

## THE NEW LOOK — 3

**T**HEY SAY that any bright schoolboy could use the device given sufficient knowledge of the subject. It would certainly knock spots off any TV video game of battleships for him.

More importantly, the Army is convinced it is going to help knock the spots off any troop positions, trenches or soft-top

vehicles to a tolerance of plus or minus two mils or a couple of metres in range.

For a hand-held computer device, not much larger than a TV remote control box called a Mortar Fire Data Control — MFDC already in Army parlance — is bringing the infantry soldier to the forefront of micro-chip technology.

It was shown to interested parties in a lively firepower scenario down on Salisbury Plain which had some 50 spectators busily trying to keep up with called-out calculations in four canvas-

topped four-tonne “classrooms” for the occasion.

Out in front were two three-man 81mm mortar detachments furnished by men of Support Weapons Company, 1st Battalion, The Royal Welch Fusiliers, the demonstration battalion, based at nearby Netheravon.

As Major Dick Foster, the Duke of Edinburgh’s Royal Regiment and former chief instructor of the Mortar Division at Netheravon, told the truck-borne assembly: “This is the forefront of 20th century micro-chip technology. MFDC is very simple to use and the clever part is the only thing you have to know is what each key does and, thereafter, react to a series of prompts. You don’t have to learn lengthy procedures of the old plotter. Weighing only 625

grammes and in a protective case which is dust and waterproof, it’s easy to carry and ‘ruggedised’. It’s just what the infantryman on mortars wants. It will record ten mortar lines, ten OPs and up to 58 targets.

“Any 16-year-old could operate it with a knowledge of charge, elevation and bearing and the basics of mortar and fire control. There are other countries developing similar equipment but none of them is comparable to this.”

A total of 585 sets have been distributed to the Army’s infantry battalions — it is understood the TA will also be equipped with them — and 150 teachers of the new system have been taught the virtues of MORZEN or MFDC by nine instructors of the Royal Small Arms Corps at Netheravon. They are back with their units.

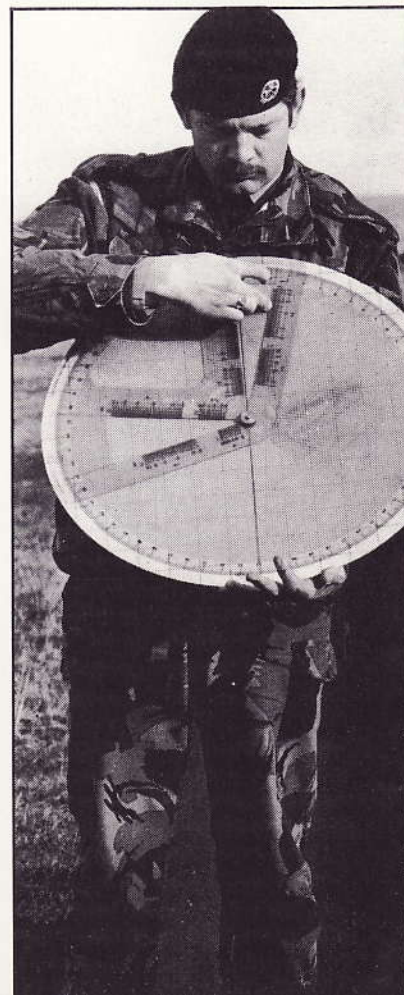
One instructor, Sergeant Steve Szymendera, told me: “For knowledge up to basic standard we gave six 40-minute periods. To be fully conversant with the system, you need about twenty 40-minute periods. It’s a vast improvement on the old plotter. It’s easy to teach, easy to learn and it’s fun.

“Once they play with MFDC they go away at night and sit up for hours practising. I understand initially there will be one MFDC between two mortars and then eventually two per section.”

Mr Peter Turner, for the Company, Zengrange Ltd., of Leeds said: “The thing I have learned

# MFDC: MICRO-CHIPS FOR MORTARMEN

Going up! The 81mm shell screams away on demo by men of the 1st Battalion, The Royal Welch Fusiliers.





from feedback is that the computer has reduced training time currently on mortar plotting in excess of 20 per cent. The other factor is that soldiers have found the system to be sufficiently comprehensive to feel happy with it.

