"TRAINING WITH A SHORTENED RANGE CARTRIDGE
FOR AUTOMATIC RIFLE"

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ABSTRACT

In order to allow for firing manoeuvre, on the ground, of the combat group in reasonably safe conditions, a shortened range firing system, adaptable to the French automatic rifle, has been developed.

In a first part, after having recalled the military requirements, the system's conditions of use are exposed, and in particular those of its associated 5,56 ammunition.

The second part is devoted to the description of the materiel which has been studied on the ground of the military specifications issued from the requirements stated before.

The materiel is composed of a kit adaptable to the rifle and of a 5.56 cartridge with a plastic bullet said "balplast".

This system is at the last stage of its development and should be proposed for evaluation to the official services by the end of 1981.

INTRODUCTION

When adopting at the beginning of the century high velocity small calibre infantry weapons, the French Army necessarily grew interested in shortened range training systems (Cf. fig. 1).

Whereas service ammunition requires heavy infrastucture (firing ranges) and large size layouts (safety limits) which are more particularly unpermissible in Europe, use of shortened range ammunition brings forth notable reduction of utilisation restraint and cost.

In particular, in as much as it has very short lethal range, such ammunition affords collective practice on the training ground, and firing manoeuvre for combat groups, which cannot be thought of with service ammunition.

Widespread adoption throughout the past ten years of automatic individual weapons ipso facto led to the necessity of automatic fire practice.

In order to meet this particular military requirement, viz., "combat group training to automatic fire in open ground", a special shortened range system has been elaborated which can be adapted without any tooling, by sub-assembly replacement, on the service rifle.

For obvious medium range accuracy and safety reasons, the 22 LR system was left aside and an original solution was preferred, consisting of a lightened body and a specially designed round, with a training purpose bullet.

The round is derived from the service ammunition 5.56 cartridge case, with a rebated rim diameter.

A very light plastic bullet (10 grains boattail) is propelled at 4,000 ft/sec muzzle velocity by 12 grains of fast powder, with external ballistics matching exactly that of the service ammunition bullet up to 100 meters.

The characteristics of the ammunition and its subcomponents are described in detail.

The French automatic rifle can be classed as a delayed blowback type. With respect to the low impulse available, the weight of moving parts had to be cut down consistenly so as to afford automatic firing mode.

The lightened training subcomponents are supplied as a kit comprising the breech block, the bolt head carrier and the delay lever, directly interchangeable with the respective parts of the service weapon.

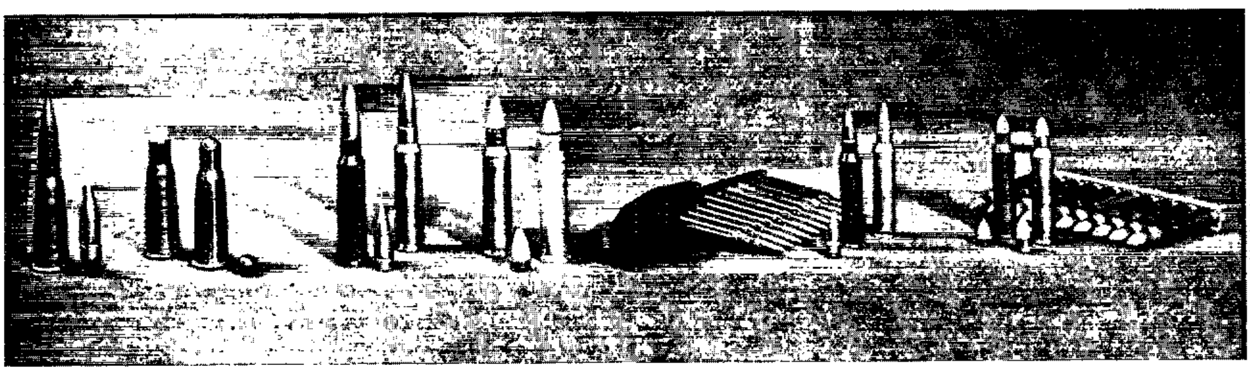


Fig. 1 The shortened range cartridges family since 1900

In order to forbid use of service ammunition (most unadvisable both for the gunner and the people around) during a practice session, the diameter of the recess in the bolt head of the kit was reduced so that only a special profile balplast cartridge with a rebated rim can be fired.

