

U.S. M1 Rifle, cal. .30-'06.

M1 RIFLE CONVERSIONS TO 7.62 MM. NATO

Several methods are in current use to alter the .30-'06 M1 rifle to the NATO cartridge By Col. JIM CROSSMAN, USA (Ret'd)

FROM the time the 7.62 mm. NATO cartridge first became a recognizable shape as the T65, the idea of converting .30-'06 rifles and machine guns to handle the new cartridge has been most appealing. Well before the T65E3 was standardized as the 7.62 mm. NATO, a number of studies and experiments had been conducted to determine the problems involved in converting the M1 rifle, Browning Automatic Rifle, (BAR), and the Browning machine guns to the new cartridge.

If you were thinking about converting your own rifle from .30-'06 to the 7.62 mm. NATO cartridge, you would want the answers to 3 questions: Will the conversion work satisfactorily; what will it cost me; and what will I gain?

Periodically the same questions are raised in military circles, as new people take office, as requirements change, or as new ideas come along. Until recently, the answers always added up to "No conversion". As the result of a comparatively new technique, however, there has been considerable recent interest in the subject.

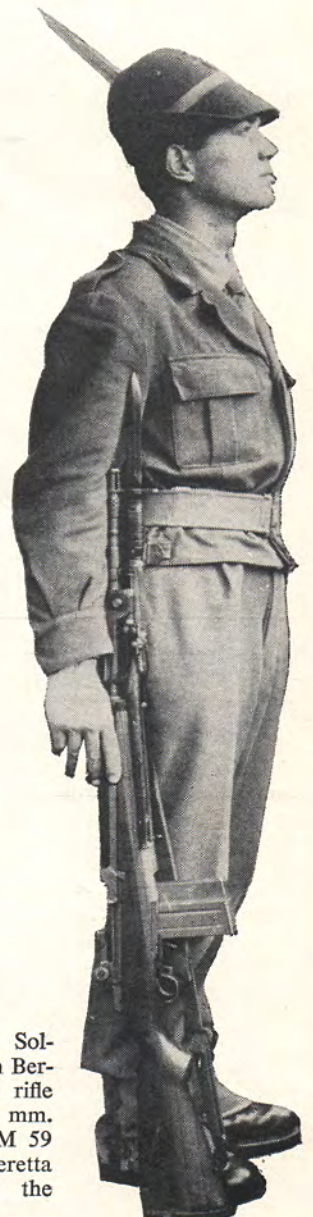
What is involved in converting? The bullets and the cartridge bases of the 2 rounds are the same diameter, and the main difference is about $\frac{1}{2}$ " of length. However, the 7.62 mm. NATO case is the short one and it is not easy to fill up the $\frac{1}{2}$ " space in the chamber. One solution would be to cut off the barrel the right amount and touch up the chamber. The M1 rifle barrel, however, has many external cuts, slots, and holes, and changing all these is such a chore that the rechambering idea is abandoned quickly. It has been found cheaper to

make a new barrel chambered for the 7.62 mm. NATO cartridge than to rechamber an M1 barrel.

With a new barrel installed on the rifle, how about the feeding? Since the 7.62 mm. NATO cartridge is shorter, it can be moved forward in the magazine, which has the advantage of giving the bolt an additional $\frac{1}{2}$ " of overtravel which might improve functioning under bad conditions. This would require a special clip and additional work on other parts involved in the feeding. With the cartridge located back in the magazine, where the base of the .30-'06 case now is, feeding is satisfactory. To help hold the cartridges in this rear position under recoil and rough handling, and to prevent inserting a clip of .30-'06 by accident, a filler block should be placed in the magazine well.

Functioning

The M1 rifle was known to be rather sensitive to muzzle pressure, since the gas port is quite close to the muzzle. The 7.62 mm. NATO round was designed around Ball powder without much concern for muzzle pressure. It comes as no surprise to find that the converted rifle does not function well without additional help. The help can take the form of a gas system moved farther to the rear, but this involves dwell time, gas pressure, weight of parts, residual pressure at unlocking, and so forth, which require many rifle changes. A simpler solution which gives reliable functioning is to open up the gas port in the barrel. This port is normally 0.085" in diameter and open-



Italian Alpine Soldier armed with Beretta Model 59 rifle in cal. 7.62 mm. NATO. The BM 59 rifle is the Beretta conversion of the U.S. M1 rifle.

ing it to 0.100" should be a solution.

