.gA "threatening" image of one of the first prototypes of the new South African G-6 155/45 mm seIt-propelled gun/howitzer. Here the gun is
At
still fitted with the original triple battle muzzle brake. Above the armoured casing for the recuperator there Is a mount intended for the
muzzle velocity measuring device.

G-5 ’& G-6: South Africa
does it (almost) by itself

...and causes an earthquake In artillery technology whose ushock waves" will be felt for many years to come.

It often happens that some of the most interesting developments in defence technology are the result of isolation: a country, unable to purchase the equipment it needs from abroad because of an international embargo or similar political problems, Is forced to develop and produce It on Its own. The results are nearly invarIably systems which, having been tailored to specitic requirements and specific Industrial capabilities, are highly unconventional In design and performance. .

Such a sltuatlon Is presently the case In South Africa, which, due to the United Natlons’ embargo, has seen all Its tormer hardware procurement channels abruptly cut. Tremendous development, financial and industrial efforts have been concentrated in the establishment of a national concern - AHMSCOR - charged with the difficult task of providing the South African Armed Forces with the equipment they need. The first results of these efforts are now coming to llght. Amongst the most important are the G-5 gun/howitzer and _ its G-6 selt-propelled version.

The requirement for the G-5 started to materialise during the Angolan campaign, when South African forces encountered a problem which also was (and still is) one of the main reasons for concern among NATO planners: that is. they found themselves hopelessly outranged by the Soviet-made artillery systems and rocket launchers fielded by the Cuban "advisors". Development of a new, very longsrange fire support weapon system was clearly a matter of primary importance.

In their search for suitable technology, South African representatives contacted a Canadian company. SRC-Q (Space Fle-search Corporation of Quebec). Established in 1967. this company had been for some years working on the development of both

new gun/howitzer designs and innovative ammunition concepts specifically to obtain a significant breakthrough in artillery range. SRC-Q had focused its studies on long and very long barrels (39 calibers at first, 45 calibers later) and on a range of high slenderness ratio projectiles. designated ERFB (Extended Range Full Bore). The combination of these two technologies resulted in a weapon system with a max. range in excess of 30.000 m -as against the 20.000-22.000 m max. range of current gun/howitzers (30,000 m with rocket-assisted RAP ammunition).

Founder and President of SRC-Q was Dr. Gerald Bull, who - according to nCommandant" Piet Marais, President of AFIMSCOR - is "an extremely good technician. but in no way a businessman". a tact which caused some trouble later.

ARMSCOR covertly acquired a minority shareholding in SRC-Q (about 25%). made available to the company important financial resources and on the basis of the SRC-O G045 155/45 mm gun/howitzer and of some original South African ideas development activity began for an artillery system optimized for South African needs. Both SRC-Q and ARMSCOR technicians worked on the project.

In the meantime, the marketing company SRO International was established in 1976 in Belgium in order to fully exploit the obvious commercial possibilities of the new technologies. 45% of the share capital of SEC lnternatlonal was controlled by SRC-Q and 55% by the Belgian ammunition firm PRB. Partnership with PBS provided access to another very interesting ammunition technology. the "base bleed". Developed in Sweden by Wallemberg, this technology is owned worldwide (with the exception of Sweden itself) by IIP (International Industrial Products), a marketing subsidiary of PRB. Addition of the "base bleed" device to the ERFB-design rounds further increased range up to the present nearly unbelievable figures.

The main commercial and industrial problem lacing SRC International was to find an industrial partner for gun manufacture. as SRC-Q was mainly a research company with limited industrial capabilities and it was quite evident that a "made in South Africa" label would have seriously hampered export efforts. Consequently. in 1979 an agreement was reached between SRO International and the Austrian Voest-Alpine concern. providing that Voest-Alpine should manufacture the gun. and its ammunition subsidiary

Hirtenberger Patronenfabrik the ERFB ammunition incorporating the "base bleed" device. Actually. Voest-Aipine has designed and introduced many modifications to the basic GC45 gun/howitzer. and is now producing the weapon. designated GHN-45. for at least one MiddIe-East customer.

Development of the South African programme ran in parallel with this international marketing activity. In 1979. SRC-Q manufactured two gun/howitzers (according to other sources. two barrels only, with carriages being provided by ARMSCOR). After trials in Canada and on the island of Antigua they were transferred to South Africa to serve as "models" for series production. Through its involvement in SRC International. ARMSCOR also gained access to the "base bleed" technology.