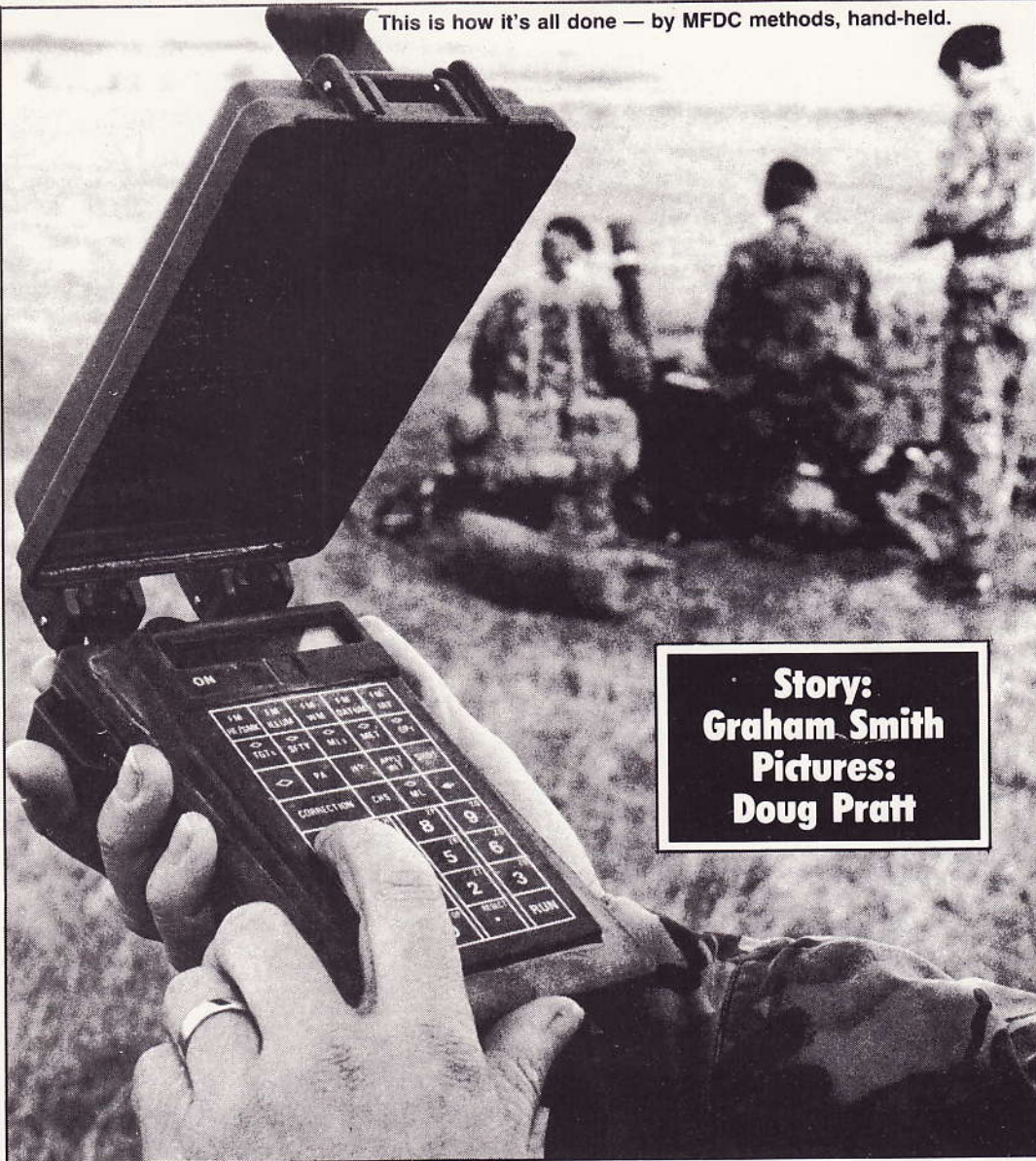
"It is, in our opinion, the first hand-held computer to be in a front line Army in the West. It's not corruptible. The contract was placed in April 1981 and delivery started in December last year."

Later, he made a presentation of a statuette of a hand clutching an MFDC to Major-General Colin Shortis, Director of Infantry, who, in part of his remarks, said: "Unless you have an Einstein capacity to crunch figures in your head despite the fibre glass plotter, this idea, an exceptional idea, has from the very beginning been dependent on people who are going to have to use it."

It's a pretty rugged bit of kit designed to withstand the British soldier at his most enquiring. The equipment is going to save an awful lot of our own soldiers' lives and makes us more effective when closing with an enemy."

Included in the MFDC's fire drills are grid reference, correct from grid reference, stored target, correct from stored target, quick action, co-ordinating illumination, indicating round technique, without-maps operation, datum firing, multiple target registration and dual missions. ■

This is how it's all done — by MFDC methods, hand-held.



**Story:**  
**Graham Smith**  
**Pictures:**  
**Doug Pratt**

Ancient and modern alongside each other.  
The old plotter; the new keyboard.



It's going to be a hit — direct  
— thanks to the new system  
of sums.





