them the working area should be well ventilated because the fumes and vapours are dangerous in the wrong conditions. They are also inflammable but this is not the only reason why smoking should be avoided during their use. Some fumes can become lethal when inhaled through a burning cigarette!

Even while observing the safety rules it is a wise precaution when engaged on a long job using such substances to take frequent breaks for a breath of fresh air... and always replace paint lids and bottle caps when not in immediate use.

Stuart C. Finn

KITS TO WATCH FOR

If you are attracted by the prospect of building a diorama but do not feel inclined to do so from scratch then Eschi have a range of battle scenes in 1/72nd scale which are sure to tempt you.

Each kit is complete with figures, armoured vehicles and the litter of war such as tank traps. Also included, where appropriate are buildings and ruins, trees, telegraph poles etc as well as terrain features represented by a moulded base detailed according to the battle location, ie urban, jungle, desert, coastal etc.

This moulded base if of thin plastic and will need support. Most suitable suggestion is to turn the base upside down and fill with plaster of Paris. When this has set the entire unit can then be fixed to a baseboard.

Eschi kits, which are distributed in the UK by Humbrol, are renowned for their excellent detail of the finest quality and these dioramas are no exception. They provide a perfect foundation on

which to elaborate with some additional scratchbuilding and super-detailing, but are nevertheless ideal for the younger modeller who has not yet perfected these techniques for they are suitable for making up and displaying just as they are.

Naturally a high degree of skill and patience is required in painting the completed diorama and it is well worth taking a lot of time at this stage to achieve realistic effects.

Battles represented in this superb range are: Guadalcanal; Okinawa; Iwo-Jima (including the famous raising of the Stars and Stripes); Tunisia (sub-titled "British Revenge"); Operation Zitadelle — the tank battle; Saipan; the Japanese invasion of Singapore; Crimea — the siege of Sevastopol (featuring German and Soviet armour); Operation Barbarossa (the German invasion of Russia); Kasserine Pass; the battle for Berlin; Tarawa; an evocative scene representing a

point on the Siegfried Line; and jungle fighting in Burma.

Thoroughly recommended to aircraft modellers is the Airfix kit of the Grumman EA-6B Prowler. This four-seat aircraft packed with some of the most advanced electronic counter measures (ECM) equipment is a direct descendant of the A-6 Intruder two-seat strike aircraft and is powered by two Pratt and Whitney J52-408 jet engines. Part of its ECM payload is carried in four external pods which have windmill generators. It is said that these supply enough electrical power to light a fair sized city!

This Airfix model in 1/48th scale is well endowed with detail, although, disappointingly, the decal sheet does not provide cockpit instrumentation. To achieve this the modeller will have to embark on some research to check colours. Despite this omission Airfix have moulded instrument details on the respec-

tive parts and this certainly provides an ideal basis.

One aspect which requires attention plus a steady hand is that of panel lines which have been moulded as raised marks. These need to be cleaned off and then represented by a fair amount of fine engraving. Unless you possess a pyrograve instrument (a heated engraving needle) you will have to use a finely sharpened pin or needle mounted in a wooden handle or a pin vice, or alternatively the point of a new scalpel blade.

A striking feature of this kit is the transparent cockpit canopy parts which have been tinted — a praiseworthy note of realism which complements a basically good kit.

The Japanese company Tamiya are deservedly famous for their superb range of armoured fighting vehicles, selected items from which it is hoped to review in detail in future issues of PROFILE. But this same firm are also

responsible for a fine line in aircraft of which the 1/32nd scale F-14 Tomcat must surely be the piece de resistance.

I have selected from this range the 1/48th scale Harrier as a good example of the careful attention that this firm pay to detail. This model is of the GR1 and is not representative of the Harriers currently in service with the RAF because these are the GR3 version, distinguishable by their "snout" noses which incorporate the LRMTS (laser ranging and marked target seeker), and modified tail fins and tail cones accommodating passive warning radar sensors. However, the model can be converted easily to this standard with the support of suitable drawings.

Detail is very good, even if some rivets and panel lines are a little oversized and need reducing. Mouldings for the engine are provided so that the model can be exhibited with panels removed to simulate a servicing scene.

The nozzles which rotate to achieve the Harrier's unique vectored thrust have been provided with a mechanism that allows them to be moved in unison to suit any display situation of your choice.