Troubles began in 1980. when SRC-Q ran into financial problems, and as a result of investigations of its accounts, the South African involvement was discovered. Dr. Bull refused a South African offer for political asylum, and in November he was convicted of contravening the UN embargo and jailed. SRC-Q went bankrupt.

As a result of this higth-complicated affair the industrial situation is presently as follows:

rough terrain.

u ARMSCOR is manufacturing the G-5 gun/howitzer (its own version of the GC45) as well as the ERFB ammunition including the "base bleed"; ’

D PRB is manufacturing the ERFB ammunition with "base bleed";

D Voest-Alpine is manufacturing the GHN-45 gun/howitzer (its own version of the GC45). While its Hirtenberger subsidiary manufactures the ERFB ammunition with "base bleed":

U Eurometaal has purchased license production for the ERFB ammunition. but oniy for the potential Dutch market, and not including the "base bleed";

D Luchaire has acquired license production for the "base bleed" (directly from HP. and not through SRC International) with the aim of incorporating this device into conventional (as opposed to ERFB) ammunition.

"Base bleed" conventional ammunition is also being manufactured in Italy by SIMMEL tor the OTC Meiara PALMAFtiA 155/41 mm seIi-propelled gun/howitzer. Source of this technology is not known.

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A battery of 6-5 155 mm gun/howitzers ot the South African Army. Notice the very

Due to the rather unusual circumstances surrounding the development of the GC45/G-5/GHN-45. and because South Africa was the only country to immediately grasp the potential offered by the SHC-Q’s researches, there is now a situation in which artillery weapons are being produced - and marketed to the Third World - whose operational performance far exceed those of similar weapons fielded by the most advanced NATO and Warsaw Pact armies. Just to give one example. Thailand

(which has two batteries oi GC45 in service. having ordered the weapons from SRC-Q before the firm closed down) is now better equipped to face Soviet-manufactured Iong-range artillery than, say. Western Germany or the US. Conversely, Soviet-equipped artillery units would face more serious problems in fighting against a Third World country fielding the new "GC45 generation" gun/howitzers than the Soviet Army itself during a war in Central Europe.

A redirection on development of NATO artillery appears to be urgent. Already heaveily committed to their own programmes (the M198 155/39 mm for the US. and the FH-70 155/39 mm for Great Britain. West Germany and Italy) NATO countries have so far paid little or no attention to the very promising
i
technologies pioneered by SRC-Q, and developed by ARMSCOR, PFtB and Voest-Alpine. However, it appears very doubtful that this situation could. or should. continue. The ERFB range of ammunition can be fired by other current Western 155 mm gun/howitzers. but performs best when fired by Iong-barreled weapons of the GC45 category. Indirectly, the technology required to develop improved, ionger-barrel versions of the M198 and/or the FH-7O is already at hand. because SRC-Q sub-contracted manufacture of 45 caliber barrels tor the Thai order to the US Watervliet Arsenal and the British ROF.

The G45 gun/howitzer

The 6-5 155/45 mm gun/howitzer was mainly designed - as the GC45 from which it is derived - around the ERFB round and the charges developed to fire it. The salient feature of the gun is its 45 caliber (6.975 mm) monobloc autotrettaged barrel of high-yeid steel. The firing chamber. being matched to the 45 caliber barrel length. is large tyres, adopted in order to increase mobility over larger than usual in’other 155 mm weapons (about 1,170 x 160 mm, total volume of around 13,548 cm3), resulting in lower breech pressure for a given range and muzzle velocity when compared to, say, M198 or FH-70. Firing chamber pressures in excess of 50,000 psi (3,500 kg/cmz) are obtained with the maximum charge.

The barrel is rifled at the constant pitch of 1 turn in 20 calibers (3100 mm), that is. a 8355’ pitch, and has 48 RH grooves. It is fitted with a singie-baftle "mushroom" muzzle brake. which has replaced the earlier triple-baffle muzzle brake as fitted on the GC45.

The hinged breech is of the interrupted screw type with cam-operated semi-automatic action. The breech opens automatically when the barrel assembly returns to battery, and closes automatically when the cam is swung out of engagement. The ramming and loading system is based on a swing aside loading tray mounted on the rear cradle of the recoil system. so that it moves in elevation with the cannon assem-
. bly. A pneumatically operated and manually controlled telescopic ramming cylinder is rotated Into place behind the projectile for

loading at high elevation angles. With this arrangement. it is no longer necessary to lower the gun between shots for ramming, and reloading can be performed at any given barrel elevation. The pneumatic system is powered by a bottle carried on the right trail spade.