In early 1950 Ordnance made up a number of T35 rifles with these changes, and the rifles performed reasonably well, although there were still a few bugs that needed attention. Other M1 rifle conversions have generally followed the same principles—modify chamber, feed, and gas system.

It is not surprising that converting from .30-'06 could give some problems, when the 7.62 mm. NATO cartridge is examined closely. While basically it is like the .30-'06, the 7.62 mm. NATO eliminates some weaknesses of the .30-'06 and introduces some minor differences which do not escape the critical attention of the gun mechanism. Obviously the chamber must be changed. A magazine filler block is also desirable. The 7.62 mm. NATO cartridge may leave the guiding lips at a different

angle, and will have ½" of motion which is not as well controlled as with the longer cartridge. The center of gravity of the cartridge will be in a different location.

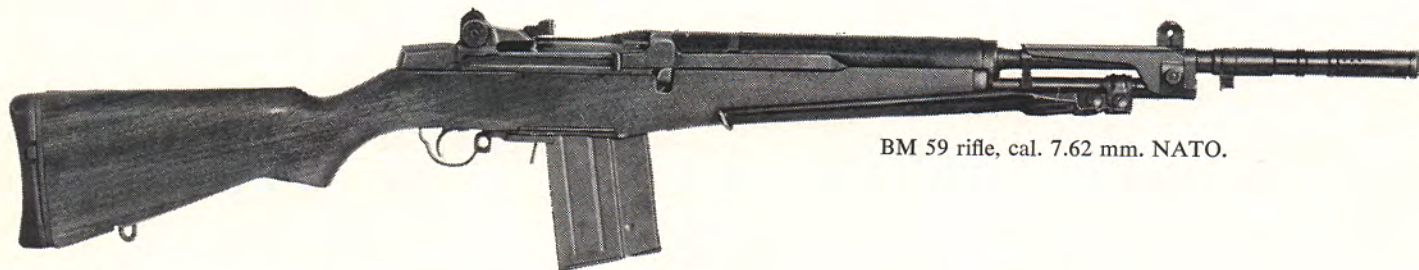
Not so apparent is the fact that the rim thickness is about 10% greater on the 7.62 mm. NATO and an extractor might have trouble reaching that extra distance. The shoulder angle is also steeper on the new cartridge and, finally, its case has less external taper than the .30-'06. Where the latter has a taper of .0165" per inch, the 7.62 mm. NATO has only .012". With the same base diameter, this means that forward of the base the 7.62 mm. NATO case will be fatter, amounting to .014" at start of the 7.62 mm. NATO shoulder. While this may not seem like much, with the 8 rounds in the M1 rifle clip the change is considerable and notice-

able; with 20 rounds in a box magazine, the difference in diameter may cause some real problems.

Despite these difficulties, the 'simple' conversion can be made to work, but results only in an M1 rifle which will shoot the 7.62 mm. NATO cartridge. Some of the not-so-simple conversions end up with an M14-like rifle, using the M1 receiver and action.

