BY ROCKET THROUGH SPACE

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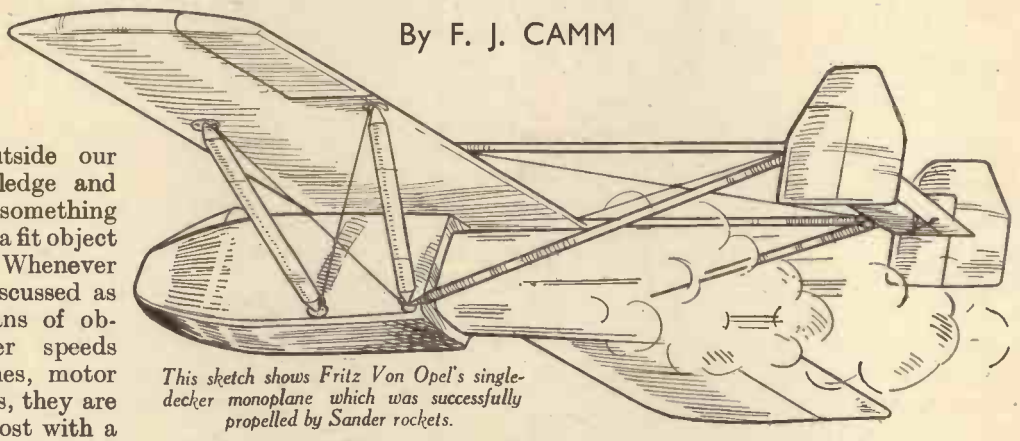
ROCKETS—THE POWER OF THE FUTURE

It Would Seem that Practical Limits have been Reached in the Speeds of Cars, Aeroplanes, and Steam Ships. Is Rocket Power Feasible? In this Article We Show that it is More than a Qualified Success and and that Rocket Power will be Used in the Future.

By F. J. CAMM



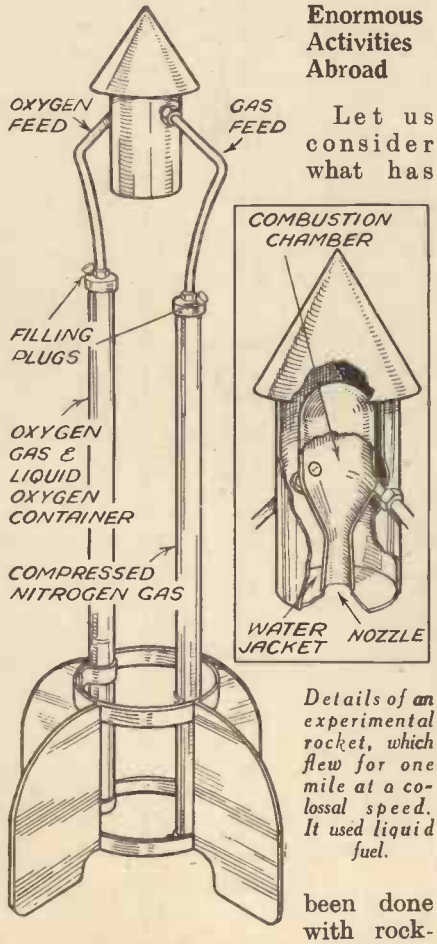
This sketch shows Fritz Von Opel's single-decker monoplane which was successfully propelled by Sander rockets.

THERE is always a tendency to regard a new suggestion outside our present knowledge and experience as something grotesque and a fit object for derision. Whenever rockets are discussed as a possible means of obtaining higher speeds with aeroplanes, motor cars, and ships, they are dismissed almost with a snigger or considered as a piece of schoolboy fiction. It was so with wireless, and with television, with motor cars, and with aeroplanes. It has been so with rocket flight. We cannot, however, continue to so regard it in view of the facts which I place before you in this article.

Prophetic

When George Stephenson named his early locomotive the "Rocket" he was more prophetic than he knew. The "Rocket" seemed like a rocket in those days, for it was faster than anything the public had known before. Mechanical travel was not then born. Speed is purely relative and what is considered fast to-day is considered slow to-morrow.