The semi-automatic breech action and the pneumatic rammer allow a sustained rate of fire of 2 rounds/min. As far a maximum rate of fire (for 15 min.) is concerned. it is rather surprising to discover that - although the GC45. the GHN-45 and the 6-5 are substantially the same weapon - SRC-Q claimed 4 rounds/min.. Voest-Alpine maintains a figure of 6 rounds/min. (with a new rammer and an electro-slag refined steel barrel, however). while ARMSCOR. prefers to stick to the more conservative figure of 3 rounds/min.

The carriage design of the GC45. based on a simple spiit-trail configuration with built-in tow bar. has been maintained on the G-5, but has been somewhat strengthened. Trail lifting wheel assemblies are located at the outboard rear of each trail, in order to assist the gun crew during emplacement and disemplacement operations. The pivoted trail spades have four pre-set posi-

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tions and can be spread to a maximum angle of 84o. The undercarriage comprises a walking beam suspension system (with two wheels per side), allowing high towing speed and greater mobility under tow in rough terrain.

The design of the crew jack and float system incorporates a telescopic system and ’ ball screw jack. Disengagement of the ball jack will result in immediate settling of the gun on its undercarriage wheels. The elevating system incorporates two 100 kg pneumatic equilibrators, located at the sides of the barrel; the hydraulic recuperator is mounted above the barrel.

The main modification of the G-5 compared to the earlier GC45 is the addition of an auxiliary power unit. a 68 hp air-cooled diesel engine. This is used not only to provide a certain degree of seIf-propulsion capability, but also to power hydraulic servos for trails spread/close. trail wheels raise/lower/steer and firing platform raise/lower. considerably reducing the crew workload.

In addition to its special range of EFlFB ammunition. the G-5 can of course fire all the 155 mm rounds developed for other Western weapons.

In South Africa. the G-5 is manufactured by Lyttelton Engineering Works (Pty) Ltd.. while the ammunition is produced by Naschem. Both firms are directly controlled by ARMSCOR.

No details have been released about the number of weapons already in service with the South African Army or about the planned production.

It should also be mentioned that both G-5 and 6-6 are now to be equipped with a device for the continuous measurement of the muzzle velocity. also developed in South Africa and designated EMVA Mk.1OB. The system. which works on the l band, can measure muzzle velocities to an accuracy of i 0.05%. in the range 30 m/sec. to 3.000 m/sec.

In its present configuration. the system and its digital microprocessor are connected to a display and printing unit. However. given the rather limited usefulness of muzzle velocity information provided in this way during sustained fire, the presence of the EMVA Mk.1OB seems to suggest that South Africa is developing an artillery fire control system. to be fed - amongst other things -- with the data provided by the muzzle velocity analyzer.

The ammunition

When faced with the basic problem of developing very Iong-range tube weapons. researchers at SRC-Q focused their efforts on two directions: a new gun featuring advanced internal ballistic characteristics. and a new kind of ammunition. The conventional approach for Iong-range ammunition - i.e. RAP. Rocket Assisted Propulsion - was rejected from the very start, and the decision was taken to aim at a purely ballistic solution. ARMSCOR maintains that the development of this new ammunition was shared between SRC-Q and ARMSCOR

