A FLASH-STEAM PLANT

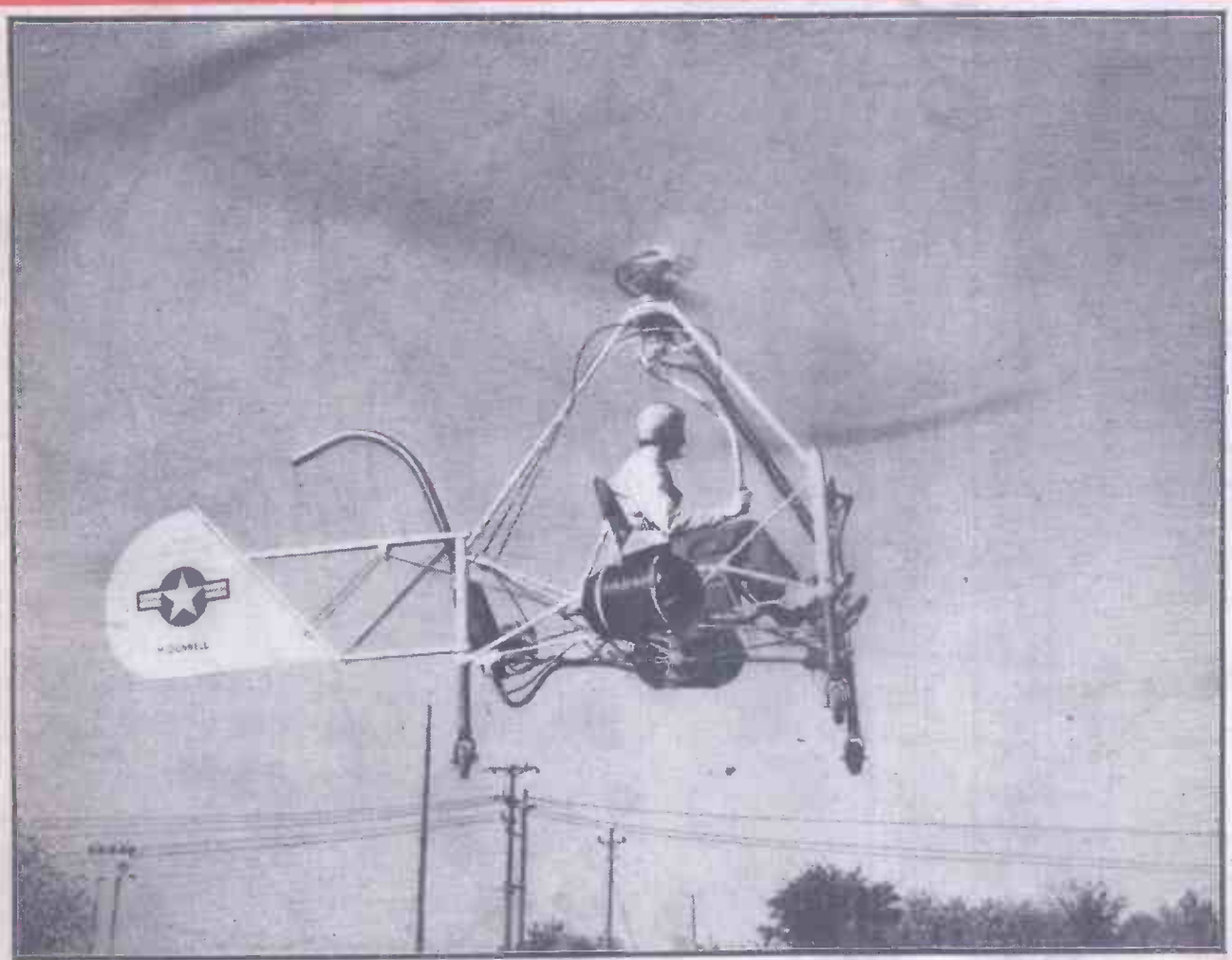
NEWNES

9D.