When an early motor car travelled at forty miles an hour it was considered that the ultimate had been reached. Doctors stated that a human being could not live at the speed of sixty miles an hour. Trains and aeroplanes have all travelled at speeds of over 100 miles an hour, and so we must consider in view of the practical limits set by modern methods whether even higher speeds are possible and, if so, how obtainable. We must not forget that it still takes nearly four days to travel from here to America. A long time! It takes at least seven hours to travel from London to Edinburgh. An eternity! Is there any limit to speed? Actually it is considered that speed cannot travel faster than sound, but we have a long way to go before we can travel at the rate of 1,100 ft. a second.



Details of an experimental rocket, which flew for one mile at a colossal speed. It used liquid fuel.

Enormous Activities Abroad

Let us consider what has been done with rockets. In America, Russia, France, England, and Germany there have been enormous activities in the development of the rocket engine with liquid fuel. Opel, Valier, and others have conducted successful experiments with rocket cars in Germany. Successful experiments with rocket aeroplanes and rocket boats have taken place in America.

It is chiefly in connection with air travel that the possibilities of rockets are being investigated. Already the Interplanetary Society is actively engaged on the problem. It has members in every country in the world.

Rocket Propulsion

The great point in favour of rocket propulsion is the fact that there is no engine in the ordinary sense of the word, the rocket body being propelled forward by the exploded fuel. Of course, such fuels as gunpowder and similar "firework" components were found to be both weak and bulky. The most suitable system up to now is founded on the ignition of a fuel such as petrol, benzine, or alcohol in an atmosphere of oxygen. The explosive force and power generated are simply terrific. If you look at the illustrations you will see the idea in diagrammatic form, the particular rocket there illustrated being designed to act like a shell, carrying a load of explosive substance in the forward compartment which would detonate on impact.

A Rocket Car

An illustration shows the same idea as used by the famous German experimenter, Max Valier, in 1930. This car, despite the simple nature of the power plant, developed nearly 200 h.p. and lapped the course at Tempel-

hof Aerodrome, Berlin, for seven circuits at an average speed of 90 miles per hour. It was an impressive sight as the vehicle tore along with a roar like artillery in action and a 6-ft. spear of white-hot incandescent gas shooting out behind it. Apart from the steering and brakes, the sole control was a lever which controlled the valves regulating the supply of liquid oxygen and fuel. Unfortunately the driver was killed some time after while experimenting with the use of oil, instead of spirit, as fuel. The rocket, as a successor to the engine, is, however, a tried and proven fact, and while not likely to supplant the latter for ordinary use, opens up an entirely new sphere of potential travel.

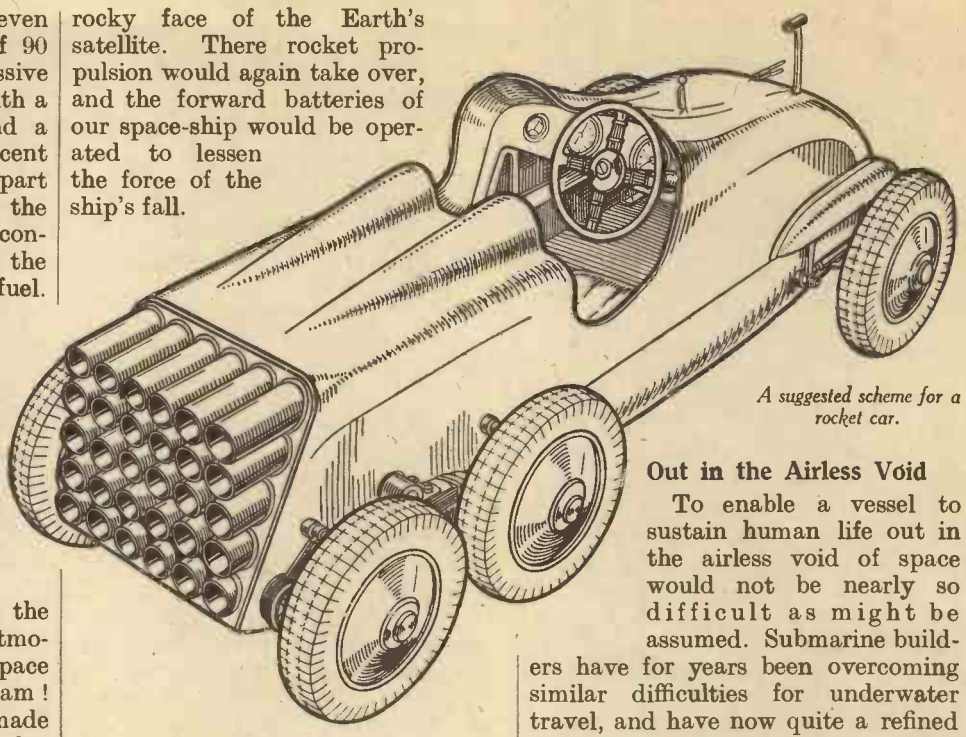
For the first time in history, the idea of travelling beyond the atmosphere and into the realms of space has become more than a mere dream ! Already preparations are being made to launch a huge rocket moonwards ; and here the fuel used will be still more powerful, being a jet of hydrogen gas burning in an atmosphere of oxygen. As every schoolboy knows, both these gases are now available in liquefied form, which means an immense volume of gas in a very small space.

