

ORDNANCE

# Rockets For Tomorrow's Warfare

## Self-Propelled Projectiles May Take Over Parts of Functions Now Performed by Artillery and Aircraft

By DR. FRANK THONE

**C**ITIES of what we used to call the civilized parts of the world now cower beneath the looming menace of raiding airfleets that may ride out of tomorrow's dawn (or tonight's dark) to kill and demolish with TNT, gas, and flame bombs.

A new horror can be added to the infernal *Ragnorak* that now impends. Rockets, that we have always known merely as pretty things to shoot up into the sky on Fourth of July nights, may presently come plunging out of that sky like the meteors of Judgment Day, laden with tons of flaming, explosive death.

This is not a fantastic dream of a Wellsian imagination. It is a definitely calculated possibility, backed by the cold figures of ordnance engineering.

In the professional journal, *Army Ordnance*, an officer of the U. S. Army Ordnance Reserve, Major James R. Randolph, has set forth the military possibilities of rockets as they exist at present and as they may be expected to become practical in the fairly near future.

### Long-Range Bombardments

Major Randolph sees rockets as capable even now of long-range bombardments: "In the present state of the art, there probably would be no great difficulty in equaling with rockets the performance of the German long-range gun that bombarded Paris from a distance of 75 miles. But instead of firing shots of moderate caliber at long intervals, a rocket plant could fire the equivalent of 24-inch shells about as fast as desired. Such a job would be no more ahead of present practice than war-time bombing raids were ahead of the airplanes of 1913."

The shells of the long-range gun that bombarded Paris had a caliber of only eight inches or a little over, and weighed about 700 pounds. A 24-inch shell would weigh in the neighborhood of four tons!

Potential range of such bombarding rockets is much greater than that of any imaginable gun. Theoretically at least it would be possible to fire rockets clear across the ocean, and bombard New York from Berlin. The practical limits

would be the enormous cost of such super-rockets and the difficulty of hitting the target. Even at 75 miles, Paris proved a hard mark for the Prussian gunners to hit; and rockets are subject to the same factors of inaccuracy as projectiles from guns.

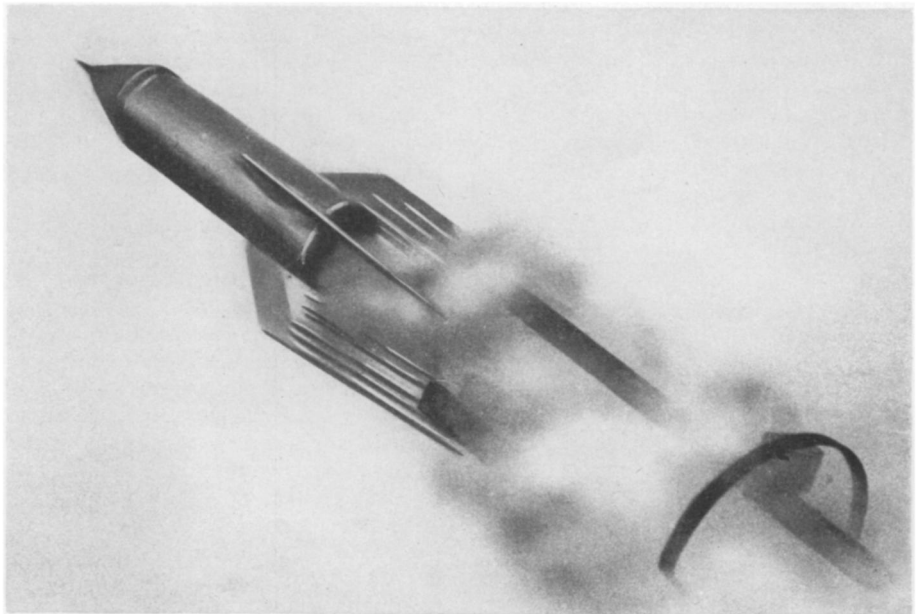
For very long flights, as in possible transoceanic rockets, Major Randolph thinks that human pilots will be carried. It will not be necessary to recruit suicide squads for this purpose. After they have guided their deadly space-ships close to the doomed target, the pilots can escape in parachutes or small planes, make a landing, and either surrender as prisoners of war or slip off into the country to start forest fires, cut communication wires, and generally raise individual hob until tracked down.

The very lack of accuracy, in unmanned bombarding rockets, is one element of their terror. One of the things that gave Parisians the jitters was that they never knew where or when the next one of those infernal Boche shells would burst. It would be very fine (from the

attacker's viewpoint) if all hits were made on arsenals, munitions works, railway stations and similar targets. Even the citizen could take some comfort in that, for he would know what places to avoid. But when a truckload of hell may be dumped into his own unimportant back yard at any moment, and without benefit of air raid warnings—well, it isn't good for civilian nerves.