# British Army Introduces Mortar Fire-Data Computer

The British Army is replacing its mechanical plotters with *Morzen*, a mortar fire-data computer developed by the UK specialist software engineering company Zengrange. The firm has delivered more than 500 units to the Army, which will use them with its L16 81mm mortars. Zengrange is now developing *Gunzen*, a more advanced version to replace the Royal Artillery's FAME mechanical plotting equipment and to act as a back-up to the FACE system.

The significant increase in speed of fire resulting from the use of *Morzen* has already led to changes in the British Army's mortar fire procedure. Because the physical training of the weapon on to its target bearing is the most time-consuming item, *Morzen* computes bearing information first. This is available some 6s after the target is notified, with charge data being produced simultaneously. Elevation and time-of-flight information then follow automatically after a further 6s.

*Morzen* was developed following an adverse report by the Infantry Trials and Development Unit (ITDU) on a hand-held fire-data computer developed by another UK company. The US Hewlett Packard HP41 computer, introduced in late 1979, was becoming widely used in the British Army for a variety of tasks and had achieved a reputation for high reliability. In November 1981, therefore, the ITDU tested an HP41 with a primitive mortar fire-control program, and in February 1982 the MoD Procurement Executive decided to proceed with a mortar fire-data computer based on that machine. Hewlett Packard recommended Zengrange, which had developed accounting packages using the HP41, and a contract was let in the spring of 1982. *Morzen* prototypes were delivered in December 1982 and the initial production batch had been completed by the end of March 1983. The unit can be programmed to operate with any other type of mortar if required.

Advantages claimed for *Morzen* include ruggedness and reliability, simplicity of operation, a long battery life and a price

only some 60% that of competing devices. The unit comprises a Hewlett Packard HP41CV computer with the mortar fire-data program permanently etched directly on to the encased read-only memory (ROM), a number of plug-in modules to provide additional facilities, and a purpose-designed lightweight case that is waterproof and can be carried in a pouch pocket. All computations are carried out to ten digits of accuracy, even though grid-reference inputs normally contain only six or eight digits. The unit can store information on up to 58 targets, together with data on ten observation posts and ten mortar lines for routine or "shoot-and-scoot" operations.

*Morzen's* standard program includes the following fire drills: grid reference, correct from grid reference, stored target, correct from stored target, quick action, co-ordinating illumination, indicating-round technique, without-maps operation, datum firing, multiple target registration, and dual missions.

The computer can calculate firing data for two simultaneous missions from one mortar line, which is particularly useful for quick-action missions when the mortars cannot be laid properly before the start of firing. *Morzen* allows high-explosive and/or smoke rounds to be fired quickly on to received grid references, corrections from grid references, recorded targets or corrections from recorded targets. Data for illuminating shells can be produced as easily, and a co-ordinating illumination procedure greatly simplifies the co-ordinated firing of two ammunition types.

When maps are not available, *Morzen* permits the rapid location of targets, observation posts and new mortar lines on a real grid if the mission is started from a known location, or on a pseudo grid if not. The unit's datum procedure greatly simplifies the accurate location of a new mortar line, enabling firing to be carried out without adjustment on to previously recorded targets. *Morzen* provides indicating-round technique procedures for use with laser

sighting from known OP grid references, thus greatly speeding the accurate adjustment of fire. Reduced target data can be quickly and easily stored in the computer memory against standard mortar or artillery numbers. Using the reset key, several targets can be recorded from a single fall of shot. Target data received from other sources can be stored through the keyboard. The locations of OPs can be entered through the keyboard or quickly be established using the fixed-OP or resect routines. They can then be stored for use with the indicating-round technique procedure. Meteorological information, when available, can be entered to improve first-round accuracy. Range safety limits, once entered, are automatically checked against reduced ranges and bearings. Point of aim, bearing and map range are always available for inspection. *Morzen* automatically indicates an error when invalid data are entered or the wrong key is pressed.

A built-in quartz clock provides read-outs of present time and time relative to hour. It can also generate a time-of-flight countdown to impact of the mortar bomb.



◀▶▶ Zengrange has delivered over 500 *Morzen* mortar fire-data computers to the British Army for use with 81mm mortars (photo at left shows soldiers of the 2nd Battalion, the Parachute Regiment using the equipment). The unit, which is based on a Hewlett Packard HP41CV computer, can store information on up to 58 targets, plus data on ten observation posts and ten mortar lines for routine or "shoot-and-scoot" operations.