Travelling to Mars

Before mankind is ready to step into a luxurious space-ship and voyage to Mars in comfort, many years may pass and much painstaking work must be done, but make no mistake, the possibility of space travel is in sight !

Just what are the obstacles to be overcome ? Briefly, they are gravitation, the vacuum (so called) of space, and distance. When the first space-ship is launched its objective will undoubtedly be the Moon, as being the nearest celestial body and situated some 240,000 miles away, a mere nothing for inter-stellar space.

Yet that " mere nothing " is decidedly formidable, judged by Earth standards, for at 50 miles an hour—roughly the speed of the London-Brighton express—it would take over 200 days, or about seven months' continuous travelling to get to the Moon. Fortunately—once beyond the Earth's atmosphere—there would be no resistance and speed would pile up to a dizzy figure as the pull of Earth's gravity lessened and that of the Moon increased. When the neutral point between the gravitation of Earth and Moon were passed, difficulty would be to slow up, and so avoid crashing into the bleak and rocky face of the Earth's satellite. There rocket propulsion would again take over, and the forward batteries of our space-ship would be operated to lessen the force of the ship's fall.



A suggested scheme for a rocket car.

Out in the Airless Void

To enable a vessel to sustain human life out in the airless void of space would not be nearly so difficult as might be assumed. Submarine builders have for years been overcoming similar difficulties for underwater travel, and have now quite a refined and stable technique for providing heat, oxygen, light, food, and other necessities of life in a hermetically-sealed hull. In emergency, the driving of stale air through lime-water, and heating of potassium chlorate to liberate oxygen, will keep air breathable for quite a long time. Submarine practice, too, would be invaluable if once the Moon were reached ; for air-locks could be built in the vessel's wall, for exit and entry without leakage of air on to the airless desert of the Moon, just as diving-locks on a submarine permit safe entry for divers while under the surface.

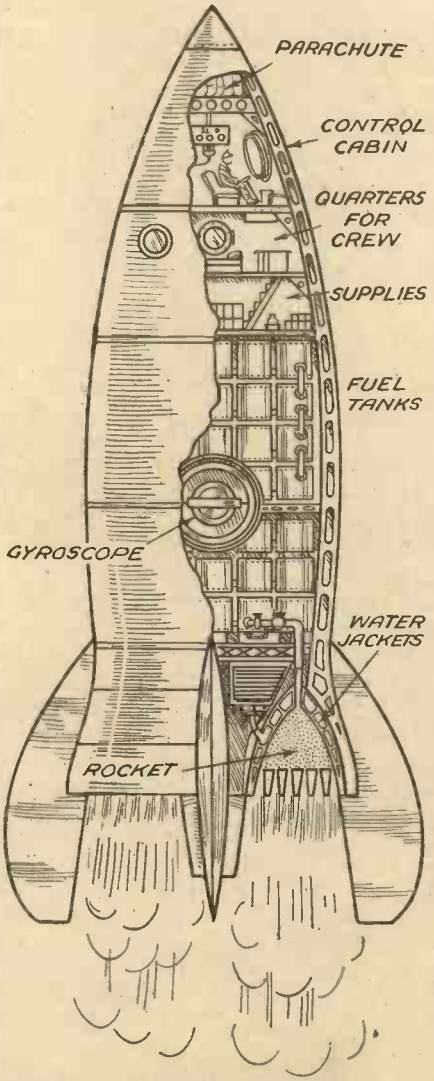
For exploration of the Moon's arid surface an adapted form of diver's suit and helmet could easily be evolved. The atmospheric pressure required by man is only 15 lb. to the square inch, while divers' suits are now made to withstand enormous pressures.