PRACTICAL MECHANICS

EDITOR : F. J. CAMM

JULY, 1948



THE FIRST RAM-JET HELICOPTER. (SEE PAGE 325)

PRINCIPAL CONTENTS

Twenty Years from Now

Questions of the Future

By Prof. A. M. LOW

IN twenty years from now every single thing you know will be entirely different. The world will have changed out of all recognition. Judge for yourself by looking back twenty years. In 1927 the Atlantic had yet to be flown from east to west in an aeroplane. Only these few years ago the first solo flight by Colonel Lindbergh was such a sensational event that it held the headlines for days.

Look up the last edition of the Encyclopædia Britannica, published about twenty years ago, and you will find no entry for radar, penicillin, electronics and a score of inventions and discoveries which to-day every schoolboy understands.

The idea of "splitting the atom" was considered Wellsian—something that might happen some time, but more likely in the 21st century than the 20th and certainly not likely to trouble anyone living in 1927.

Aircraft, it was assumed, would always be driven by petrol engines which would become more and more powerful. The "jet" engine was not even mentioned, although in fact the R.A.F. had begun some tentative investigations which were not to be taken very seriously until ten years later. As for rockets—they were things which boys fired on Guy Fawkes night and anyone who suggested that they might be fired from Germany to London might have risked being certified as a lunatic or a sensationalist trying to disturb international peace!

A little earlier I had written one of my early books, "The Future," and some reviewers had treated its forecasts with good humour as the work of a scientist using his imagination, or an inventor having a nightmare. To-day, the book seems stale—so many of the forecasts which then seemed "sensational" have become accepted commonplaces.

Yes, a great deal has changed in twenty years. Not only in the field of the physical but in the social sciences. Men and women, their values and their customs have undergone great changes.

We can reasonably expect changes at least as great to take place in the next twenty years. Always remember that nothing ever remains unchanged for even a part of a second. If you will read any newspaper of twenty years ago you will wonder "how it could have happened." Unless you can think forward to-day, in twenty years time someone will say of you, "How *could* anyone be so careless, so wrong or so ignorant!"

In this series I shall answer some of the questions about the future which are so often put to me.

Shall We have Reached the Moon?

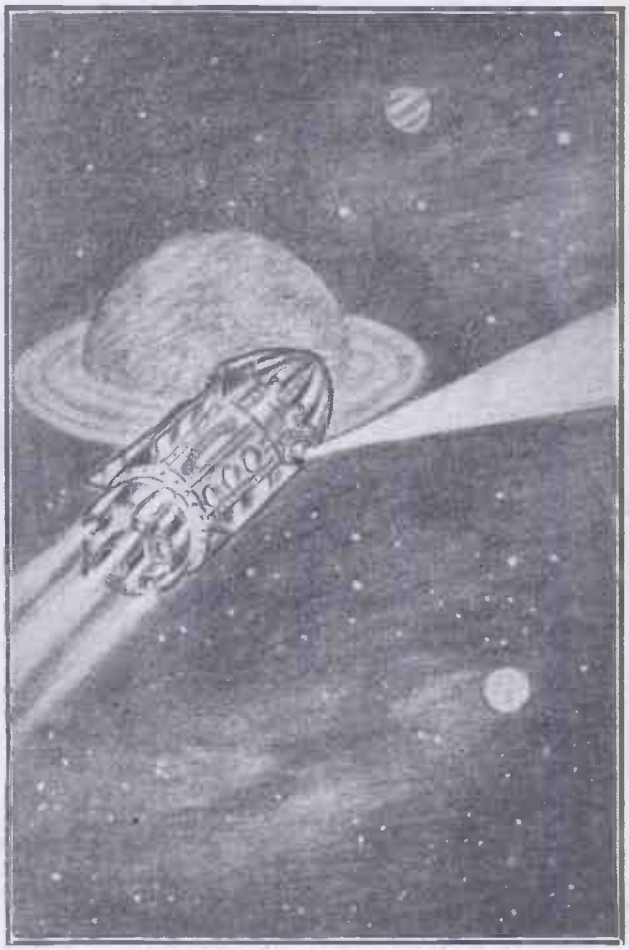
United States Army experimenters recently announced that they had sent a German V-2 rocket to a height of 111 miles from the earth and shot tiny metal slugs from it during flight at a velocity sufficient for them to escape the gravity of the earth and travel into space.