MILITARY REQUIREMENTS

In fact the military need is not new, but it has been modified with the widespread use of automatic assault rifles.

In France, the need for a shortened range system able to work in the automatic mode has been confirmed by the adoption, in july 1977, of the FAMAS 5.56 F1, and the wish to use fully for training the potentialities of the new 5.56 weapon system.

Military requirements

The external ballistic characteristics of the service ammunition are such as to lead, on the one hand, to important safety space requirements, on the other hand, in the case of a use inside a military enclosure, to non negligible structures.

According to these safety space requirements, the firing grounds have to be very large, and so are generally quite distant from the barracking of the troops, this heads to frequently important movings.

Besides, in the camps used in France for manoeuvres as well as for firing, the execution of the firing course necessary for the infantry troops individual and collective training makes it compulsory to neutralize, for safety reasons, wide spaces which are therefore not available for the tactical training of the troops

It was therefore necessary to elaborate an ammunition having the same ballistic characteristics as the service ammunition, but with a shortened range (1,000 m)

This ammunition makes possible : the use of light structures inside the barracks.

The performance of instinctive fire practice without blocking more space than is necessary.

Use of 5.56 balplast cartridges

Due to its charactéristics, the balplast cartridge has the same external ballistics as the service ammunition between 0 and 100 m, but its terminal efficiency is very much reduced beyond this distance therefore a simple brick wall stops it beyond 100 m.

The safety area is limited to 500 m (instead of 3,500 for the service ammunition).

This ammunition is used for the soldier's elementary training, the time of which being very short during the 12 months "Service National". The movings, which involve delays and wastes of time, are limited to a minimum, as the firings take place inside the barracks of the troops.

For the infantry's individual as well as collective further training, with as small safety areas as possible.

For firing with a cine simulator in enclosures destined to this purpose
It is therefore necessary that the functions held by the service ammunition, in particular the automatic firing, be possible with this shortened range, yet real firing ammunition.

THE BALPLAST KIT

Therefore, in order to meet the requirement corresponding to the tactical use of the automatic rifle FAMAS 5.56, a shortened range firing system has been developed.

a) it has been STUDIED on the ground of military requirements the priorities of which are recalled there after.

1. Safety :
   - Dangerous range limit inferior to 600 m
   - The kit design must not allow firing with service ammunitions.
   - The pieces must be easily recognized as well as the ammunitions.
2. Firing :
   - the performances are judged in comparison with those observed for the rifle with service ammunitions, on the same targets, at the same ranges.
   - In various respects, this also concerns :
     - probability of hit
     - the accuracy (group and zero) in the case of firing with a rest (bipod, or sand bag, and so on...)
3. Reliability :
   - adverse conditions
   - climatic extremes
   - fouling
   - miscellaneous incidents
4. Life expectation :

   15,000 rounds per kit (with the possibility of exchanging the striker, springs, ejector, extractor...).

b) it is COMPOSED of :

- an adaptable kit for the whole bolt unit
- a cartridge with a plastic bullet.
- a magazine (which is in fact polyvalent, as it allows the rifle to work with any of the adopted cartridges : service ammunitions, blank, dummy).

c) it ENSURES the different firing modes of the rifle, with 5.56 plastic bullet cartridges, and a useful range of 100 m.
Fundamentally, the problem to solve is not a simple one. Automatic firing requires a lot of energy, and that is a priori at the opposite of shortened range, let alone with the requirements about accuracy.

Nevertheless, *the question once put*, the firsideas to come forth in answer were these :

For the ammunition, try to scale down and adapt *for* the 5.56 automatic rifle, the existing cartridge used for the 7.5 rifle, and in particular its projectile.

As for the weapon, considering the low energy available with the balplast, design a blowback unit, the FAMAS being a priori suited for this

The first idea, i.e. reduction of the 7.5 round, *misfired, so to say...* because of the shape of the flat based bullet. As for the second idea, it was quickly dismissed for two major reasons : a technical one and a human one.