And after the Moon ?

Why, Mars, of course ! That nearest neighbour of ours who twinkles so redly at us, who has a definite atmosphere of some sort, and whose strange " canals " have puzzled astronomers for years, would be a goal worth reaching.

Is Mars Inhabited ?

That question, which has been debated times without number, would be answered once and for all. As Mars is much smaller than the Earth, it is presumed to have cooled down millions of years before our globe did, and therefore the Martian intelligence may be assumed to be far ahead of



Section of a rocket-flying ship, which has been successfully demonstrated in Germany.

A rocket car capable of travelling at 80 m.p.h.

our own. Now, if Martians have developed on the same lines as the human race, and are so far ahead of us in evolution, why have they not, long since, solved the problem of interplanetary travel and visited our world? Either they did so long before our globe came into the period of recorded history, and they have died out, as a race, long ago; or intelligent life has developed on entirely different lines to that on Earth. It is feasible that intelligence may have been housed in an insect form, and in this case the instinct of travel, might never have been evolved.

A further step in the development will be mail rockets; such a rocket could carry 1 cwt. of letters from London to New York in less than half an hour, and the cost of transport would be astonishingly small.

The rocket mail express service might therefore be not only a valuable innovation, but would also work very economically and provide an excellent source of revenue for the countries concerned.

Leaving the Earth

Whether it will be possible within any reasonable space of time to leave the sphere hemming in the earth, and rush onward to another heavenly body, by earthly expedients, cannot yet be determined. At all events, further attempts with liquid fuel must first lay the technical foundation for the further development of the stratosphere rocket.

In the literature on this subject expansive calculations and plans for future stratosphere airships have already been made. These would be composed of several large liquid fuel rockets, and would have to attain a speed of 7 miles per second in order to penetrate the heavy sphere round the earth.

Thus we see that the problem of travelling in the stratosphere is mainly a question of speed. And this is a question of fuel, and the rocket motor which converts it into energy.

The Stratosphere

The stratosphere and the empyrean beyond, with the constellations, stars, satellites, planets, and other heavenly bodies, have formerly been the special preserves of the astronomer, the realms pierced only by high-power telescopes, the object of skilled observation and conjecture based upon the recurrence of certain phenomena, and on which we have built our theses as to the constitution and order of the universe, of which the earth is but a minute and unimportant part.

The Rocket Ship

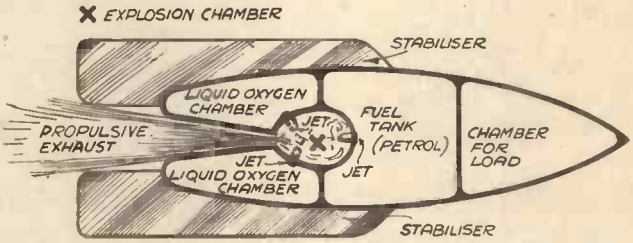
No lighter-than-air vessel could ascend for more than a limited altitude, the extreme limit being in the nature of 30 miles. Hence science has directed its attention to an entirely new type of space ship propelled on the rocket principle. It is necessary to remember that travelling in the upper regions requires much less power than that expended in travelling through the air, and ultra-high speeds for very small expenditure of power are thus possible once we leave the atmosphere. Fog and snow, lightning and storms do not exist in the stratosphere, and thus there must be additional safety in travelling at these high altitudes. If we could travel, via the stratosphere, a journey between England and Australia, which at the present time takes a matter of days by ordinary aircraft, would take but a few hours. In fact, the extreme limits of the earth could be reached in a maximum of two or three hours.

