ASTRONAUTICS

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ASTRONAUTICS is the official organ of the American Interplanetary Society and is published monthly for its members.

Associate Membership in the Society at $3.00 per year may be obtained by sending the first year's dues to the Secretary, C. P. Mason at 450 W. 22 St., New York. Information on other classes of membership may be obtained by writing the Secretary. Meetings of the Society are held monthly at the American Museum of Natural History, 77th St. and Central Park West, New York.

SOCIETY ELECTS 1932-1933 OFFICERS

At a meeting of the Board of Directors of the Society, on April 2, the following officers were elected to serve for the year 1932-1933:

G. Edward Pendray, president.
Nathan Schachner, vice-president.
Dr. Samuel Lichtenstein, treasurer.
C. P. Mason, secretary.
Miss Lee Gregory, librarian.

Mr. Pendray was vice-president of the society for the first two years of its duration, and succeeds David Lasser, who served as president from 1930-1932. Mr. Schachner was secretary during the last year, turning his post over to C. P. Mason, who was the Society's first secretary. Pendray, Schachner, Mason and Miss Gregory are among the charter members of the Society.

IT IS NOW "ASTRONAUTICS"

The name of the official publication of the American Interplanetary Society has been changed from "The Bulletin" to "Astronautics", since this term most fittingly embraces the complete scope of the planned activities of the Society.

Astronautics may be called the companion word to aeronautics, which is the science of aerial navigation. In this case "Astronautics" may be taken, not as "the science of navigation among the stars" as its roots might indicate, but more humbly as "the science of navigating *above* the air."

It is hoped that the members of the Society will consider this publication as their own, and that their comments upon its makeup, its contents and its policies will be welcomed—*Editor.*

THE CONTROL OF ROCKET VEHICLES*

by Dr. H. H. Sheldon

New York University

I am of the opinion that the question of control is not the major problem in the development of rockets. In fact the business of control seems so simple to me that I am inclined to think that I must be wrong, and before I get very far someone will step in and say that my theories are no good.

The various methods of possible control which I have considered are principally those which are used to direct or guide vehicles in motion at the present time. I am going to tell you about these

*Summary of an address delivered before the Society on March 25, 1932.

various control devices starting from the simplest and going to the more complex, explaining which would be most useful in the earth's atmosphere and which could be adapted for use when going beyond the earth's influence.

If we were to shoot a rocket straight upward, and that were our only problem, then in that case the control would be quite simple, because a rocket once having reached a definite velocity, which has already been decided upon, must advance upward further by proper feeding of the fuel. The rocket in any case has no lengthy period of acceleration.

The simplest form of control that we have thought of is the pendulum. This can be used only in the earth's gravitational influence, for naturally the pendulum depends on gravitation for its action. If a pendulum be suspended in the rocket between contact points, and set so that it touches none of the points when the nose of the rocket is pointed on its proper course, then we have a simple means of control. For once the rocket's nose turns in any direction it will cause one of the contact points to touch the pendulum. If these contacts close electric circuits that operate rocket discharges on various sides, then corrective shots will be made to bring the rocket back on its course. Such a device could be used for control in either a horizontal or vertical plane. The possible disadvantage of this is that it is not delicate and quickly responsive enough; and, as I have said before, it is useless outside of a gravitational field.

The Gyroscope Possible

Another means of control is by the use of the gyroscope. People are quite frightened by the gyroscope, yet it is a very simple instrument. The gyroscope can do two things—first, it acts like a wheel which if started in motion continues in motion in the same plane unless acted upon by some external force. This is analogous to Newton's first law of motion. The second thing that the gyroscope does is to move or "precess" on its axis at right angles to a force applied to it. Thus if one attempted, let us say, to tip the axis of the spinning gyroscope toward the South, it will "precess" toward the west, or east.

It is easy to see from this how the gyroscope can act as a compass or as a control device. As a compass, it maintains a certain plane of rotation, which is established to determine the ship's or rocket's course. If the ship is off that course it will be evident from the relation of the axis of the ship or rocket to the axis of the gyroscope. Thus like the pendulum device, a set of contacts could be provided to close a circuit if the rocket gets off the course set for it and registered by the gyroscope.