As a matter of fact, in the FAMAS the automatic sear is controled by one of the lever lower wings, replacing the present bolt unit by a *simple blowback lightened block meant that firing* was suppressed ! As this is precisely one of the safeties of the FAMAS. Moreover, it is necessary that the soldier should acquire and retain the *knowledge of one mechanism for this weapon, and* this would not have been true any more had the working system been transformed in the exchange between the pieces of the bolt unit and those of the adapter.

This being said, and although the working principle of the FAMAS is well known, it is now necessary *to do some mechanics to understand* the whys of the retained solutions.

The FAMAS, a small bullpup design works according to the principle of delayed blowback with a delay lever. This lever couples the breech and the bolt-carrier (1), (2), (3), (4).

In order to avoid the gripping of the case in *the chamber*, there are canelures along the chamber in such a way that the case floats in the gas with an equal pressure on both sides of the wall of the case.

So, as the pressure increases, and as the bullet moves down the barrel and the head of the case pushes back the breech, the bolt carrier *starts to shift back, linked by the delay lever.*

At this time the floating case acts as a differential distributor of momentum.

$$\mu = \frac{\text{surface of the HEAD of the case}}{\text{surface of the MOUTH of the case}}$$

So the conservation of momentum before and after the firing of the cartridge is expressed by :

$$P_\rho + P_g + P_\alpha = 0$$

Where : P_ρ = *momentum of the bullet and* propellant gas

P_g = momentum of the rifle (in recoil)

and P_α = momentum of the single equivalent moving part. (for breech, bolt carrier...)

we find : $P_\alpha = -\mu P_\rho$ and $P_g = (\mu - 1) P_\rho$

Another relation between the mass of the single equivalent moving part (m_r) and the mass of the moving parts (m_h) *for the breech and* (m_{bc}) for the bolt carrier is obtained from the conservation of energy : (Cf. fig. 2);

$$m_r \dot{x}^2 = m_h \dot{x}^2 + m_{bc} \dot{y}^2$$

With $\rho = \frac{OB}{OA}$ Ratio of the arms length (upper and lower) of the delay lever.

So $\dot{y} = \rho \dot{x}$

In fact ρ is not a constant with the FAMAS. During recoil its value changes from ρ = 3.6 at the beginning to 1, a mean value of ρ = 2.77 is a good one in most cases.

As a first approximation, these two equations represent the working of the rifle :

$$P_\alpha = -\mu P_\rho$$

$$m_r = m_h + \rho^2 m_{bc}$$

For example with the FAMAS 5.56 : m_r = 3.2 kg
With "standard" ammunition P_ρ = 6 *Ns.*
So for automatic firing the total mass of the moving parts should be less than 11.6 kg.

The kinetic energy of this mass (3.2 kg) with service ammunition is ranging about 22 joules* ; and a minimum momentum of 3 Ns is needed to work the FAMAS with this mass.

To conclude, with a shortened range firing system where the cartridge must give out a momentum ranging between 1.2 and 1.7 Ns, it is necessary that the equivalent recoiling mass should range *between .5 and 1 kg.*

	SERVICE	TRAINING
Bolt head / Breech	110,5g	109g
Bolt carrier	240,5g	148g
Delay lever+Firing-pin	29g	23g
Cocking	153g	153g
Total weight	533g	433g

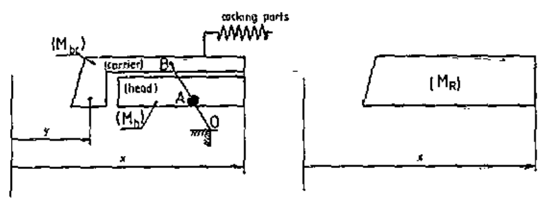


FIG : 2 WEIGHT OF BOLT PARTS

* 1 joule = .72 ft.lb.

The adapter of the bolt unit (cf. fig. 2 and 3)

In the weapon, the adapter must substitute for the following items :

- the bolt (breech)
- the bolt carrier

and ensure the functions of the existing parts.

For human engineering (E), technical (T) and industrial (F) reasons, the following solutions have been retained :

- to keep the working principle (E and T)
- to keep the breech (E,T and F) ($m_h \approx 140g$)

The only alterations effected in the breech have been performed for safety reasons.

- a smaller diameter for the recess in the bolt head so as to avoid the accidental firing of a service ammunition.
- the setting of a foolproof device so as to forbid the improper exchange of one of the breeches for the other.