This is the greatest distance to which man has yet sent anything from the earth. But it is still a long way from the moon—to be precise, 238,730 miles. Shall we in the next twenty years see rocket projectiles improved to the point where they can travel two thousand times as far from the earth as this V-2 and reach the moon?

I think the answer is "yes." Twenty years ago it was easy for any mathematician to prove that Jules Verne's moonship was scientifically unsound and would never have escaped the clutches of the earth's gravity. To-day, the fantasy moon journeys of Verne and Wells are approaching the realms of possibility. There no longer remain insuperable "theoretical" difficulties barring the way of escape into space. It was the absence of any fuel capable of achieving the required velocity which made a moon-flight theoretically impossible until recently. Now the experts, inclined to be conservative, speak of a moon flight in from ten to fifty years. It seems to me that the first man-made "moonship" may make its journey well within 20 years and that there are people living to-day who may actually hear by radio this landing on the moon.

The first flight to the moon is likely to be as unsensational as a spectacle as was the first splitting of the atom. A guided missile of some hundreds of tons will take off and disappear into the sky. Even the most powerful telescopes will not make it possible to follow its flight, not only because of its comparatively small size, but also because of its speed. At 5,000 m.p.h. it would make the journey in about two days, but only its automatic radio transmitter sending back messages will enable us to know whether its flight has been successful.

At a spectacle it will be of no interest, but the public will, I believe, follow the flight communiques from scientists with breathless fascination. The tangible results will be a mass of figures unintelligible to all but a handful of experts. But so was Einstein's theory of relativity, and you will recall how this "hit the headlines" and influenced the thoughts of millions quite incapable of understanding its mathematics.



Our artist's impression of space-ships of the future.

Beginning of a New Era

The ordinary man will understand that this first flight by an unpiloted rocket will mark the beginning of a new era, the era of space travel so long forecast by the science-fictionists. The data obtained by the pilotless rocket will make it possible to get down to the details of a passenger-carrying space-ship which will eventually embark human beings on the most important and perilous journey since Columbus set sail. With this difference, that the first passengers in a space-ship will not have unknown perils to face, but known dangers of which the chances have been nicely calculated.

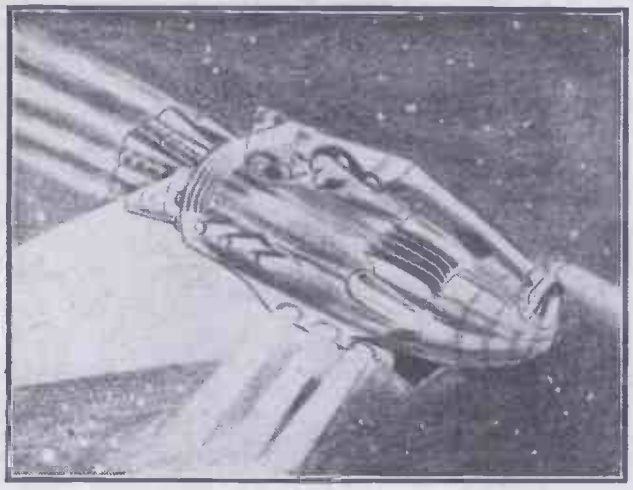
Possibly, within twenty years, more probably later, the day will come when half a dozen men will climb into a space-ship designed to encircle the moon or even land on its frozen surface. They will be men chosen from hundreds or even thousands of volunteers not only for their knowledge but for their physique and courage. Even with the many aids to space flying which will have been developed, they will have to be prepared for great hardship. To overcome the gravity of the earth and "escape," the space-ship must still attain a speed of 12,000 feet a second. To save the crew from being crushed like matchwood against the back of the rocket, this speed will be reached comparatively slowly, but they will still have to be strapped down and will suffer acute discomfort at all stages of the voyage.