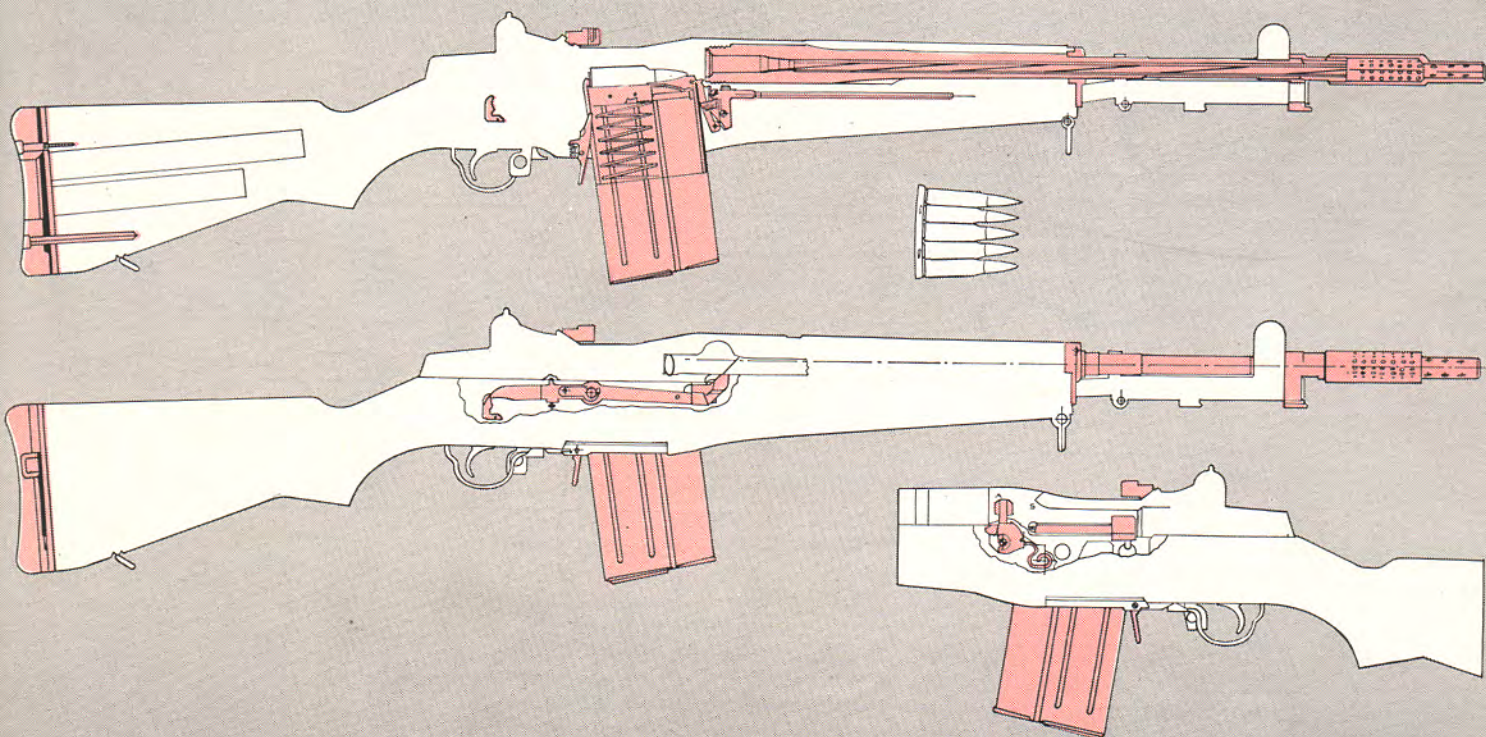
More elaborate conversions

The Italian gunmaking firm of Beretta has probably done as much of this as anyone. A few years ago Beretta tooled up to manufacture the M1 rifle, and made about 100,000 of them, so they are familiar with it. Their conversion of the M1 to 7.62 mm. NATO—which they call the BM 59—ends up as 6 different models, depending on



BM 59 rifle, cal. 7.62 mm. NATO.

The Beretta conversion results in a nearly new rifle with full automatic fire, a new gas system, and a 20-round box magazine. The drawing illustrates (in color) the new parts manufactured by the Beretta firm for the conversion.



choice of stock, bipod, grenade launcher, and other accessories. The basic rifle conversion, however, is the same in all.

The Beretta conversion is a major rebuilding of the M1 rifle, since:

Only 34 M1 parts are unmodified (including 14 in the sight); 13 M1 parts are used with some Beretta modifications, including the operating rod, stock, receiver, bolt, etc.; 25 parts are made by Beretta for this conversion; 18 parts or assemblies of the M1 are not used.

The finished BM 59 rifle has a new, shorter barrel chambered for the 7.62 mm. NATO cartridge, a 20-round detachable box magazine, selective full- or semi-automatic fire, and a modified and relocated gas system. This is obviously not the company-mechanic sort of conversion, but is a rifle rebuilt from rubber buttplate to new muzzle brake depressor flash-hider. Nor is it cheap, since Beretta is quoting more than \$40 for the complete task. This, of course, includes stripping the rifle, examination of parts for wear, modifying or making new parts, assembly, and testing. It is no small-time operation, as Beretta has

converted over 50,000 M1 rifles to the BM 59 version and they have a capacity of several thousand a month.