Then again, as it was necessary to keep the main spring & miscellaneous ($m_r \approx 150$ g) and that the design made it quite impossible to lower the ratio of the lever beyond 1.6, it was found that the ammunition had to fire out a momentum superior to 1.3 Ns., with a bolt carrier mass of about 150 g, that is to say a total of about 300 g for. ($m_{bi} + m_r$)

Concerning the mass of the rifle mobile unit elements and of the adapter, see fig. 2, their outline is shown on figure n° 3.

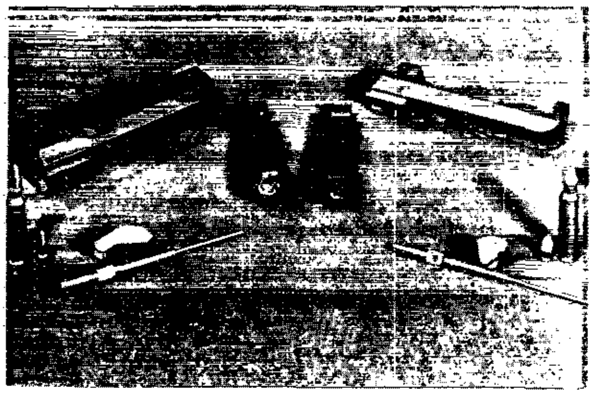


Fig. 3 - BOLT PARTS (left-Service items and "balplast" adapter at the right)

The balplast cartridge

Since about 1960 the French Army has been using with its 7.5 armament (MAS 36/51 and FSA-MAS 49/56) an ammunition. This cartridge only allows hand operated firing.

The projectile of this cartridge is a plastic ogival bullet, made out of orange colored RILSAN, with a flat brass base. This base has a double fonction as a gas-check inside the barrel, and as a support for the crimping of the cartridge mouth.

At the time, the characteristics required for this projectile were as follows :

- a 7.5 bullet (.308)
- total weight of the brass base : 0.77 g
- total mass of the bullet : 1.25 g

At first this cartridge (see. fig. 8) used the service ammunition brass case, and this caused many incidents. As a matter of fact, the pressure developed while firing being too low, the case could not be an efficient gas seal in the chamber, and this frequently caused discomfort for the shooter. In order to put these incidents right on the one hand, and to reduce the cost of the cartridge on the other hand, a much softer case made in a light alloy was worked out, which is still in service.

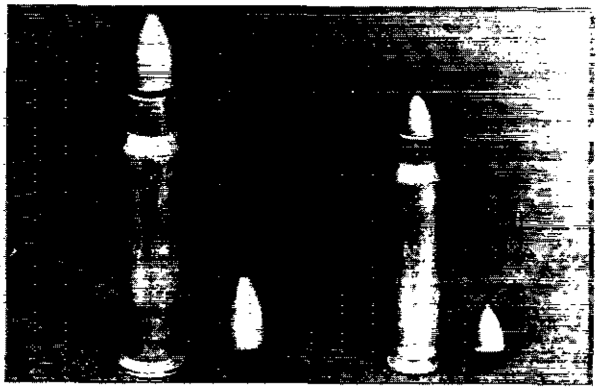


Fig. 8 - Down scaling from 7.5 to 5.56 mm

The first idea was therefore to reconsider this cartridge and adapt it to the 5.56 caliber. No sooner said than done and that was the beginning of troubles all the more embarrassing as they appeared late, too late. As a matter of fact, these cartridges are loaded wtih an extremely fast burning powder (the same as the one used in blank cartridges). As it was not possible to rely on the crimping of the mouth of the light alloy case for a good ignition of the powder, the diameter of the bullet had been slighly enlarged of 0.05 mm (.002"). The forcing was sufficient and the pressure regular (on the other side, this was a great contraint from the industrial point of view because it meant recalibrating the neck).