itself.
The logical way to obtain the required results was to reduce projectile drag by designing a more streamlined body. This is a very well known principle. which however cannot be pushed very far with conven-
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tional technologies because spin-stabilised projectiles cannot have a length/diameter’ ratio far exceeding 5:1. Also. the need to provide a suitable bearing surface (driving band(s) aft. bourrelet forward) results in a shell having a cylindrical section for aboutf; of its length.
A first step was made by discarding-sabot sub-caliber rounds. but this solution, although effective. obviously resulted in projectiles with a smaller diameter and carrying less explosive charge than conventional ones. and was consequently deemed impractical. The final outcome was the ERFB (Extended Range Full Bore) round.
The 6-5 firing at maximum elevation: the recoiling mass is already moving.
The ERFB is a very long and streamlined projectile (in practice. the whole body is ogive-shaped) fitted with conventional driving bands at the base but with the forward bourrelet replaced by angled "nubs". As the driving bands and the nubs stabilise the projectile in the barrel. the projectile shape can be optimized for drag-reduction without having to consider its stabilisation.
The nubs were separate elements welded to the projectile body in the first ammunition developed by SRC-Q. Subsequently. this technology was replaced by machined nubs by PRB (and very probably by Hirtenberger too) while ARMSCOR is still producing ammunition with welded nubs. Both companies maintain that their solution is the best choice. All ERFB projectiles are also fitted with a hollow boat tail.
As a result of the important reduction in wave drag. ERFB projectiles decelerate more slowly than conventional ones. and consequently have increased range and lower dispersion figures. Also. the very long projectile allows a larger internal volume, and can carry a larger amount of explosives.
Range is further increased by the addition of the "base bleed" device. The "base bleed" replaces the hollow boat tail with a section containing granes of combustible materials. which are ignited by the propelling gases and which in turn generate gases which are ejected through a hole in the base. These gases burn in contact with the atmosphere. The result however is not additional thrust (as provided by a FlAP device). but simply an increase in local pressure which strongly reduces base drag. Base drag is a phaenomenon created by the wave vortices at the projectile base. In practice, the ’base bleed" works by "simulating" an aerodynamically shaped projectile base section. and hence disrupting the drag-inducing vortices. Ftange can be increased by more than 15% with conventional rounds, and 25% with ERFB rounds.
ARMSCOR is now producing five types of

ammunition. under the common designation of 155 mm M57: High Explosive (HE). High Explosive Base Bleed (HEBB), Smoke (SMK), illuminating (lLLUM) and White Phosphorous (WP). Main data are as follows:

Type tuzed	Length (mm)	Nominal mass (kg)	Payload mass (kg)
HE	938	45.5	8.7
HEBB	958	47.0	8.7
SMK	938	45.7	10.9
lLLUM	938	45.2’	11.8
WP	938	47.7	7.6

These figures are closely similar to those of the ammunition range manufactured by PRB and Hirtenberger for the GHN-45. The HE and HEBB rounds can be filled either with TNT or with the more dense Composition B (60% BOX. 40% TNT) significantly increasing terminal effects.

Three main types of fuzes are available: the PD M572 point-detonating super-quick (0.5 sec. delay) fuze for HE. HEBB and WP rounds; the SA804 proximity fuze (burst height 4-8 m) with point-detonating back-up for HE. HEBB and WP rounds; and the SA805 time fuze (time range 0-200 sec.) for SMK and lLLUM rounds.

The G-5 tires with three different charges: charge 1 (composed of a base charge and three increment charges for the different zones) for zones 1. 2. 3 and 4. charge 2 for Zone 5 and charge 3 for zone 6. Ranges and muzzle velocities for the HE round are as follows:

Charge	Zone	Muzzle velocity (m/sec)	Max. range (m) (At sea level)
1	.1 ’	250	5.300
1t	2	317	7,800
Hi	8	440	11.900
H- ti-	4	615	17.700
2	5	795	24,700
3	6	897	30.000
3(’)	6(’)	897	37.500

(’) Base bleed round.

The dramatic operational improvement through this new ammunition can be appreciated by comparing the max. range of 37.500 m with the 22.000-24.000 m or so which can be attained by "modern" 155/39 mm gun/howitzers of the M198/FH-70 category firing conventional ammunition based on the US M107 design. or with the 30,000 m or so that the same weapons can reach with rocket-assisted RAP rounds. Under favourable height and atmospheric conditions, the already startling figures glven can be further increased. During a series of firing