The Belgian firm of FN (Fabrique Nationale) has taken a little different approach. The FN solution is much easier and simpler, therefore costing less, but it doesn't do as much, either. They ream out a portion of the chamber in the vicinity of the cartridge shoulder, and insert a sleeve which is of 7.62 mm. NATO dimensions inside. The barrel is heated and the sleeve chilled for insertion, so that at normal temperatures there is a good, positive interference fit which can be controlled by chamber hole diameter and sleeve outside diameter. As a final step, the chamber and sleeve are reamed to 7.62 mm. NATO dimensions.

To give proper functioning, FN opens the gas port in the barrel. To help out in the feeding they make a small change to the follower arm, and slightly spread the lips of the M1 clip to reduce the effort of stripping the fatter 7.62 mm. NATO case.

The FN conversion is simple, cheap, and relatively easy to do. The net result

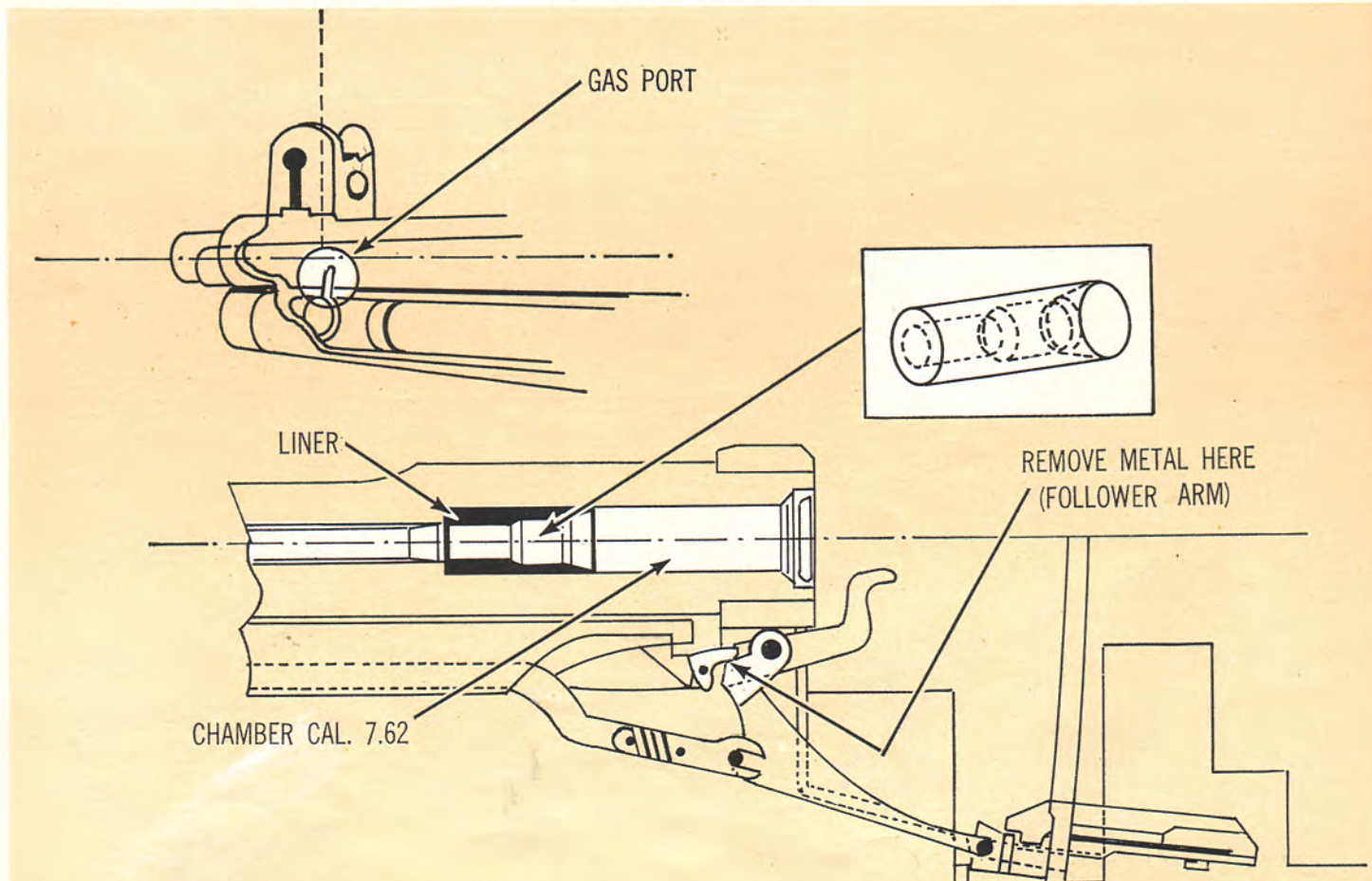
is no improvement over the standard M1 rifle, except that it will now function well with the 7.62 mm. NATO cartridge. Most other developers have not found it necessary to change the clip.