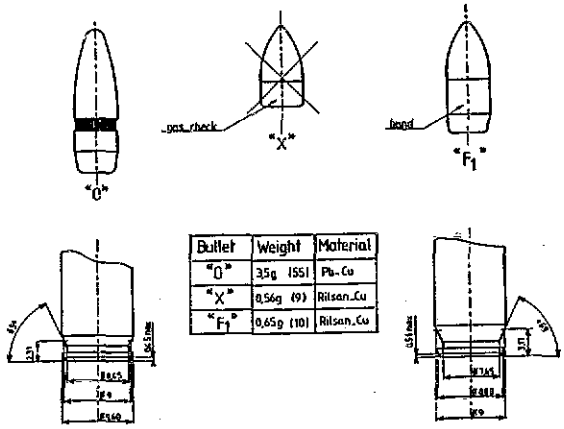
And then, one day, it happened that the impacts observed on a target were tipped and even keyholed and that dispersion was also aberrant. After a few investigations it became obvious that the profile of this projectile was not suitable because it was far too sensitive to the barrel state of wear (a phenomenon that unknown in the 7.5).

Under this shape, it has not been possible to come back to a smaller projectile diameter and to ensure a better ignition by using strong crimping only, in particular by changing the material of the case because, with a steel case, ruptures of the projectile were observed to happen at the upper level of the gas check due to the crimping.

Therefore, the whole study had to be resumed from the definition of the bullet, and this resulted in the "F1" design.

This misadventure explains you the presence of two sketches on figure 4, where the diagram "X" is related to the projectile that was left out.

It is a 5.71 mm boat-tailed projectile ; its mass is of 0.65 g (10 grains). A real rotating band constitutes the cylindrical part upon which the Rilsan is moulded.



Bullet	Weight	Material
"0"	3,5g (55)	Pb-Cu
"X"	0,56g (9)	Rilsan-Cu
"F_1"	0,65g (10)	Rilsan-Cu

FIG:4 CART 5,56 (Bullet "0" - Balplast "F_1")

It is obvious that this design is very much ill suited to create an important drag. However, after many tests, it is the only one which is satisfactory with the arms on the field, and which enables us to reach the level of performance required by the French H.Q.

The CASE

The service ammunition brass case has been chosen, since, as explained before, the steel one was not suitable.

In the FAMAS, there is no tightness problem since, on the contrary, the chamber is designed so as to allow the powder gas pressure to release the case thanks to longitudinal grooves cut a long the wall of the chamber (the cartriges fired with a FAMAS are easy to recognize by the fluting on the neck).

For obvious safety reasons, it is necessary that it should be impossible to fire service ammunition in a rifle which has been modified for practice firing. Apart from the fact that the components are easily recognizable by sight as well as by touch, it has been judged useful and safer to reduce the diameter of the recess in the bolt head. In such conditions, it is not possible any more to fire unperposedly a ball cartridge.

This arrangement has brought about two other modifications concerning :

- the cartridge case which ressembles now a small .284 WINCHESTER

- the lips of the clip, which have been stretched so as to be able to grasp the cartridge tightly while remaining compatible with the rifle's other accessories (loader, bandoleer...).

On the other hand, it has been necessary to study a new magazine, the clips of which are better suited to lead these rebated rimmed cases.

At present, works are dealing with this magazine so as to make it really polyvalent with ALL the cartridges which are used (service ammunition, blank, dummy, a.s.o.)

PERFORMANCES OBTAINED

The results which are presented are relative to the works state of advancement in May 1981.

With the objective of a presentation to the technical official services by the end of the year, the results of these works evolve every day, and will not be definitely fixed until December 1981.

This being said, the nature of some of the tests may surprise, but one should keep in mind that this is about a pratice system where, up to a certain extent, men and projectiles will have to coexist with somme reservations (it has not happened so far, but this projectile can cause an almost fatal wound up to 60 m and a certainly very severe one up to 100 m).

Interior ballistics

At the end of this stage of the study, it should be possible to choose a powder and a charge, so as to get in a way the required performances :

- a momentum sufficient to allow *automatic* firing

- a maximum pressure compatible with the mechanical strength of the projectile for all temperatures ranging from − 15°C to + 40°C (5° F to 104° F)

- taking into account the small mass of the projectile, the chosen powder had to be very fast burning, with a low density so as to have a good loading density of the case, and therefore good pressure steadiness.

The double base powders have been eliminated because they proved to be far too erosive. Within 400 or 500 rounds, the beginning of the rifling is almost erased !

In the scope of this study, the results obtained with various temperatures for the same powder have been tabulated hereafter (table I).