Once acceleration slows down and the rocket cruises freely in space the passengers will have no weight. They will float in the air, and such simple things as pouring out a glass of water or swallowing food will be almost impossible. The release of all weight from the body will bring on acute sickness far more nauseating than sea or air sickness. Indeed, I think it probable that the experimental passenger flights which will precede the first flight to the moon will show that it is essential to produce "artificial gravity" by spinning the whole rocket-ship or the cabin inside it.

In space there will be risk of collision with a meteor. Millions of them are continually flying through the void and although the majority are very small, collision with something weighing only a pound or two at very high speed would be sufficient to destroy the space-ship. Once the pressurised cabin was punctured, death from cold would be a matter of moments. It may well be that the accident rate with early space-ships will be high, al-

though calculations of meteorite frequency suggests that this particular risk is less than that of crossing a main road.

In the next twenty years many of the technical difficulties of space flight will disappear. To-day we may wonder how the flight of the space-ship will be checked to make a safe landing, how the space-ship will be guided, how it will be powered and so on. We can suggest crude ways of overcoming the difficulties, such as reverse firing rockets for deceleration. But I think we can be confident that technicians will solve these problems. Just think how formidable first seemed deicing, variable pitch propellers, pressurised cabins, landing speeds of 120 m.p.h. and many other commonplaces of modern aviation, to the designers of early aeroplanes!



For landings on the moon, the passengers will require special suits supplying them with warmth and oxygen. The moon is without atmosphere and there are enormous drops in temperature. Suits have, in fact, already been planned, enabling men to walk, breathe and even eat in them. They weigh two or three hundred pounds, but since gravity (and thus "weight") on the moon is only about one-eighth that on the earth, this presents no serious hardship.

Light will be no difficulty. The journey will probably be arranged for the period when the earth will present a fully lit surface to the moon—a sort of "full earth." The earth reflects about 80 times as much light to the moon as does the full moon to the earth.

First Flights to the Moon

The first flights to the moon will be enormously expensive undertakings, far too expensive for private explorers. But given the incentive, the twenty or thirty millions that a space-ship might cost will not seem excessive to nations that spent this sum every day for years in warfare. What will be the incentive? There will be the natural urge to explore the unknown, the possibility of discovering valuable atomic minerals, and probably most of all the military aspect. Millions a year are being spent on the development of rockets to-day, primarily from the point of view of war, and it is this effort which makes the flight of a missile to the moon in the next twenty years seem so much more probable that it did even three or four years ago.

Commercially, the moon may seem as valueless as the Antarctic Continent when its exploration first began less than a hundred years ago. Expeditions to the moon may be as infrequent as Antarctic expeditions at the beginning of the century, although looking ahead it may be argued that if there are ever to be flights to other planets, it is from the moon, with its absence of atmosphere and low gravity, that they would best be launched. This conjures up pictures of a space-ship assembly plant on the moon, with all that will involve in constructing "pressurised" factories and even towns. To-day, it all seems wildly fantastic, but the discoveries of the next twenty years may make it seem no more difficult than, say, the construction of the Mulberry Harbours would have appeared to a 19th century engineer.

Rocket-flights of 160 Miles

In fact, during the next twenty years flight to the moon will be preceded by hundreds and even thousands of others to varying distances from the earth. The Americans have stated that within two years they will be sending unmanned missiles to a height of 160 miles and manned rockets to 15 miles. The purpose of these flights will be exploratory. A multitude of ingenious automatically recording instruments will discover all about cosmic rays, changes in temperature, reflection of radio, the danger of meteors, and many other problems that must be solved before we can venture into outer space. Postal Services at vast speeds are within our power during the next few years.