The second action of the gyroscope depends on its inertia. If a gyro were made heavy enough, its mere inertia would tend to keep a craft in the path on which it was set. This use however, although it is helpful in preventing the roll of ocean liners, could have little application to a rocket.

Another disadvantage of the gyroscope is that it is heavy, and its reaction to a change of course is too slow—there is too much of a "time lag." Those that are small enough to be carried on airplanes are too inacurate for delicate use. And naturally once the earth is left behind, although it will point toward a definite point in space, the gyroscope is useless as a compass, or a compass-control guide.

The Earth Inductor Compass

The next possibility that must be discarded because of its frailty is the earth inductor compass. This device, too, operates only near the earth, in fact only in the magnetic field of the earth. But it is an ingenious device and is widely used on airplanes. It operates by a generator set vertically in the plane, the armature of the generator being turned by a small metal windmill projecting above the fuselage. The brushes on the commutator of the armature can be set so that when they are in an east and west line, no current flows to the little registering galvanometer. A controller can set the brushes at any desired angle and by the deviation of the galvanometer needle to left or right, the pilot can tell if he is off his course and by how much.

The inductor compass naturally acts quickly and is responsive so long as it is in the earth's magnetic field, and the magnetism is not upset. To use the inductor compass as a means of control, the same device would be used to make corrective rocket shots, as was suggested for the pendulum or gyroscope.

Another possible means of rocket control would be the use of radio beams. By having two converging beams, and by equipping the rocket with a directional antenna, if the ship swerved off its course, the change in the intensity of radio signals could operate appropriate devices to set it back on its course again. The beams could be sent out from two stations. When the ship is off its course the signals would naturally become weaker.

Naturally this cannot be used beyond the earth's atmosphere, for although many experimenters have claimed to have sent radio waves beyond the Kennelly-Heaviside Layer and received the signals back, we have no evidence that ordinary radio waves do penetrate the Layer.

The radio beam idea, however, does offer a satisfactory means of landing an unmanned

rocket. For when we consider shooting mail and express across the Atlantic we must consider how we are going to land it where we want to. By radio beams we can, when the ship comes within a reasonable distance, control its direction by a set of radio signals sent to it. We have already tried and used this successfully in driving airplanes and ships from the ground by radio signals that operate various of the craft's apparatus. Automobiles have been driven down Fifth Avenue by this means.

In view of their mutual effectiveness within a certain range, the gyroscope might be used to control the rocket on the major part of its flight, then applying radio signals from the ground, the gyroscopic control is shut off and the rocket landed by radio signals.

The Thermopile Reacts Slowly

The thermopile is a device that is really more fitted for control beyond the atmosphere, than within it. The thermopile consists of several thermocouples each of which is made up of two pieces of metal, of different thermoelectric properties, joined together to form two junctions. If the junctions are kept at different temperatures a current will flow in an external circuit. The greater the difference of temperature the greater the flow of current, which can be registered on a galvanometer or ammeter.

Now suppose the thermopile were mounted in the nose of a rocket and the two junctions shielded from each other and placed so that each received equal heat from the sun. No current would then flow in the electric circuit, and no reading would register on the galvanometer. But if the nose of the rocket were turned so that one junction received more heat than the other, a current would flow, and the rocket would be observed off its course.

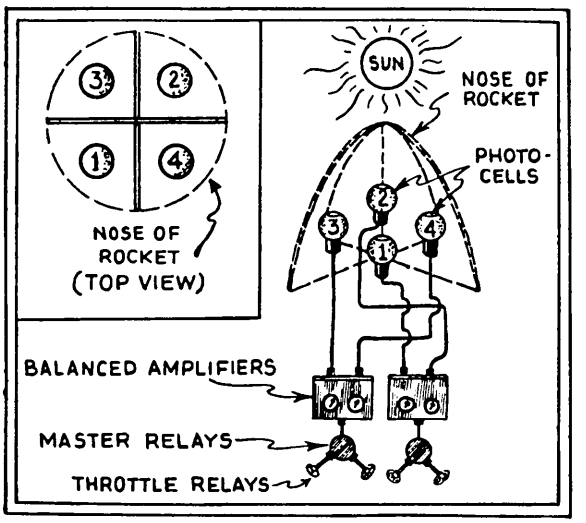
The thermopile is so delicate that it is unnecessary to use the heat from the sun. The heat of suns hundreds of light years away, or that reflected from the moon or the other planets could be used to operate the thermopile.