3G 5 gun/hownzer ’-_-’ mam technical data
Dimensional data v
caliber (mm) 155
caliber length . _ 45
total mass (kg) " 13.500
totai length (m) (barrel aft. travel position) 9.100
total length (m) (bartel forward travel position) 11.100
trunnion height (m) 1.770
overall height (barrel horizontal) 2.300
overall width (In) 2,500
barrel in trail clamp (kg) 3.000
elevation from -8i to 175"
traverse angles: -
elevation up to 150 841(42’1 on each side)
eievation above 151’ 650 (32.5: on each side)
Performance:
deployment with power assistance:
normal conditions (crew of 5) 2 min.
emergency (crew of 2) , , , 5 min.
rate offire: , I
maximum(for15min.) r I A ’ ’ 3r/min.
sustained (torso min.) 2 r/min.
Range(m) (atsea level): . ., - " .- 1
minimum (elevation 750) - _ 3.000
maximum (HE projectile) , , " I 30.000
maximum (HEBB projectilie) , I I $7.500
Accuracy(at 75% of max. range) , I , V ’ i
in length . I; . I , _ ’ 0.48% of range
sin breadth I , i 0.10% ofrange
’Auxliiary power unit: -
One air-cooied diesel engine developing 51 kW (68hp) for self-
propulsion and deployment of hydraulic systems
Tyres: I _ (I V I w - I _ ,
’ main wheels . ’ I: , I . r 14.00x20
-trailwheels v I ’ 9 iv: ,, , I 7.50x16
(Mobility: I i ’ , ’ n y 7 ’ I
,max.towlng speed(hlghways)(km/h) ’ ’ I , 90,
i max towing speed (secondary roads) (km/h) a 50
Iseit-propelled on hard Ievelsurface(km/h) I w , I; 18
self-propelled on sand(km/h) - ’ , g . _ 1 , Physical dimensions of the 6-5 In transport configuration and in
battery.
trials carried out at an altitude of about
’ 1.000 m, the G-5 fired HEBB rounds at a
range of more than 45.000 m(i).
increased range is only a part of the story.
As already mentioned. the M57 ammunition
has a larger internal volume than the stan-
dard M107 155 mm round. and carries a
larger and more densb explosive filling.
Thi5. coupled with the use of high-fragmen-
tation steel. gives far better terminal effects. f .
as shown by this table: ’1
.ExpiQsta fIli (ty 7’
.3, xplpswe iili (isg ,

The ERFB range of ammunition (be it of ARMSCOR. PRB or Hirtenberger manufacture) can also be fired by existing 155 mm gun/howitzers of Western design using appropriate charges. The ammunition is qualified for the M109 (155/23 mm), the M-109A1 (155/39 mm). the FH-70 (155/39 mm). the M198 (155/39 mm), the Swedish FH-77 (155/38 mm), the French 155 TR (155/28 mm) and the 155 GCT seIt-propelled. A significant increase in range is achieved in any case, up to 30,000 m (that is. a figure identical to that for RAP rounds) when firing ubase bleed" projectiles from the longer barrel weapons.

However. the possible introduction of this ammunition in NATO armies is made difficult by the new SP70 self-propelled gun/howitzer programme in Great Britain, West Germany and Italy. As the SP70 has been conceived to operate in "buttoned up" conditions, its internal arrangement has been designed around the conventional M107 ammunition, and it would be impossible to handle the longer ERFB rounds (something which is perfectly feasible in the M-109. which tires with the aft doors open). As a result. introduction of the ERFB ammunition would either require a major redesigning of the SP70 or would only be possible for the FH-70; the latter solution would create a logistic problem with two different kinds of ammunition for the towed gun/howitzer and its seIf-propelled version - something which is not likely to be considered acceptable.

The G-6 seIf-propelled gun/howitzer

Although development of the G-5 towed gun/howitzer fully satisfied the South African Army’s requirement for a long range fire support weapon. another very important operational problem still had to be solved: namely. the need for a high mobile fire support weapon. able to rapidly reach the intervention areas in a country like South Africa. where roads and railway networks are relatively less developed than. say, in Central Europe.

The bold decision was consequently taken to develop a self-propelled gun/howitzer. to be completely designed and manufactured in South Africa. 1

The particular operational requirements resulted from the very start in a very specific design. SeIf-propelled guns and howitzers. both of Western and Eastern design, are nearly invariably tracked vehicles (often based on MBT chassis). and are mainly intended to provide fire support for large armoured and mechanised units. Tactical mobility (that is. cross-country capability) is consequently judged far more important than strategic mobility, and the self-propelled systems are usually transported to just behind the FEBA on railway carriages or large tank transporter semi-trailers.

On the contrary. the South African Army needed a system to provide fire support to its mechanised infantry units (now equipped with ELAND armoured cars and FlATEL

wheeled lCVs) during their intervention raids. nearly always carried out with little or no warning and over long and very long distances from bases. Consequently. the required vehicle should be able to keep pace with ELANDs and RATELs over many

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Schematic diagram 01 an ERFB round with "base bleed". The shape of an ERFB round is shown here compared with that of a conventional M107 round of US design. Apart from boasting a tar better slenderness ratio and hence less drag, the ERFB round also otters a larger internal volume.

hundreds of kilometers; the accent was hence placed on strategic. as opposed to tactical. mobility. What matters is not the cross-country performance, but rather the capability to move at high speed over unpaved roads or open, flat countryside without requiring special transport equipment.