In table II the temperature is constant but with a different powder in each case. The charge is the lowest possible providing reliable automatic functionning, with less than 1 per cent jamming incidents. In fact, the charge from one powder to another varies very little, about one grain differences (.065 g).

Conditions :
- Pressure gun with electronic transducer
- average firing : three series of ten rounds
- bullet :.65 g boattail F1
- brass cases.

TABLE I

t°	V_{25}	σ_V	Pm	σ_p	Tb	σ_T	S
+40/104°	833	32	1024	96	1,05	0,07	3
+21/70	815	18	980	40	1,05	0,06	2,5
- 15/5°	775	27	900	60	1,1	0,07	3

t° = temperature - ° C/F
V_{25} = velocity at 25 m from muzzle (m/s)
σ (v, p, t) = standard deviation
P_m = pressure (electronic and bar)
t_b = barrel time (m/sec)

$$S = \sqrt{\tfrac{1}{2}(\sigma_X^2 + \sigma_Y^2)}$$

In both tables, accuracy is quoted for information only. However it can be derived from the values mentioned in table I that accuracy *remains satisfactory in the whole range* of temperatures, it can hence be concluded that bullet material and design are suitable.

TABLE II

Powder	V25	σ_V	Pm	σ_P	Tb	σ_T	S (+)
BPs 100	1030	20	1815	115*	1.01	0.05	≤ 2 cm
BS 30 Ba	815	18	980	40	1,05	0.06	≏ 2,5cm
GBPs**	920	13	1254	53	0.95	0.06	≏ 2.5cm

t° = 21° C / 70°F
(*) = queerly enough, the highest σ_p, yet the lowest S
(**) = discarded (too erosive)
(+) = indoor range at 100 m

EXTERIOR BALLISTICS

Ballistic tables

Traditionally, the designing work for a new cartridge always results in a great number of test data being collected in two large families :

on the one hand interior ballistics,
on the other hand exterior ballistics, the latter resulting eventually in a ballistic table.

The case of terminal ballistics in definitely beside the question for the moment.

The interior ballistics data could be gathered with little difficulty.

Reversely, it has not been so far possible to establish complete ballistic tables beyond 200 m's range.

Actually, beyond this distance, the trajectory becomes so randomly that it is practically impossible to display the measurement facilities.

Let us quote two observations in support of this assessment:

at 100 m's range, the accuracy of such bullets is comparable to, and maybe better than *that of ball ammunitions.*

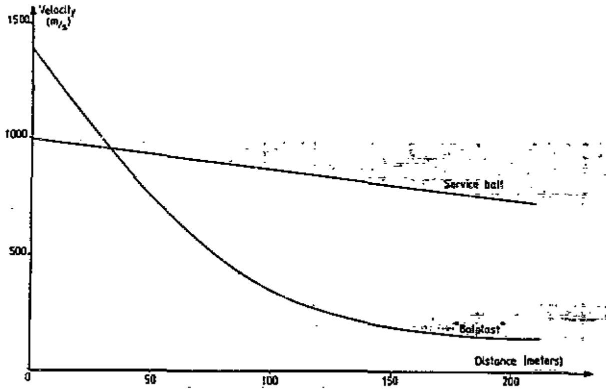


FIG:5 VELOCITY V DISTANCE (Service ball and "balplast")

Reversely, at 300 m's range, whereas accuracies of 10 cm s 15 cm are frequent for service ammunition, out of 10 balplast fired at a 6 by 6 m target standing at the same range, 3 bullets only impinged the cardboard.

Again, during the maximum range evaluation tests, the proving ground had to be chequered on a large area to help recover the bullets on the ground. In particular, 3 m/s gusts of wind may alter the range by over 100 m, which is easily explained by the low weight of the projectile, which has approximately the same bulk as the M 193.