The difficulty with the thermopile for rocket crafts, is the slowness with which it reacts. It is evident that for rockets travelling at seven miles a second in space, a means of almost instantaneous checking of a deviation from the course is needed. A small angular error in the course can, in a trip of millions of miles, throw the rocket a considerable distance from its destination, and possibly spell disaster to the ship.

The Photoelectric Cell is Best

I come now to what I believe to be the best means for rocket control—the photoelectric cell. Here we have an instrument which not only has extreme delicacy but almost instantaneous reaction. It operates by changes of light instead of, as does the thermopile, by differences of heat, and therefore is admirably suited for use in a field of constant light, such as that from the distant stars. The photoelectric cell consists of a form of vacuum tube coated with a "light sensitive" material. Such a material undergoes a change when exposed to light and causes a small electric current to flow in the circuit to which it is a part. The greater the light intensity, the greater the current flow.

Photoelectric cells have been used successfully to automatically open and close doors, set off burglar alarms, stop and start vehicles, detect minute differences in the colors of materials, in fact it has an almost infinite number of uses.



Suggested rocket control by photoelectric cells to keep the nose of a ship aimed toward the sun.

The four cells - 1, 2, 3, and 4—are separated by two shields. Cells 1 and 2 are connected to a mutual electric circuit; and 3 and 4 to another. If the nose of the rocket tips from its normal position cell 1 may receive more light than 2; more current will flow through 1's circuit; and an amplifier, actuating a master relay will be set in operation. This will operate a throttle controlling flow of fuel to rocket tubes, and corrective shots will be made to restore the nose to a position in which both cells receive an equal amount of the sun's light. This holds true also for cells 3 and 4. By control in two perpendicular planes the rocket can always be kept on a predetermined course.

Suppose we had two such cells opposed to one another. If both receive the same amount of light then an equal current will flow in each, which opposing each other neutralizes each other, and no meter reading is shown. But if a stronger light shines upon one than the other, then a read-

ing will result from the stronger current.

As in the use of the thermopile, we would have the two electric eyes with a fin between them, each pointed at a celestial object which has a given light intensity. Perhaps both would be pointed at the sun, and while the rocket was on its course they would both receive an equal amount of the sun's light. But when the rocket went off its course one would receive more light than the other, as one would be shaded by the fin, and a reading on a meter would register this fact. The circuits could be connected to the rocket discharge apparatus and corrective rocket shots be automatically made, when the rocket gets off its course.

Again the light from distant stars could be used as guides for a rocket on its interplanetary journey. It would be possible to use four such cells, one pair at right angles to the other. This would provide control in two planes, which is urgently necessary in the three-dimensional navigational of interplanetary space.

Since we have the gyroscope, the inductor compass, radio beams and possibly other means for control of the rocket within the earth's atmosphere; and we have the delicate but dependable photoelectric cell for interplanetary space, I feel that between them the problem of rocket control is theoretically capable of solution at present. And since all of these devices have actually been used in practice on other vehicles, I believe that the solution of the problem of rocket control means simply their application to a given rocket vehicle.

I have thus utilized practically all of the electromagnetic spectrum for forces to control rockets. I have used gravitation, magnetic waves, heat waves, radio waves, and light waves. And if in interstellar space we discover any laws of the distribution of the so-called cosmic rays, we may be able to harness them too, for the problem of rocket guidance and control.

NEWS OF THE MONTH

AUTOMATIC ROCKET CONTROL FORESHADOWED BY CREWLESS SHIP

The foreshadowing of the automatic control of rockets will be found soon in a "phantom fleet" of the U. S. Navy which will operate and execute maneuvers without a human soul aboard. The principles underlying such operations are relatively well-established and matter-of-fact for almost every person who tinkers with a radio set is familiar with some of them.

The U. S. S. *Utah*, ex-dreadnaught of the Navy, which has become a ghost target ship, will be remotely controlled by radio apparatus. Exact details of the vessel's operation are being carefully withheld by government officials as a military secret, but scientists have pointed out the principle features involved in such radio control.