Speed in a Vacuum

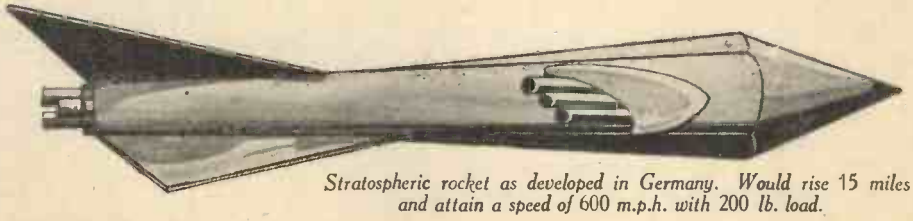
The first practicable experiments in rocket propulsion or, to use a more accurate term, reaction propulsion, really commenced in the year 1919, when Prof. Goddard published the results of his experiments made with rockets propelled in a vacuum.

Briefly, he found that a pistol or rocket fired in a vacuum kicks back or recoils even more so than in the open air, and thus disproved the old idea that a rocket depended for its action by pressing back, so to speak, on the air. We have already seen that no form of space ship making use of an ordinary airscrew could function in a vacuum or the partial vacuum of the upper regions, since it could not produce tractive effort unless it operated in air; and in this vital principle discovered by Prof. Goddard we have the basis of design for a space ship.

The recoil of a rocket or a pistol or a gun obeys Newton's Third Law of Motion—that action and reaction are equal and opposite. The momentum of a bullet fired from a pistol will be equal to the momentum of the recoil of the pistol. Momentum, it must be remembered, is the product of the mass (or weight) of the body times its velocity; hence, since the mass of the pistol is considerably greater than that of the bullet, its velocity will be considerably less than that of the bullet. If you multiply the speed of its recoil by its weight this will be found to equal the weight of the bullet multiplied by the speed of the bullet. This principle of motion applies in ordinary air; it is even more effective



Sectional view of a boat propelled by rockets. Small toys are available which demonstrate the principle.



Stratospheric rocket as developed in Germany. Would rise 15 miles and attain a speed of 600 m.p.h. with 200 lb. load.

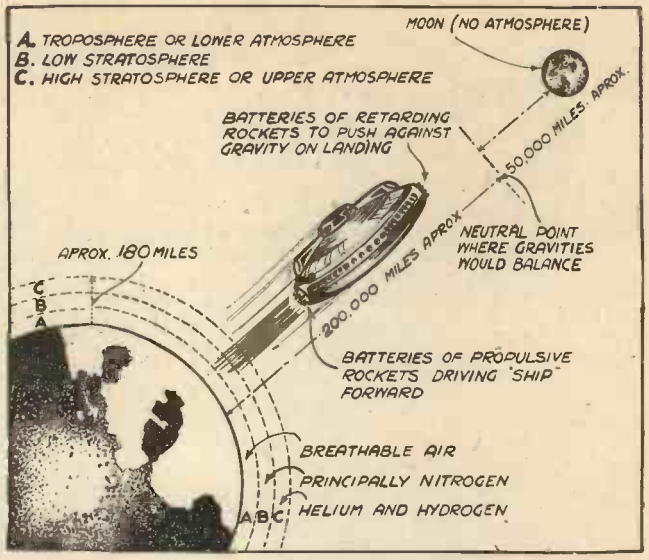
in a vacuum, and reaches maximum efficiency in it.

Reaction Propulsion

We have thus arrived at the point where it has been demonstrated that the only practicable means of travelling through the vacuum of space is by means of reaction propulsion. We have also seen that enormous speeds are possible in a vacuum with a very small propelling effort, and, in fact, an even rate of consumption of the fuel used to impart reaction propulsion will provide the ship to which such apparatus is attached with a velocity which increases every second.

No Sensation of Speed

Bearing this in mind, we must remember that Nature has apparently provided us in advance with the ability to travel at these colossal speeds of several hundreds of miles an hour, since it is well known that we do not possess any sensation of speed. This may sound startling, but if you recall that every moment of our lives every human being is travelling at a constant speed around the sun of 65,000 miles an hour, and that we are quite unaware of it, you will more easily understand the point. We are only conscious of speed when it exists in relation to something else. If you draw the blinds of a railway carriage in which you are travelling, you will be unable to say with certainty which way you are going, and if the train could be made vibrationless you would not feel any sensation of motion. We only become sensitive to changes of speed. Once your car has attained a certain speed and is kept at that speed, you cannot feel the pressure of the back of the seat. Directly the car slows down, you are aware of the fact by a tendency to shoot forward, and if you violently accelerate, your back presses hard against the back of the seat. You experience a somewhat similar sensation in a lift, either when it is starting or when it is slowing down. But during the *constant speed* portion of its travel you are unaware of its direction of motion.