As in many kits, the ejection seat is not truly representative and will therefore require modification, unless you decide to scratchbuild a fresh one. To achieve all the detail of a seat is not exactly easy for a manufacturer if he is aiming to keep the retail price at an acceptable level and in any case, the need to indulge in some extra work creates a much more interesting project for the enterprising modelmaker.

Decals provided include instrument panel detail and warning triangles for weapons pylons as well as those triangles which warn of the ejection seats. The range of national markings provides a choice between RAF, US Marines and Spanish Navy.

PROFILE ALBUM

Fox CVR

The combat vehicle reconnaissance version of the Fox was designed to meet the needs for a lightweight, compact vehicle capable of undertaking a wide variety of roles in addition to reconnaissance. The result of this is an extremely versatile vehicle which is admirably suited to tasks such as patrolling, escort and internal security duties.

Powered by a 4.2 litre six-cylinder Jaguar engine coupled to a Daimler epicyclic gearbox, it has an exceptionally high power/weight ratio and excellent cross-country characteristics.

Armament comprises the 30mm RARDEN cannon and a 7.62mm General Purpose Machine Gun mounted coaxially. Fox also has smoke dischargers and day and night optional night sighting and vision instruments. On the communications side a Clansman radio system provides a highly flexible integrated facility for both short and long range use in all theatres and environments.

Another valuable feature of this vehicle is its air transportability — three can be carried comfortably in a Hercules. For parachute dropping using specially developed equipment two can be carried. It also has a wide ranging climatic capability from

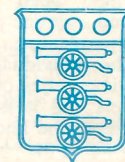


—25 degrees to +50 degrees Centigrade.

Fox requires a crew of three: commander, gunner and driver; has a typical battle weight of 6120 kg and a fuel capacity of just over 145 litres in tanks under

armour with an additional external stowage in two jerry cans of just over 38 litres. External dimensions are: length (with gun forward) 5.08 metres; width 2.13 metres; and height to top of cupola 1.98 metres.

The 4,235cc engine develops a maximum 190 brake horsepower at 4,500 rpm and maximum road speed is 105 kilometres per hour, rate of acceleration is 0-48kph in 9 seconds and the vehicle's road range is 430 kilometres.



Treading path of African history

A holiday of a lifetime is the subject of this article by RON HUGHES, an Apprentices Instructor at the Royal Small Arms Factory Enfield. In it he recaptures vivid memories of an enjoyable trip to South Africa last year — an experience which he and his wife are keen to repeat:

Our journey began with an uneventful flight on British Airways from Heathrow to Jo'burg, thence to our base which was with relatives in Pretoria — a truly beautiful city with a good blend of old and new architecture. Having visited both East and West Africa on previous holidays my wife and I have fallen in love with the country and on this trip we were to realise many ambitions.

The first ten days we travelled overland, crossing the border into Botswana, skirting the Kalahari desert and northwards to the Chavango swamps — an area teeming with game such as antelope, giraffe, buffalo, rhinoceros, hippos, and many great herds of elephant which seem to be devastating the area owing to their great numbers.

We slept under the stars at night in

our sleeping bags (no tents!) Some nights we heard lions quite close by, but I might add that we did have a very experienced guide with us.

Our journey took us through Moremi National Park and Chobe National Park until eventually we reached the Zimbabwe (formerly Rhodesia) border where, having negotiated entry we drove the last 70 kilometres through Zambesi National Park to Victoria Falls. This was a sight and sound never to be forgotten. Our cameras worked overtime! From here we made our return journey to Pretoria having covered some 2,000 miles.

Boer War

The next trip we made from Pretoria was in a southerly direction and it proved to be very interesting historically. Having a great interest in the history of the Boer War we took the opportunity on the way down to the Drakenburg Mountains to visit Ladysmith — famous for the siege, and the battles of Spion Kop, Colenso



The forces of nature at work ... the awe-inspiring Victoria Falls, one of the many fascinating places visited and photographed by Ron Hughes and his wife on their memorable African holiday

and Belfast. My great uncle was in the Rifle Brigade and survived the siege of Ladysmith. I visited the military cemeteries where his not so lucky comrades were buried and found them to be very well cared for. In the museums I also found the

historic Enfield weapons of the times. They are very well exhibited alongside the Boers' Mausers and together with the Martini Henris.

The last place we visited was the site of the battle of Rorke's Drift in 1879. Access to it was some 50

kilometres up a dust road. We were shown around by a very dignified old Zulu whose great grandfather had fought there. His last words to us, translated, were: "Go safely and return in peace."

We certainly do hope to return. ♪