On the destroyer that directs the activities of the crewless U. S. S. *Utah* is set up a radio transmitter. Signals, specially coded, will be sent out from the control ship and picked up by an ordinary receiving set on board the U. S. S. *Utah*

As the energy transmitted by radio is insufficient to run any sort of motor, an amplifier is necessary. The amplified current then operates a relay, or device which completes an electrical connection with motors on the ship. The motors allow the movement of such devices as the rudder, the throttles, and the lights. In every instance the ship's own power is used, the radio impulses merely acting as a governor.

For the sending of control messages, there is located on the destroyer a little black box, with keys arranged like those on a typewriter. By simply pressing one of these keys, an operator can direct the crewless battleship to make a complete turn, lay down a smoke screen, blow its siren, or go full speed ahead.

To distinguish between the various signals from the control ship, the ghost vessel has a device which receives them selectively and causes the desired piece of mechanism to go into operation. Somewhat the same principle is involved in the selectors of dial telephone centrals.

The Navy destroyed *Stoddert* was equipped for radio control in the fall of 1931 and two other destroyers, the *Kilty* and the *Boggs*, are soon to join with the *Utah* to comprise Uncle Sam's phantom fleet.

TIDES IN AIR CREATED BY SUN, MOON AND HEAT

Discovery of three kinds of tides in the ocean of air above our heads was announced by Prof. J. Bartels, German meteorologist and research associate of the Carnegie Institution of Washington's department of terrestrial magnetism, when he summarized a long series of researches into barometer readings.

Atmospheric tides have greater regularity than the tides of the oceans but they are masked more effectively from simple detection by the great var-

iations and irregularities of the atmosphere which cause our weather, Prof. Bartels reported.

The same gravitational forces of the sun and moon which cause the tides of the oceans produce part of these rhythmical oscillations in the atmosphere, but the daily heating and cooling of the air also exerts its influence.

Prof. Bartels summarized three mathematical harmonic analyses, using thousands of readings of the barometer at all parts of the earth. Buried within the great irregularities of the barometer which show the march of fair and storm areas over the face of the earth, Prof. Bartels found three distinct types of oscillations of striking symmetry. There is a twelve-hourly tide due to the sun, a lunar wave which is exactly the sort of tide that theory says the moon's gravitation should produce, and an eight-hourly wave that is caused by the variation in heat of the atmosphere and is built up by resonance.

Scientists at the Carnegie Institution studying the electrical and magnetic conditions of the earth are interested in the tidal variations in the atmosphere because they help in the interpretations of the systematic variations of the earth's magnetism during each day. The variations of the earth's magnetism in turn are the main sources of information about the physical state of the outermost layers of the earth's atmosphere and the effect that cosmical influences have on the earth.

PATENT FOR DECELERATING AIRCRAFT GRANTED TO GODDARD

A patent for a series of devices to decelerate aircraft, has been granted to Robert H. Goddard, noted rocket experimenter. Although the apparatus is applicable to all airplanes, according to the patent request, it has especial application to rocket planes which would travel at extremely high speeds in the upper layers of the atmosphere, and must decelerate their speeds quickly on descending to the lower air levels.

The devices consist of vanes that are opened out near the tail of the plane, either manually or mechanically, the vanes adding sufficient resistance to the craft to slow its speed. The vanes which may be two or more in number or may be spread around the rear of the fuselage, when they are not in use, are flush with the streamlined fuselage, but in use they may be used either to retard the plane's speed without throwing it off its line of flight; or may be used also to steer the plane. In the latter case the steering can be accomplished by using only the vanes on the side of the plane in which direction it is desired to turn its nose. This effect will therefore augment the steering power of the rudder.

To first open the vanes springs are used. The air rushing against the vane surfaces complete the opening, and the vanes are held in position at a definite angle to the fuselage by cables or they are pivoted by metal retaining bars.

By the use of clocks or other means, the vanes can be set to open wither at a predetermined hour of the flight, or when the atmosphere pressure has reached a determined value.

PLANET VENUS SOUNDS A HIGH NOTE ON RADIO

The sound of starlight was broadcast for the first time, it was believed, over a WABC-Columbia network from the general science laboratory of the School of Commerce of New York University at Washington Square recently. The beam of Venus was picked up from the eyepiece of a telescope by a photoelectric cell and amplified into a microphone as a sustained high note resembling one from a violin.