The unit has attachment points for it to be carried on webbing, and the three-position hinged lid prevents reflections. The sealed keyboard can be operated when wearing NBC or arctic clothing. Battery life is nine months on average (operating on an 8h day), with an early warning of impending failure. Batteries can be replaced in the field. *Morzen* weighs 625g and measures 200 × 118mm. Accuracies are  $\pm 1\text{m}$  on map range,  $\pm 1\text{mil}$  in bearing and elevation,  $\pm 0.5$  units on fuze setting and  $\pm 0.5\text{s}$  on time of flight.

The Royal Ordnance Factories have adopted *Morzen* as part of their standard sales package for the 81mm mortar, and Zengrange hopes to achieve overseas sales this year. *Gunzen*, the version being developed for artillery applications, is due to enter service with the British Army in 1984 and will be operated with weapons up to and including *Lance*. ♦♦





▲ A Morzen computer in use under operational conditions by a mortar controller, who is giving orders to his section



▲ The Morzen mortar fire control computer is housed in a shock- and water-proof casing. Essentially, it is a Hewlett-Packard HP41 hand-held computer

# Morzen mortar computer in service

THE BRITISH ARMY recently became the first army in the world to equip its infantry mortar sections with a hand-held fire control computer, replacing the existing and cumbersome manual plotters. The Morzen computer is manufactured by Messrs Zengrange of Leeds and is fundamentally a Hewlett-Packard HP41 hand-held computer with special programming, fitted into a shock-proof and weather-proof casing. Operating is extremely simple; at a recent demonstration spectators were given computers and invited to follow a sequence of orders from a mortar controller, which were being given to a mortar section. In a very short time they were able to follow the routines quite easily, which effectively demonstrated the essential 'self-instructing' capability of the

design. Once the computer has been switched on, its digital display prompts the operator to each further step in the fire orders sequence, so that there is a minimum of rote learning required.

The instrument is capable of performing all the necessary fire control tasks; once the locations of mortar, OP and target and the OT bearing have been entered, it will then produce firing data for the target and corrections to the fall of shot based on the observer's corrections on the OT line. Bearing, elevation, charge and time of flight are calculated and displayed, and there are further facilities for counting down the time of flight, calculating fuze lengths for illuminating bombs, determining illuminating bomb firing data to match the HE/Smoke trajectory,

recording targets, and even correcting for meteor conditions, should this sort of information ever become available for mortars. Another useful facility is a clock which can be used to record and give a count-down to H-Hour. Presumably, the standard Order Group pro-forma will now be amended to read 'Synchronise Computers' instead of 'Synchronise Watches'.

The demonstration was followed by a short ceremony at the Support Weapons Wing, School of Infantry, at which the managing director of Zengrange, Mr Peter E Turner, presented an appropriate trophy to Maj Gen C T Shortis, Director of Infantry. The bronze trophy represents a hand holding a Morzen computer.

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## Gunzen AFDC joins Morzen in British Service

FOLLOWING a recent demonstration at the Royal School of Artillery at Larkhill, the British Army has officially adopted the Zengrange Gunzen hand-held Artillery Fire Data Computer (AFDC) for full-scale service. The Gunzen has been used during extensive trials over several months, and the 7 RHA (the artillery fire support element for 5 Airborne Brigade) has discarded its much larger and bulkier Field Artillery Computer Equipment (FACE) sets and now relies entirely upon the Gunzen AFDC.

The adoption of Gunzen follows the successful introduction of the mortar-orientated Morzen (*JDW* 3 March 1984) into the British Army and it uses the same Hewlett-Packard HP41 hand-held computer as the base element. Gunzen is programmed for all field artillery drills and procedures and can be used with any artillery system in service with the British Army, up to and including Lance.

Gunzen can be easily altered for use with different types of equipment by changing a single read-only memory (ROM) chip on the AFDC. In use, Gunzen will hold fire-control data for up to eight guns dispersed over a frontage of 2000 m, and its memory can store 47 target locations, nine observer post locations and 18 meteorological registration points.

All types of ammunition can be catered for and Gunzen can also be used for artillery survey calculations. All procedures are computer-led using standard artillery terminology. The system is easy to operate and even untrained personnel can handle a simple fire mission with the minimum of guidance. Full proficiency training for all aspects of Gunzen is stated to take three days.

Weighing 625 g, Gunzen is shock-proof and waterproof and, with dimensions of 200 x 118 x 58 mm, is small enough to fit into an ammunition pouch. Zengrange Ltd of Leeds is now producing Gunzen for issue to all Royal Artillery batteries at the rate of two to a command post. 7 RHA has already adopted Gunzen 'full time' and other units, such as 29 Commando Regiment RA, have indicated a marked preference for Gunzen over FACE. Both these regiments use the 105 mm L118 Light Gun.

**TJG**