On the basis of these requirements. the already challenging technical problem of completely developing a selt-propelled system within South Africa was made even more’difficult with the decision to design a wheeled vehicle. wheels offering better strategic mobility than tracks. Before the G-6. the one and only wheeled seIf-propelled gun/howitzer operational all over the world was the Czechoslovakian DANA 152 mm. based on a Tatra 8x8 KOLOSS truck chassis.

Development of the G-6, appropriately designated RHINO. is now almost complete; extensive evaluation trials have already been carried out by the South African Army. The prototype(s) so far built still use a certain amount of foreign-manufactured components (purchased through normal commercial channels. as they are not considered as defence-related items and consequently do not fall under the UN embargo). It is planned however to replace as many of these components as possible with items of South African production during series manufacture.

The 6-6 FiHINO is expected to be in full production in about three years; no details have been released about the number of vehicles planned by the South African Army. in additioanRMSCOFl is already making a quite noticeable export effort for the system, mainly aimed - according to "Commandant" Marais - at titriendly, non-communist countries with arid operational areas and geographical conditions similar to those in South Africa".

Although marketing a South-African system would undoubtedly cause some political problems. and although the very particular design of the G-6 makes it unsuitable for

the requirements of some potential customers. entrance of the RHINO into the export arena has the potential for creating serious troubles for other manufacturers. No other
C
x
mm 1 A...
w i mu 20 1 mt
mot inFl
FH10
mus 721nm 24.4 n
ma! Ema
5m:
23mm 30mm
MIDI ?MPH
Typical Increases in range performance offered by ERFB ammunition (without base bleed) In comparison with the standard M107 ammunition and for some ditte- , rent 155 mm gun/howitzers.
selt-propelled gun/howitzer available from either the West or the East can come close to matching the G-6’s range, and on top of that thetRHINO is - according to ARMSCOR -- significantly cheaper than any 155 mm tracked SP gun/howitzer.
Technical description
The sis RHINO is a 155/45 mm seIf-propelled gun/howitzer on a 6x6 chassis. in order to accommodate the very heavy and long-barreled weapon and a sufficient amount of reserve ammunition, it was necessary to design a correspondingly large chassis. With a weight of 36 t in combat order. a length of 10 m (hull), a width of 3.25 m and a height of 3.25 m at the turret roof. the RHINO is by far the heaviest and largest wheeled combat vehicle currently around, with the possible exception of some huge Soviet missile transporters (which. however. could hardly be considered combat vehicles).
in order to properly distribute this weight. and as a low ground pressure (allowing for easy movements over sand) was a prerequisite. enormous 21x25 run-flat tyres. of the type used in some very large earthmov-

ers, have been used. it is diffICUlt to appreci-
ate the huge size of the RHlNO unless a man
stands near it for comparison, but it actually
dwarfs the M-109. It is heavier than the latter
by more than 12 t. and longer by about 4 m
with the same width. although slightly
higher.
The tyres are equipped with a centralised
pressure control system.
The 155/45 m gun/howitzer. which is
nearly identical to the towed G-5 (the only
main differences being the addition of a
bore evacuator and the inclosure of the
recuperator inside an armoured casing) and
can fire the same range of ammunition with
identical performance, is mounted on a very
large and spacious armoured steel turret,
weighing 12 t and placed at the extreme aft
of the vehicle. The turret is fully traversabie.
but firing is only possible on a frontal arc of
40" on each side; the arc of fire in elevation
is from -50 to 4750. Turret and weapon are
moved by electro-hydraulio servos with
back-up. The gun/howitzer is equipped with
a semi-automatlc loading system allowing
for a sustained rate of fire of 4 rounds/min.
Because of the very long hull. the FlHlNO
has a curiously "streamlined" aspect, rather
unusual in self-propelled systems. The hull
is made completely of armoured steel
plates. The engine is at the centre of the
vehicle. just in front of the fighting compart-
ment. Given the strategic mobility require-
ments, particular care was taken in design-
ing a larger and more comfortable fighting
compartment than usual. This space and
comfort allow the crew to remain many
hours inside the vehicle without too many
latigue problems. According to ARMSCOR.
the turret base ring possibly has the largest
diameter of any current turreted AFV. and
integration of the RHlNO’s turret on other
hulls would be quite difficult.
The RHINO has a crew of live: driver.
commander. gunner. loader and ammuni-
tion handler, with the driver doubling as
ammunition handler when the vehicle is fir-
ing. Commander. gunner. loader and
ammunition handler are all inside the turret
(the commander on the left and the loader
on the right. each with his access hatch. the
gunner on the left before and below the
commander and the ammunition handler on
the aft). The vehicle has a main entrance
door att. and an emergency escape hatch is
’lli’w Technologyt MlLTECH 1193
provided in the vehicle floor. The driver is -
highly unconventionally - seated at the
extreme front of the vehicle. in front of the
first axle. and is separated from the rest of
the crew by the engine compartment. He
enters the vehicle via a roof hatch. and has a
rather large armoured glass windscreen
and two side windows which can be
covered by armoured plates in an engage-
ment. This particular arrangement gives the
driver the best forward visibility possible.
allowing him to drive at high speed even on
broken ground. It also keeps him relatively
safe from mines. as they would explode
behind him. The commander has rudimen-