The experiment, conducted by Professor Albert Sheppard, assisted by Dr. E. E. Free, concluded a number of similar ones, which included broadcasting of colors. The "electric eye," as the cell is popularly called, evolved sounds from objects ranging from mesh stockings, which look to it like two bears growling, to an American flag, which apparently appeared like an undirected orchestra.

The sound of light from the planet began and gained in volume as the spinning of the earth brought it into the range of the telescope. A cell especially constructed by Dr. Sheppard for the experiment, resembling a radio vacuum tube, like the cells used in the other experiments, and differing from the tube in that it is sensitive to light waves instead of sound waves, was used.

Scientists have used the principle before to measure starlight and for other observations, Dr. Sheppard explained.

For a moment before the broadcast it was feared the weather might prevent the experiment, for the sky started clouding over. An assistant bearing a wax candle was dispatched to the adjoining room, in which the telescope was mounted, to make up for the planet's deficiency had the event arisen. Unromantic students of science assured spectators the properties of candle-light and starlight were sufficiently analogous to guarantee the experiment. The clouds drifted away, however.

Sounds from objects like stockings, the glowing ends of a cigarette, a cigar and a match were found to be deep, hoarse and often scratchy.

NEW YORKER RECEIVES ROCKET AIRPLANE PATENT

A patent for a type of rocket-propelled airplane has been received by Louis Berkowitz of 1701 Eastburn Ave., Bronx, N. Y. Mr. Berkowitz has designed a plane carrying a number of small rocket motors spread over the wings and some landing pontoons. His special device upon which the patent was granted consists of a means for feeding small particles of an apparently solid fuel into the combustion chamber of each motor and regulating the flow of fuel. Into a hopper the fuel is poured and is fed into a piston chamber by a rotating geared wheel. The piston operated by a crank shaft feeds the fuel into the combustion chamber. By a series of levers the fuel charge can be regulated and by a deflecting plate at the exhaust of the rocket a means is devised to regulate the angle at which the gases escape.

FIRST MAIL ROCKET FLOWN IN AUSTRIA

What is deemed to be the first rocket carrying government mail has been flown in Austria, according to Herbert Rosen, writing in *Die Umschau* (Frankfurt, Germany).

Carrying 333 letters, the rocket was shot into the air from the top of the Hoch-Trotch (Austria) in the direction of the neighboring town of Semriach by Fritz Schmiedl, a young chemist and engineer.

By a special arrangement with the Austrian postal authorities, Schmiedl added to the usual postal stamp another marked "Flown by Experimental Rocket R-1".

The start of the flight was made at 1238 meters above sea level, the direction being toward Semriach. The rocket was shot at an angle of 65 degrees and it travelled a horizontal distance of about 2 kilometers. The inventor however did not know the exact height to which the rocket travelled during its flight.

A dry fuel propelled this rocket, composed of a special preparation of "chlorates and nitrates" about 47 pounds of it being used to send the 20 pound rocket on its journey. Of this weight 15½ pounds was the weight of the shell and about 4 pounds that of the metal container holding the letters, together with other accessories, such as the parachute.

The rocket was coated inside with asbestos, while the outside consisted of tough, brass sheet weighing about 7 pounds. For the exterior construction "a special kind of cord, and a tough paper were used, the latter being applied closely immersed in a special glue without leaving any distance between. The combustion chamber was lined with asbestos between clay, against the inner compartment.

"The interior diameter," according to the article, "was about 8 inches, the outer diameter 9 3-4 inches at the front end and 9 1-4 inches at the tail. The stabilizing surfaces made of aluminum were 3 1-4 inches wide."

The rocket which was something over five feet high was injured sufficiently in the descent to prevent its being used in a repetition of the experiment. The inventor claims to have set off two "registering rockets" last year, but apparently they did not function.

He intends, however, to continue his experiments with his new funds and believes that within a short time the use of rockets generally for carrying mail will become an actuality.

WAS THE MOON ONCE A SECOND SUN?