Simple chamber sleeve

While the FN conversion might seem like the simplest possible, our Navy devised an even simpler method. Using a scheme patented jointly by Navy Commander Haley and Navy civilian O'Connor, Burt Munhall and technicians at the H.P. White Laboratory worked out the details. The basis is a steel sleeve, a little less than an inch long, with the dimensions of the .30-'06 neck and shoulder on the outside and the 7.62 mm. NATO inside. The sleeve is slipped on the end of a 7.62 mm. NATO cartridge, the assembly chambered, the rifle fired and there you have a rifle rechambered for the 7.62 mm. NATO. Usually, at least!

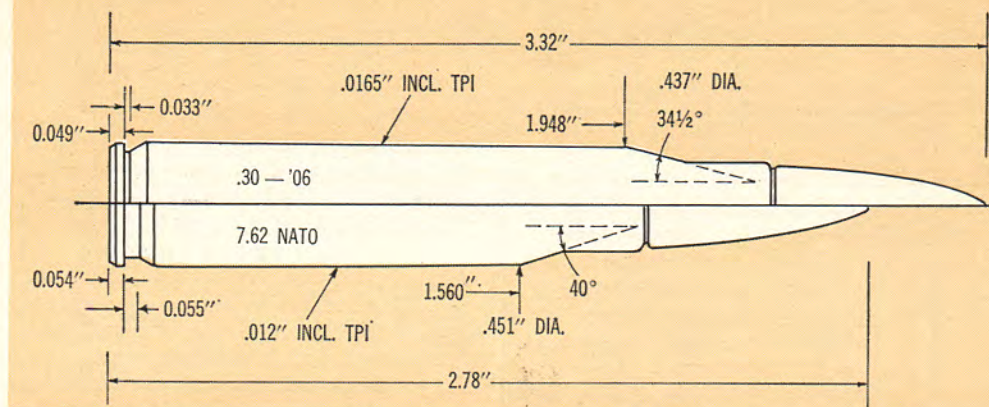
Does it work? I have seen it work; I have also seen it not work. The trick lies in getting the sleeve to stick in the chamber. This depends on metal of the

The M1 rifle conversion of the Belgian firm of Fabrique Nationale is simpler than that of Beretta. A portion of the chamber in vicinity of the cartridge shoulder is reamed out, a sleeve of 7.62 mm. NATO cartridge dimensions inside is inserted, and then the chamber and sleeve are reamed to finished dimensions. In addition, FN opens the gas port in the barrel, alters the follower arm slightly, and spreads the lips of the M1 clip to make it easier to strip the fatter 7.62 mm. NATO case (spreading operation shown on facing page).



sleeve, cleanliness of sleeve and chamber, their finish, and their relative dimensions. Sleeves have come out in the first clip, and they have stayed through thousands of rounds. Some of the torture tests have involved endurance firing, firing with the barrel extremely cold, and firing until the barrel was very hot and quickly cooling it with water or compressed air.

The steel of the bushings is important, as the White Laboratory found when they made sleeves of old barrels and could not make them stay in. A softer alloy helped considerably. It is necessary that the chamber and the sleeve be clean of oil or solvent. With the tremendous number of M1 rifle barrels made in the past 25 years, by many different makers and often accepted on specification waivers, not to mention varying amounts of wear and rust in used barrels, it is no surprise that the chambers are not all alike. At one time selective fitting was tried, with several sizes of bushings, but this has several obvious disadvantages. After considerable experience and varying success, and



Differences in dimensions of the .30-'06 cartridge and the 7.62 mm. NATO cartridge.

after trying varying cures for the failures, the Navy settled on a system that involves some additional work but practically guarantees chamber retention.