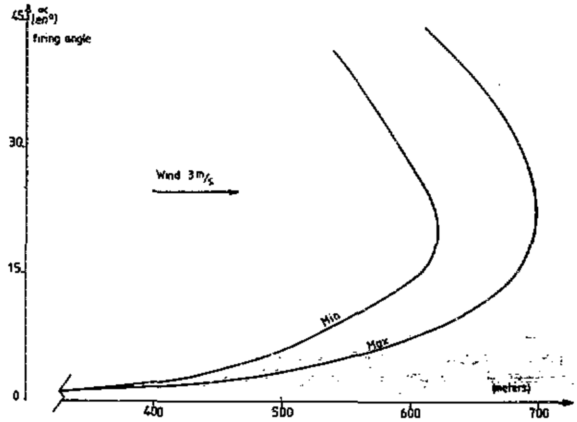


FIG:7 RANGE

This summer, (1981) an extensive testing program is scheduled for determination of the velocity vs range data as far as the flight can be detected, this being capital information for reliable determination of safety area.

Last year during trials with a view to determine the ballistic table of a 5.56 bullet, doppler radar (type vezero-graph lambda 10) was used to follow the trajectory of the projectile up to 900 m's range.

Today this facility seems to be our only hope to try and determine the velocity of balplast at the end of flight, without having to close the horizon with acres of cardboard.

The results obtained up to now are gathered in table III hereafter and are also to be found in figures 5 and 7.

TABLE III

Range (m)	Velocity (m/s)	Energy (J)	Energy density (J/cm^2)	ft.lb/sq.in
5	1050	330	1290	6030
25	810	218	850	3970
50	550	100	390	1820
100	320	34	133	620
200	180	10	39	180
X?	130	5,5	21.5 (*)	100

(*) On the basis of Gl. JOURNEE's works (7) it is considered in France that the limit of bruises and wounds in the soft parts of a naked man is reached when the energy density of the bullet is 21 J/cm^2.

Considering this value, the velocity threshold should be about 130 m/s (425 ft/sec), and hence the limit of the hazardous area should be about 250 to 300 m (1,000 ft), which confirms the result of the safety area determination led in 1964 for the Mle 61 bullet of the 7.5 mm cartridge.

In order to give a more precise idea of the magnitude of this energy density .Ib/sq.in.), this corresponds approximately to the energy of a No 7 ½ pellet 70 yards from the shooter.

NOTA : For this and the following paragraphs, all data quoted refer to firings performed with rifles equipped with a balplast kit ; the

the production line, and have fired about 1,500 rounds in previous tests. All firings are performed by able shooters (not marksmen), using the production type

bipod.

Accuracy

On firing balplast cartridges with the rifle, a displacement of the mean point of impact is observed with respect to the results obtained with ball ammunition.

This displacement results in a target at 100 m's range by : (cf. fig. 9 hereafter)

3 to 5 cm drift to the right
15 cm rise in elevation

It is most likely that nothing can be done as regards the drift, the latter being inherent to flight physics ; on the other hand, it has been observed that by adding a muzzle mounted device, it was possible to decrease, and even suppress the rise in elevation. Works are being led in that line.

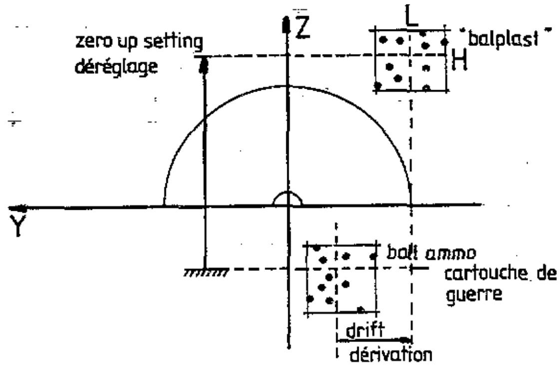


Fig. 9 Shifting of the mean point

Table IV is a report of the results obtained on rifle firing in the conditions below :

- indoor range
- firing on the bench with bipod as a rest
- metallic sights
- rifle Nr P 127 equipped with Balplast adapter
- 10 rounds series fired shot by shot
- BS 30 Ba powder

TABLE IV

V5(m/s)	(m/s)	H + L	S	Z	Y	Δ Z	Δ Y
1045	40	16.7 19.1 20.3	2.8 3.2 3.3	19.6 24.3 18.3	4.4 7.9 8.1	15 (up)	3/5 right

NOTA : Unless otherwise mentioned, all measures are in cm.

Time of flight

The system being designed for elementary training and practice to automatic firing, its utilization should in no case develop in the shooter reflex behaviour differing in any way from that implied by firing service ammunition.