That the moon is the hardened inner core of what was once a dwarf sun is the ingenious theory proposed by John Lowell Butler in *Popular Astronomy* for April, 1932. It is well known to paleobotanists and geologists that the earth's climate prior to Pleistocene and Glacial times was much more moderate and even in temperature—particularly toward the poles. The supposition that the moon once poured as much heat upon the earth as the sun does at present would nicely account for such a climate history, for the orbit of the moon carries it from the tropic of Capricorn to Cancer and back again once every 28 days. There could be no true winter under such circumstances.

Mr. Butler's arguments are based on the close similarity between the ray systems of the Moon's present surface with the present metallic eruptive prominences of our Sun. These cast out radial streamers of metallic matter thousands of miles in height.

If similar prominences were present in the Moon's former glory, they would fall approximately where the present white rays now lie—and falling from a great height would, of course, run straight over mountains and valleys as can be observed on the Moon's surface today.

Moreover, the Sun's eruptive prominences contain a high percentage of calcium which, upon cooling, would of course account for the color of the Moon's rays.

A corroborating point is that a crater occurs at the center of each Lunar ray system, which fits nicely into the theory that these rays were caused by violent eruptions from the interior of

the moon which would throw the outer crust in a circular mound away from the point of escape of the metallic eruptive matter.

Astronomers have been puzzled heretofore to account for the length and topographical character of the Moon's rays. Such an ingenious explanation as Mr. Butler's, fulfilling all the requirements and conforming with all known observations, is worthy of careful thought. How this blazing sun was so suddenly extinguished is a subject not discussed in the current article but in a forthcoming book by Mr. Butler on the subject it is to be hoped that this point will be fully elucidated.

REPORT OF THE PRESIDENT OF THE AMERICAN INTERPLANETARY SOCIETY

Rendered at the Third Annual Meeting April 1, 1932

1. *Membership*: During the past year the membership of the Society approximately doubled. We gained 22 active members and lost 5 with a net gain of 17. We acquired 47 associate members and lost 7 with a gain of 40 making a total gain during the year of 57, which is just about half of our present membership.

The membership is now divided over 21 states in the Union and 9 foreign countries, and includes now practically every profession.

The Society no doubt faces a difficult year, and I urge you members here tonight who wish to help the Society to carry on its work to make missionaries of yourselves and talk rockets among your friends. The Society got its start, through personal contacts, and for a time the Society must depend on it.

I believe that the membership is becoming more and more selective. Those who joined in the expectations that a moon journey would be made in 1932 have dropped out, and in their places we are getting more serious-minded people who are willing to see rocketry through all of its puberty and childhood. Scientific men, on the whole, do no more than look at us with detachment, they are not yet ready to associate themselves with us, and probably will not be until we have demonstrated beyond doubt that the rocket is a practical instrument and has proved itself.

2. *Meetings*: There has been a certain amount of dissatisfaction with our meetings, some of the members feeling that we get nowhere by "all of this talk." I have disagreed with that point of view from the beginning and I disagree with it now. I believe that our meetings should be considered as an indispensable part of our program. Not only do they provide the members with the chance to listen to experts in fields related to rocketry, and to meet together to discuss our problems, but, just as important, it is the open door to the interesting of newcomers in our activities.

It is the meeting that gives to the man, who feels a stirring of interest, a chance to meet with us, learn what it is all about and finally to associate himself with us. It's all very well to say, "they can learn it from books," but the fact that the outsider comes to our meetings and sees a serious-minded organization of men is a powerful influence inducing him to join with us.

No doubt, our meetings have been held too frequently. I would prefer a single monthly meeting, well-prepared with an interesting and well-informed speaker than two meetings a month hurriedly and hastily prepared. As a matter of fact there are not enough men available to us to provide two meetings a month for eight or nine months a year. I recommend the monthly instead of the semi-monthly meeting to the next Board of Directors.

3. *Organization*: The officers of your Society have faced during its two years what most membership organizations meet—a great burden of work unrelieved by the help of the general membership.

That condition can hardly continue to be true very long. The officers, like all of the members, are engaged in making a living, and there is a limit to the burden of work they can carry for the Society.

I advocate therefore that the next president appoint a Ways and Means Committee to be of general auxiliary aid to the officers. The Experimental Committee could certainly use the help of a man who would execute certain commissions for it that would save the experimenters considerable time. The Secretary will need a man whom he can depend upon to relieve him of the answering of part of the growing correspondance; the editor of the Bulletin will be able to get out a better publication with the assistance of a man who will find and help prepare the copy.