tary steering and brake commands. allowing him to stop the vehicle should the driver be incapacitated.

Particular emphasis has been put on crew protection. in addition to the armoured steel construction of both hull and turret. with no use of light alloys, the G-6 RHINO's design takes into account the. threat posed by mines, whose use by guerrillas is a difficult problem for South African forces. According to ARMSCOR. the shape and the armouring of the bottom hull allows the RHINO to withstand detonation of three mines before being immobilized. Another anti-mine detail: the triangular stiffening plates which connect the front section housing the driver to the rest of the vehicle are perforated with blow-out holes to allow the detonation energy to be vented upwards.

In addition. the RHINO is the only self-propelled howitzer featuring tiring ports (one on the turret's left side. and two on the right) allowing the crew to use their individual weapons from inside for short-range selfvdefence against guerrilla ambushes.

The G-6 is currently powered by a 520 hp air-cooled turbocharged diesel engine. possibly a Teledyne or a DeutZ' model (ARMSCOR was unwilling to go into details here). It appears likely that series vehicles will have a slightly more powerful (550-600 hp) water-cooled turbocharged diesel. The engine is coupled to a 6-speed gearbox with automatic torque converter.

The vehicle currently has torsion bar suspension plus oleopneumatic shock absorbers on the front wheels. and a walking beam ("boomerang") arrangement on the two aft axles. Although rather simple and not too expensive to manufacture. this solution was not completely successful during trials. and consequently series vehicles will have independent suspension on each wheel.

As could be expected, a power-to-weight ratio of 14.4 hp/t (M405: 17 hp/t) does not result in extremely high cross-country performance in a wheeled vehicle (see accompanying table). However. what really matters for the South African Army are the road speed of over 90 km/h and the operational range of over 400 km.

The RHINO can carry up to 50 propelling charges of the three different types and 44 rounds. that is. more than in nearly all recent Western tracked SP systems. 32 projectiles are stowed in the aft part of the bottom hull, on the left and right side of the main aft access door. and 12 are stowed in the nose. inside the front element whose curious resemblance to the spoiler of a F.1 racing car earned the G-6 the nickname of "Kalahari's Ferrari". The charges are carried inside the turret.

Before firing. four jacks are hydraulically lowered from inside the vehicle (commander and driver have duplicated commands). The driver and the ammunition handler exit the vehicle, and open the two aft hatches, giving access to the projectile magazine from outside. They then pass the projectile

to the loader through the alt door (which incorporates a ladder): the prolectile is put on the loading tray. and ramming is then automatic. The loader takes a charge from the turret and loads it manually. Preparing the vehicle for firing only takes about 1 min.. while only 30 sec. are needed to raise the jacks and disengage. Charges inside the turret are replenished through-two hatches in the turret aft.

The aiming system is very similar to that developed for the G-5, towed gun/howitzer. modified only to meet requirements for vehicle mounting. The gunner’s optics have a vertical opening protected by an armoured hatch. As with the G-5, a device for continuous measurement of the muzzle velocity is to be fitted above the barrel (this device is still not present on the prototypes).

ARMSCOR is now developing an ammunition carrier based on the same chassis.

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