We have seen above what concerns accuracy (group and zero). For time of flight, all data obtained are tabulated versus time of flight of the service ammunition in fig. 6.

At 100 m's range, the time of flight of balplast is 0.05 sec longer than that of the ball ammunition, which would result in a necessity for 25 cm correction in the case of a target moving sideways at 5 m per sec velocity (which is a maximum).

In the same conditions, between ZERO and 70 m, target correction is less than 10 cm (plus or minus).

Such values should prove a hindrance for the probability of hit, as well in shot by shot firing as burst firing.

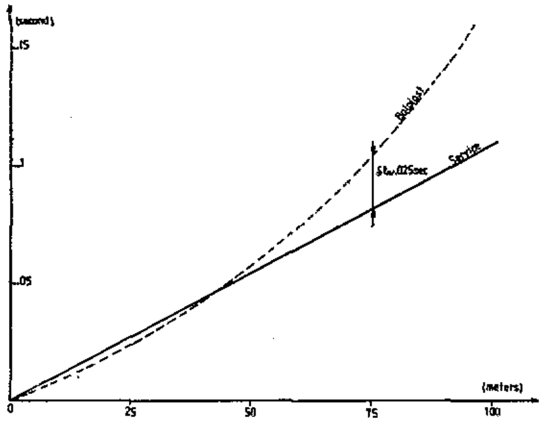


FIG:6 TIME OF FLIGT

SAFETY

The maximum range is about 500 to 700 m, according to wind velocity, but at such distances, the danger is null.

300 m is likely to be the limit retained for the hazardous area (according to the criteria taken in consideration).

The system being liable to be used in firing course practice, the necessary protections and the behaviour of the projectile at short range had to be determined :

At 45 m (50 y) and for a remaining velocity of 800 m/sec (2,620 ft/sec) under zero incidence, the minimum thickness of protective material is :

- 100 mm for poplar wood
- 6 mm for 2017 A light alloy (AU4G)
- 3 mm for A 33 mild steel

50 % penetration of 41 mm thick poplar wood is obtained at 600 m/sec velocity, that is at 65 m's range (71 yards)

Rebounce

Still in the scope of firing course practice and more precisely for street fighting, or cine simulator the behaviour of the balplast on impact against various materials was observed :

a) in all cases there is no rebounce or fragment projection beyond 7 m above the limit angles of impact given hereafter :

- mild steel	10°
- light alloy	30°
- concrete	60°
- wood	80°

As concerns wood, the projectile sticks deep into the protector and does not get through, even should 5 or 6 projectiles stack up in the same hole. For other materials the projectile breaks up into unsignificant fragments with less than 7 m lateral range.

b) beyond the above mentioned limit angles, the projectile more or less deformed, will skid along the surface. Use of metallic plates for protection is therefore not advisable if grazing fire is likely to be performed.

Foolish interferences

Experience unhappily proves that every year, in spite of all advice, some unconscious people (the term is euphemistic) will meddle with cartridge modification, and get spectacular ballistic results endangering not only their own lives but also their neighbours'.

It is worth knowing what will happen if a service ball is mounted instead of the balplast. Considering the type of powder used (BS 30, hence fast burning), we may wonder which end the whole stuff is to be expected to pop off... We plan to film the experiment for training purpose.

CONCLUSIONS

This communication is the syntheses of works led by the research teams in 4 arsenals of GIAT :

Pyrotechnics and cartridges	A.L.M.	Atelier de fabrication du Mans
Pyrotechnics and cartridges	A.T.S.	Atelier de construction de TARBES
Rifle	M.A.S.	Manufacture Nationale d'Armes de SAINT-ETIENNE
Project management	E.F.A.B.	Etablissement d'Etudes et de Fabrications d'Armement de BOURGES

It reports the present stage of development in May 1981 of the "shortened range practice system" adapted to the French assault rifle.

The system definitely maintains the same human engineering and performance criteria of the service weapon, and provides the same types of *firing modes as with the ball ammunition.*

In particular, the system will allow training of the combat group to instinctive automatic firing in adapted firing courses with a hazardous area limited to 300 m.

There still remains much to be done before final homologation, yet the characteristics of the system are already definetely settled and production

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