The growth of the Society will without doubt be choked if the officers continue to be burdened by a weight of detail, and the general membership remains indifferent to this condition.

4. *Bulletin*: I have great hopes for our little Bulletin. We have entered into an agreement to print it, and at a cost no greater than the cost of mimeographing it at present. The number of pages has been reduced temporarily to 8 from

12, but in the 8 page size we will get as much copy as in 11 pages of mimeographing.

The problem of making of the Bulletin a real magazine that shall express the Society and keep its members informed is not one of available material but of a place to put it. We could fill 16 or 20 pages every month now with interesting and informative material on all branches of astronautics, if we had the space. Only the growth in membership will permit the enlarging and improving of the Bulletin; and if the membership does grow the Society can provide a magazine our members will be proud to own.

5. With regard to our policy toward experimentation, I believe, as I have always believed, that the Society can advance astronautics fastest by encouraging experimentation throughout the country than by taking the entire burden of experimental work on itself. Unless we are suddenly endowed with a large sum, our own progress will be extremely slow. I feel that our experiments should be aimed and organized to be an incentive to others, perhaps better fitted than we are, to continue where we leave off; and to carry on independent work developing new ideas.

We are just beginning to realize the terrific number of unsolved problems facing us; and many minds will have to grapple with them before we get any practical results.

I feel that the time is strategic to interest engineers and scientists in our work. Thousands of men with energy, ability and creativeness have been torn away from their specialized work and are looking at the field of technology with a fresh viewpoint. We should try to reach those men and get them enthusiastic about the possibilities of making important contributions toward our infant science.

As a means of stimulating experimentation the Society can do two definite things.

a. It can seek a fund to use or to administer in its own experimentation.

b. We may seek for the setting up of a prize to be awarded on a definite rocket accomplishment, such as the sending of a rocket 30, 50 or 100 miles and its safe return to earth. This prize plan, seems to me to have many advantages and I believe that astronautics will advance fastest if we throw our energy into bringing it about.

In the first place, such a prize would act as a stimulant to engineers, engineering organizations and even industrial companies to expend money and energy for rocket experimentation. They would be assured that a partial recompense at least would result from a definite accomplishment.

Secondly, the successful flight would be directly in the line of experiments now being carried on with the approval of eminent scientists-notably the Goddard experiments, which are supposed to be directly aimed at the building of a meteorological rocket. The suggestion of such a rocket therefore, has behind it a definite precedent.

Thirdly, the building of such a rocket would be of immediate and practical value to aviation and meteorology.

Fourthly, the building and controlling of an unmanned rocket capable of rising at least thirty miles and descending successfully is absolutely necessary, to my mind, before we have transportation rockets. The problems of construction, fuel control, efficiency, stability in flight must all be solved as a preliminary to the practical use of the rocket.

Fifth, the donor of such a prize fund need not expend a penny unless the conditions were fulfilled and a successful altitude flight made.

Sixth, the successful flight of an altitude rocket under the stimulus of a prize fund would awaken a wave of rocket building; for it would then have a phenomenal accomplishment behind it.

Unfortunately there exists today in the public mind an uncertainty, confusion and chaos about rockets. The ideas of stratosphere transportation rockets, of moon flight, of meteorological rockets seem to be jumbled together, even among newspaper people. The prize fund for the sending of a rocket to 30, 50, or 100 miles above the earth would clarify the atmosphere. It would show that rocketors have a definite and practical aim to strive toward, an aim that everyone can understand and appreciate. Here is the unexplored layers of the stratosphere that we can conquer. The rocket is the only instrument that can do the job. The first rocket to reach that height will be the signal for the conquest of the stratosphere, with all of its implications. I urge the next Board of Directors to turn its attention to my proposal and consider it seriously.

I want to say in conclusion that this is probably the last meeting that I shall preside over. I have served as president for two years, and although I have found a comfortable niche it's much better for the Society that it get a new directing head. I want to say that I've enjoyed my work immensely, and consider it to have been a great honor to have been the Society's first president. I intend still to keep on working hard. I feel that I have an intangible stake in our work and I want to see it carried to its final successful conclusion.

(Signed) *David Lasser*, President.