Distinction must be made between the hundred-mile shots which Major Randolph thinks could be made with relatively little change in existing rockets, and the thousand-mile shots (maybe cruises would be the better term) that may be managed at some future date. Engineering principles are already known that would make such long flights possible, but as yet we lack materials that will withstand continued exposure to the temperatures and pressures necessary in the propelling blast.

There are also problems connected with fuel, that haven't been licked yet. Successful experimental rockets, like those on which Dr. Robert H. Goddard of Clark University has been conducting his researches, are powered not with the gunpowder of the familiar Fourth-of-July rockets, but with a liquid fuel such



### PORTENT OF THE FUTURE

*Something like this may come roaring through tomorrow's murky skies, laden with death and destruction.*



### VERTICAL FLIGHT

*Dr. Goddard tests a small rocket for efficiency of devices intended to insure true flight.*

as gasoline, which is made to burn more intensely by supplying liquid oxygen instead of ordinary air.

Liquid fuels and munitions don't appeal to the soldier. They're extremely bothersome to handle under rough field conditions. Military men would far rather have nice, well-behaved solids, that can be turned upside down without spilling, and that won't promptly leak out if the container gets cracked. But they would be willing to put up with liquid fuels for long-range rockets, Major Randolph thinks, if the rockets will gain them sufficient tactical advantages.

War rockets will not be confined to giant sizes and extreme ranges. Major Randolph suggests several ways in which they may be used at the front itself. Their great advantage lies in the fact that they need only a light tube for their launching, and hence can go places and do things that are impossible to ordinary cannon because of their great weight.

Rockets can be taken closer to the

front, it is pointed out; moreover "they can be carried by men, by horses, by dog sled, or by canoe through regions where wheeled vehicles cannot go."

Rocket barrage firing would be very different from the conventional field artillery bombardment, Major Randolph points out:

"The fact that the rocket's firing device would probably cost less than one per cent. of the cost of an equivalent cannon would enable a much larger number to be fired at once, and certain other characteristics of the rocket would require it.

"When a fortified position is to be reduced by cannon, the bombardment often lasts for several days, giving the enemy ample time to bring up reinforcements. With rockets, the whole artillery preparation would probably be shot off at once, or in several volleys.

### Battle, and Sudden Death

"The enemy would think himself safe in a quiet sector; his men would be out of their shelters and off their guard; then suddenly a whole bombardment of rockets would come plunging down on them, followed immediately by the attack."

Nor would rockets seek their targets only on land. Major Randolph believes that they could considerably simplify the problem of coast defense, "providing a weapon comparable in effect to the heaviest cannon, yet a great deal easier to move from place to place.

"Where a 14-inch railway gun on the move is identified readily by hostile aircraft, an equivalent rocket on the move probably would be riding in an ordinary motor truck, indistinguishable from ordinary civilian traffic."

Even more interesting is the picture offered of possible rocket-carrying naval ships: "Armor-piercing rockets, equal in power and range to a 16-inch gun, probably could be mounted on submarines, destroyers, and other small craft, making them a much greater menace to the battleship than they now are."

It would not be necessary for naval rockets to be armor-piercing. They could be fired to strike a little short of the target, so that they would plunge and explode below the armor belt, giving a torpedo effect.

In their more natural element, it is also possible that rockets might be employed for anti-aircraft defense. One of the drawbacks about using guns of large caliber against aircraft is the difficulty of aiming a heavy piece at a rapidly moving target. But the launching tube of a

300-pound rocket can be swung about more easily than an anti-aircraft cannon firing a shell weighing only a twentieth that much; and of course the bigger charge could burst much farther off its flying target and still score a knockout.

### Advantages Over Cannon

In all of its suggested uses, the rocket has two considerable advantages over the cannon. First, it keeps its velocity throughout its whole flight, until the propelling charge in its base is burned out. The shell, on the other hand, is going fastest when it leaves the gun muzzle, and is slowing down throughout its trajectory, so that it is going at its slowest when it strikes.

The rocket's second advantage is that if there is any part of the propelling charge left when it strikes, this can be so arranged that it will explode, adding its effect to that of the bursting charge in the rocket's nose.

Major Randolph does not imagine that rockets will take the place of artillery altogether. For many military purposes, the reign of King Cannon is still firmly established. But as in the World War, the jobs once performed by artillery were taken over in part by trench mortars, airplane bombs, Livens projectors and even hand grenades, so in any future war it is likely that rockets will find their part to play in the great orchestra of havoc.

Rockets are not a new thing under the red sun of Mars. They were used, with considerable effect, by the English during the Napoleonic wars. The rockets of that period were the invention of Sir William Congreve; later on, an improved type known as the Hale rocket was adopted in the British army.