After the barrel has been inspected and found to be usable, the chamber is reamed to maximum .30-'06 dimensions (or slightly over). This means that all chambers then are the same size and that bushings can be made in one size to fit the known dimensions after reaming. Then a series of grooves is cut in the throat portion of the chamber. Actually instead of annular grooves it was found easier to cut a fine-pitched thread, V-shaped and about .004" deep, covering the neck of the chamber. A sleeve is inserted in the threaded chamber, and one high pressure and 4 standard rounds are fired. The sleeve is now so well seated and locked in place that a force of 1000 to 2000 lbs. is required to pull it out. The final step is then to run in a 7.62 mm. NATO reamer, which finishes the chamber to proper dimensions.

The H.P. White Laboratory also found that it was necessary to open up the gas port and to put a filler block in the magazine well. So with 2 simple parts, 2 reaming operations and one easy drilling operation, the rifle is re-done to handle the new cartridge.

In Fiscal Year 1964, American Machine and Foundry Co. made 12,000 conversions in the old Naval Ordnance Plant at York, Pa. AMF also has 10,000 to do in 1965, with Harrington & Richardson doing 15,000.

Although the subject so far, and the one of most interest, has been the M1 rifle, this is only one of the military small arms using the .30-'06 cartridge. The Browning Automatic Rifle (BAR) and the various Browning machine guns are used alongside the M1 rifle and should be considered for conversion to simplify the whole system.

The BAR conversion is much like that for the M1 rifle and not a difficult job. The chamber is sleeved and the gas ports in the barrel and the gas cylinder are opened up. The magazine filler, in the case of the BAR, is put in the rear of the box magazine, so as to

force the cartridges forward. This gives better functioning than with the cartridges to the rear.

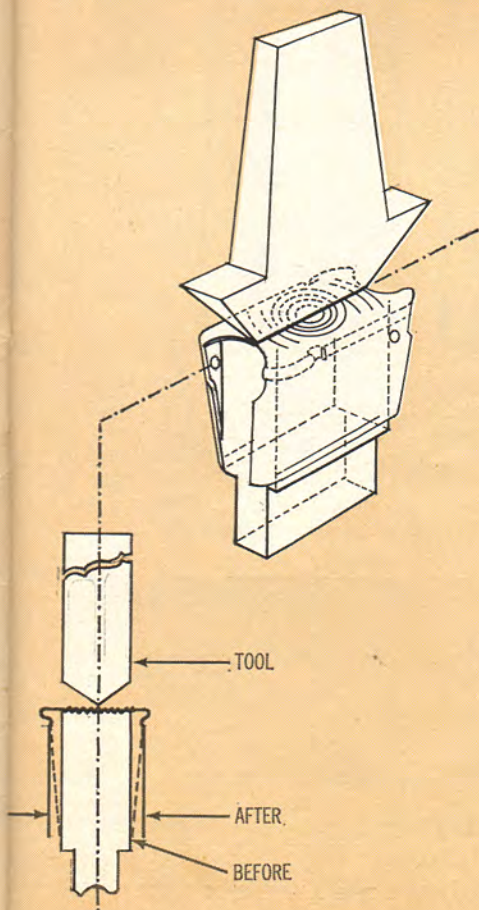
While the M1 and BAR conversions are not complicated, the Browning machine gun is something else. Feeding the belt-loaded ammunition into the receiver, out of the belt, and into the chamber is the problem.

These guns were designed for use with a solid link—originally a web belt with pockets in it. The cal. .30 metallic link M2 surrounds the cartridge, which acts as the connecting pin between links. If the M2 link is used on the 7.62 mm. NATO round, it is very tight because of the fatter cartridge case. A link of this type, modified for 7.62 mm. NATO, was used in considerable Ordnance testing and proved to be all right. But this would complicate the supply system, since it would require a different link than used in the standard M60 machine gun.

M60 push-through link

The M60 gun uses a U-shaped push-through link which only partially surrounds the cartridge. The cartridge is forced straight forward through the link by the M60 bolt. On the Browning guns, however, the cartridge is pulled to the rear out of the belt, then fed down onto the face of bolt and forward into the chamber. After some work, the H.P. White Laboratory found there was no real reason why the 7.62 mm. NATO cartridge could not be pulled to the rear out of its M13 link. By turning the belt over on its back, plenty of room was obtained and the necessary gun modifications were simple and strong. This requires feeding from the other end of the belt, but by a stroke of good fortune, belts come packed in their containers with both ends exposed, which works out just right and enables a converted Browning gun to use the same standard 7.62 mm. NATO belts and packing as the M60 gun.