From these exploratory flights may come some astonishing developments. We may see the establishment of artificial satellites at varying distances from the earth. If a missile is propelled with a velocity below the 6.64 miles per second required to escape gravity it will eventually stop in space and circle the earth like the moon—but very much closer, a matter of a few thousands of miles. From its natural speed, we could ensure it circling the earth once a day, in other words, apparently remaining in the same spot all the time.

Artificial satellites such as this may solve our radio, television and lighting problems. If we "beamed" all radio to a re-transmitter on such a satellite, it would be re-broadcast so that it could be heard without interference or "fading" over a quarter of the earth. Four such transmitters would cover the whole world and make radio communication hundreds of times more efficient. It would be even more important in the case of television, offering the one alternative to thousands of transmitters at 50-mile intervals all over the world. These projects have been seriously discussed and worked out and they may conceivably be realised in our lifetime.

Artificial lighting may come through the electrical excitation of the gases of the air. The plan would be to have a kind of man-made "northern lights" over our big cities. Instead of thousands of not very efficient street lamps, there would be a pleasant soft gentle light from the whole sky, giving, perhaps, twice the light of the full moon.

These are only some of the possibilities of rocket travel in the more immediate future. Beyond lies the incalculable possibility of flights to Venus and Mars, flights of millions of miles compared with the quarter of a million miles of the moon, but not proportionately more difficult, for once we have "conquered gravity" great distances can be covered in space with almost no expenditure of energy. I shall probably be considered very rash in suggesting that any kind of space-ship capable of reaching one of the planets may be built before the end of the next century. I shall have to console myself with the thought that I may not be alive to be laughed at or, more practically, that H. G. Wells was considered extremely optimistic when in about 1900 he gave the date 1946 as the year in which a heavier-than-air flying machine would first leave the ground.

(To be continued)

Natural Lighting in the National Gallery

A MODEL showing what may be a great advance in the natural lighting of picture galleries was to be seen at the annual exhibition of scientific instruments and apparatus of the Physical Society at the Imperial College of Science and Technology which opened on April 6th. The model was designed by the Building Research Station, D.S.I.R., to show how the war-damaged rooms at the National Gallery might be reconstructed.

It has never been easy to daylight large picture galleries well. It is technically difficult, high standards are set, and reflections on the glass in the paintings have always been a nuisance.

At the request of the Ministry of Works, the Building Research Station has made a study of the problem, in preparation for the reconstruction of some of the war-damaged rooms in the National Gallery. A solution has been made easier by a decision to air-condition these particular rooms, so that the paintings need not be glazed. Reflections, therefore, will not be much of a problem.

There are two main difficulties. A roof-light usually has to be used; it is always so bright that the eyes adjust themselves to it rather than to the light lower down in the room. This is true regardless of the kind of glass used in the roof-light, and it means that the paintings are not seen as well as they could be. The other awkward problem is that the light on the higher parts of the walls is stronger than on the lower parts where the pictures hang. The eyes tend to be attracted to the brightest things in view, and the light upper walls are, therefore, distracting. Both factors create the impression, common in picture galleries, that the room is a sort of well, and that the paintings hang in a poor light. Shadows under deep cornices around the room often aggravate this.

Louvre System

The model showed a new proposal designed to overcome these difficulties. The essential feature was a louvre system arranged so that the strongest light faces on the paintings—not on the upper parts of the walls—and so that no direct view of sky is obtained from the main part of the floor. Thus the too-bright skylight and the bad distribution of light on the walls are both dealt with. The shallow cornice also avoids aggravating shadows. Trials with and without the louvres show that though these cut down the amount of light entering the room, they produce much more comfortable lighting and better conditions for seeing the paintings.

Other minor features have been introduced. There is a flat Laylight below the louvres to reduce the amount of air which has to be conditioned, and to help to insulate against outdoor temperature changes. Another feature is a glass louvre system outside to help to protect against the heat of the summer sun without reducing the light too much. Studies have shown what types of diffusing glass are most suitable for the louvres.