The Congreve rocket was called into being by almost the same considerations that are causing military men to consider it today. The artillery of the period was heavy, difficult to move, and could not keep up with troops as they went forward in battle. The Congreve rockets, though not very accurate, could obtain considerable artillery effect, and their light tubes could be taken right along with the infantry. It had the further ad-

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## ● Earth Trembles

Information collected by Science Service from seismological observatories resulted in the location by the U. S. Coast and Geodetic Survey of the following preliminary epicenter:

Friday, Sept. 8, 7:04.8 a.m., EST

In the North Pacific, near the Aleutian islands. Latitude 52 degrees north, longitude 175 degrees east (approximately). A strong shock.

For stations cooperating with Science Service, the Coast and Geodetic Survey, and the Jesuit Seismological Association in reporting earthquakes recorded on their seismographs, see SNL, June 17.

vantage of being able to carry a bursting charge, whereas the cannon of that day fired only solid projectiles.

The Congreve rocket is permanently memorialized in our national anthem. In 1813, British frigates were equipped with these rockets, and when their fleet attacked Fort McHenry on Baltimore Harbor, one anxiously watching prisoner on a frigate deck caught glimpses through the night of a flag, still defiantly flying, by "the rockets' red glare."

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Science News Letter, September 16, 1939

### GEOGRAPHY

## Airplanes Raise Question Of How High Neutrality Goes

UNKNOWN airplanes roaring high above neutral Holland raise the question how high neutrality extends. Legally the limit of ownership is as high as up—beyond the sky is the limit. But the famous three-mile limit for ships at sea was set as the limit of shore big guns.

The highest up of anti-aircraft guns, a practical limit of neutrality, is about 40,000 feet or eight miles. Will that become the usage if not the law?

Science News Letter, September 16, 1939

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### MICROBIOLOGY

# Bacteriology of Foods Extremely Important in War

## Botulism Can be Prevented by Cold Treatment in Foods Too Delicate For Ordinary Heat Processing

"FOOD will win the war!"

That slogan, heard in the close-rationed days of 1917-18, will become loud again with war raging in the present-day world. Micro-organisms in relation to food and its storage therefore occupied an appropriately prominent part in the Third International Congress for Microbiology meeting in New York City.

Most important of the bacteria to be guarded against is the species *Clostridium botulinum*. This is not a food spoiler; it leaves the food in which it lurks innocently inviting—and strikes the eater with an always severe and sometimes fatal food poisoning afterwards.

A three-man research team from the University of Illinois, Drs. F. W. Tanner, P. R. Beamer and C. J. Rickher, told of their investigations on certain food products liable to infestation with this dangerous organism, which are spoiled for market purposes if they are given sufficiently severe heat treatment to destroy the bacteria. Fortunately, however, it was found that the same food-stuffs could be adequately preserved by cold against the deadly *Clostridium*.

From far-off Japan came a report of research on sea foods, by Dr. Yuzo Tohyama of the University of Tokyo. Characterizing his people as "the first rate fish eating nation in the world," Dr. Tohyama related how he has used more than 200 different chemicals in his search for effective means to find a disinfectant that will clear fish, shellfish and other sea foods of disease-causing and spoilage-producing bacteria and still leave them palatable and wholesome for human consumption.

Bacteria in foods are of course not always spoilers or poisoners. Dr. N. E. Gibbons of the Canadian National Research told of the role played by bacteria in the curing of the famous Canadian bacon. The bacteria swarm thickest just where the pickling fluid makes contact with the meat, and it is at this interface, Dr. Gibbons believes, that they do most of their beneficial work.

## War Against Germs

MAN'S chemical warfare against the germs that invade his body occupied a leading part in discussions. Especial prominence was given to the powerful new weapons, sulfanilamide and its related chemicals.

Just how sulfanilamide acts against bacteria is still pretty much of a riddle, it was admitted by Drs. Eleanor A. Bliss and Perrin H. Long of the Johns Hopkins Medical School. It has been known for some time that in the presence of small quantities of the chemical, germs of the group known as cocci are not killed outright but stunned or paralyzed, so that the body's own fighting forces can make an end of them. However, in the researches reported by Drs. Bliss and Long, it has also been shown that stronger concentrations of sulfanilamide kill the bacteria outright.

Another point developed was that the effectiveness of certain compounds of sulfanilamide seems to be due to their chemical decomposition, releasing "straight" sulfanilamide in contact with the bacteria.

Experiments in which sulfanilamide and sulfapyridine were used, either alone or in combination with injections of immune sera, on mice exposed to infection with meningitis were reported by Dr. Sara E. Branham of the U. S. Public Health Service:

"In general, it may be said that, weight for weight, sulfapyridine protected mice better than sulfanilamide, and that the combination of either sulfapyridine or sulfanilamide with serum gave better protection than either the drugs or the serum did alone."

## Vitamins for Microbes

THE SMALLEST plants, no less than the largest animals, must have their vitamins, hormones and other minutely concentrated but physiologically powerful substances if they are to live and grow, it was made plain in discussion be-