What happens if a sleeve should pop out? In the M1 rifle, a first-class stoppage is usually the result. In many bolt-action rifles, the BAR, and the machine guns, the main indication must be short



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cases fire-formed to fit the long chamber, which the firer might not notice.

The M1 has a strong spring-loaded ejector in the bolt face, which is depressed by the base of the cartridge so that the extractor can snap over the rim of the case. With the 7.62 mm. NATO cartridge in the .30-'06 chamber, the extractor forces the cartridge far enough into the chamber so that the extractor and firing pin cannot reach it and a stoppage results. If the bolt is then worked by hand, the next round feeds up and is jammed against the cartridge in the chamber. The bullet usually marks the primer quite heavily and there is some chance that this might fire the seated cartridge with the bolt open, giving a disastrous explosion. It probably will be very infrequent, but it can happen. Even if it does not fire, the round is jammed in the chamber and a nuisance to get out.

In the BAR and such Mauser-type rifles as the Springfield, the round feeds up under the extractor as it leaves the magazine, and is held so it will normally fire when the hammer falls. The Browning machine gun holds the cartridge in a T-slot in the bolt face and it should normally fire.

Obviously this sleeving is not the sort of thing you would do to your best match rifle. When the job is finished, there is an added $\frac{1}{2}$ " of free run before the bullet hits the rifling. This probably will not make any major difference in a combat rifle using combat ammunition, since these must be made to rather generous accuracy figures. Although the handloaders might be interested, the 10" rifling twist of the .30-'06 as against the 12" twist used in the 7.62 mm. NATO should not make any practical difference with the military bullets.

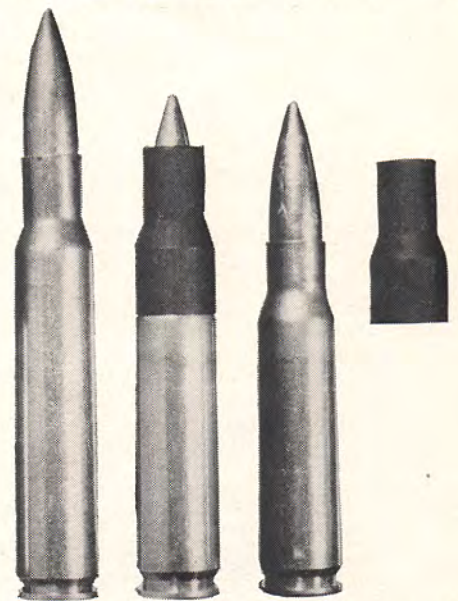
Should it be done?

With thorough proof of what was never in doubt—that it is technically possible to convert weapons from .30-'06 to 7.62 mm. NATO—the real question arises as to whether it should be done. The technical man says the conversion can be done. The combat soldier says he gets no better equipment from it. So it falls on the logistics expert to consider all the aspects and come up with the answer. An answer, incidentally, which changes from time to time, as the various factors which go into it change.

What will the conversion cost? How many rifles, BAR's, and machine guns are there to convert? Should the rifle be converted? The BAR? The machine guns? Are these existing weapons ready for issue, or must they be overhauled in any event? What about the stocks of .30-'06 and 7.62 mm. NATO ammuni-

tion? Are adequate production lines available for the 7.62 mm. NATO, its link, and other accessories? How about issuing the .30-'06 weapons to certain areas or to certain forces only? Would it be better to spend the money in buying a smaller number of the new improved 7.62 mm. NATO weapons?

These and many other questions are enough to make any conversion a real problem. So far, the Army and the Marine Corps have looked at it and concluded they did not want to make this chamber conversion. The Navy has different problems and has come up with a different answer. As the answers to the individual questions change with time, so may the over-all answer. In the minimum conversion, the one thing gained is uniformity of ammunition manufacture and supply. Having only one rifle-caliber cartridge for all rifles, machine guns, tanks, and helicopters, the same cartridge used by other NATO countries, has many advantages. The recent addition of the 5.56 mm. cartridge raises some questions about this, however. Whether or not a conversion is worth while is thus a hard decision. ■



(Above) The crux of the U.S. Navy conversion is a sleeve of .30-'06 dimensions on the outside and 7.62 mm. NATO dimensions on the inside. The sleeve is slipped over the neck of a 7.62 mm. NATO round and fired in an M1 chamber. (Below) A filler block is fastened to the M1 rifle bullet guide.