The rocket principle will probably be applied to space travel. If rockets cannot propel the craft beyond the neutral point, it would be marooned there.

The Limit in Speed

Thus, we have now demonstrated two important facts: firstly, that reaction propulsion is possible and has been demonstrated; and secondly, that human beings are able to travel at enormous speeds without danger. Without going into mathematics, it can be stated that the limit of human endurance in speed is the free falling velocity of 32 ft. per sec./per sec. which for a period of 5 minutes mounts up to 6,000 miles an hour. The problems to be solved in high speed space flight are thus those of starting and stopping, and there is really no limit—*in space*—to the speed at which a human being can fly. There is a practical limit to speed through *air*, and this limit is set by the friction of the machine passing through the air and the heat generated by it. But, this friction would not exist for more than a few miles—at most 50—and representing a few seconds, it can therefore be ignored. In support of this fact, it must be remembered that a meteor or falling star does not become visible until it enters our atmosphere, thus proving that in its descent it must pass through a vacuum, and hence no friction is generated. This alone causes it to glow as soon as it enters the atmosphere.

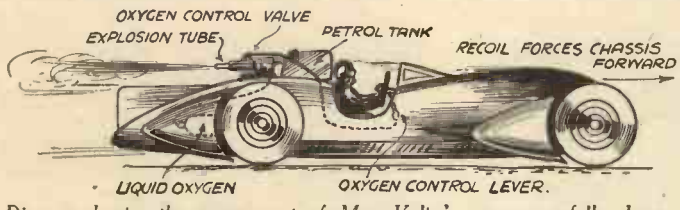
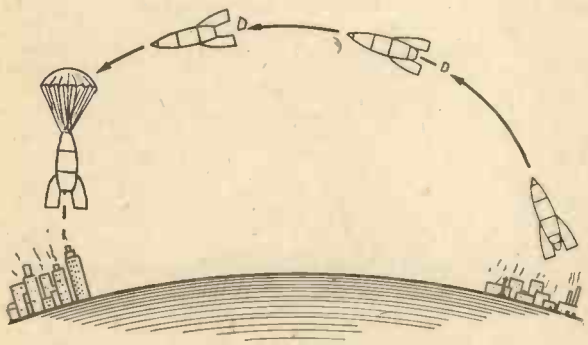


Diagram showing the arrangement of Max Valier's car, successfully demonstrated in Berlin in 1930. It attained a speed of 90 m.p.h. The combustion chamber was no larger than a soda-water bottle.



The proposed rocket mail. Calculated time for London-New York, 28 minutes. Landing effected by means of parachute.

Actually, the density of the air becomes rarefied at an altitude of about 5 miles. At 8 miles the air density is so low that it causes the blood to ooze from the pores of the skin and from the ears, the eyes freeze, and usually there is loss of consciousness.

Sounding balloons, equipped with delicate recording apparatus, have ascended without a pilot to an altitude of over 22 miles, and provided valuable data without risk to life. One important fact is that the density of air decreases by a half for every 3½ miles ascended, and that temperature drops 1° Fahrenheit for every 900 ft. ascended.

It is, therefore, easily calculated that when the lower fringe of the stratosphere is reached, the density would be only about one-tenth of the density at the surface of the earth, whilst at the top of the stratosphere it would be only one sixty-seven-thousandth.

These facts are here set on record to enable the reader to understand the principles upon which future stratospheric ascents and space flight will be based, and to indicate that, as a result of the pioneer work already done, such are now within the realm of practical possibility.

We must grow accustomed to the thought that all travel to-day is relatively slow, and that the tendency is for everything to be speeded up. There is no other means of creating faster travel, except to use the stratosphere. The world grows smaller as the speed of travel increases, and who can say that, when all nations live in closer time-proximity to one another, the problems which beset the world will thus be solved?