"Missile Away!"

THE NEW MEXICO-WEST TEXAS SECTION OF THE AMERICAN ROCKET SOCIETY

"WINGS OVER WHITE SANDS"
(Special USAF Issue)

Vol. IV, No. 1
SPRING
1956
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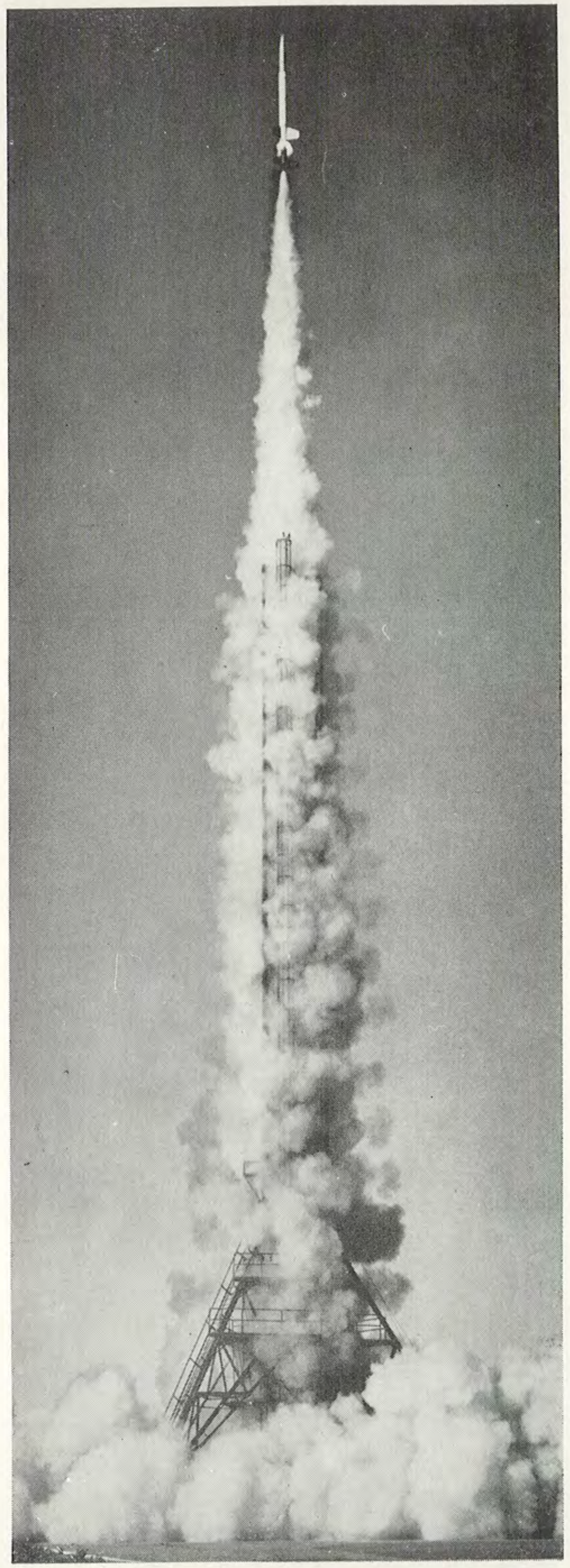

"The Actual Enemy Is The Unknown"

These words are part of a statement made by Thomas Mann many, many years ago, long before the rockets began unleashing the secrets of man's planet Earth. But no truer words could describe the forthcoming International Geophysical Year in which rockets will play a major part.

For the first time, a vehicle is available to geophysicists which is capable of directly probing the secrets of the aurora, solar radiation, earth's magnetic field, gravimetrics, and meteorology at very high altitudes bordering on the threshold of space.

From rockets like the Aerobee fired during IGY, information will come which will be of benefit to all men everywhere.

This is only one of the uses of the rocket as a prime mover. But they are all covered in "Missile Away!", the only semi-technical rocketry magazine in the world. In a short two years, the magazine has answered a great need for both scientist and layman alike and has become established as one of the finest magazines of its kind anywhere.

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"MISSILE AWAY!"

Vol. IV, No. 1
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1956

CONTENTS

STATEMENT OF EDITORIAL POLICY

The purpose of this magazine is to bring to scientist, engineer, specialist, technician, and layman a better understanding of the rocket and guided missile field with its present and future uses in war and peace. To this end, it is dedicated to publish material of common interest written in terms which are readily understood and illustrated with the finest efforts of the photographers and artists associated with this field.

International Civil Aviation Organization (ICAO)

Phonetic Alphabet

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DELTA
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HOTEL
INDIA
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KILO
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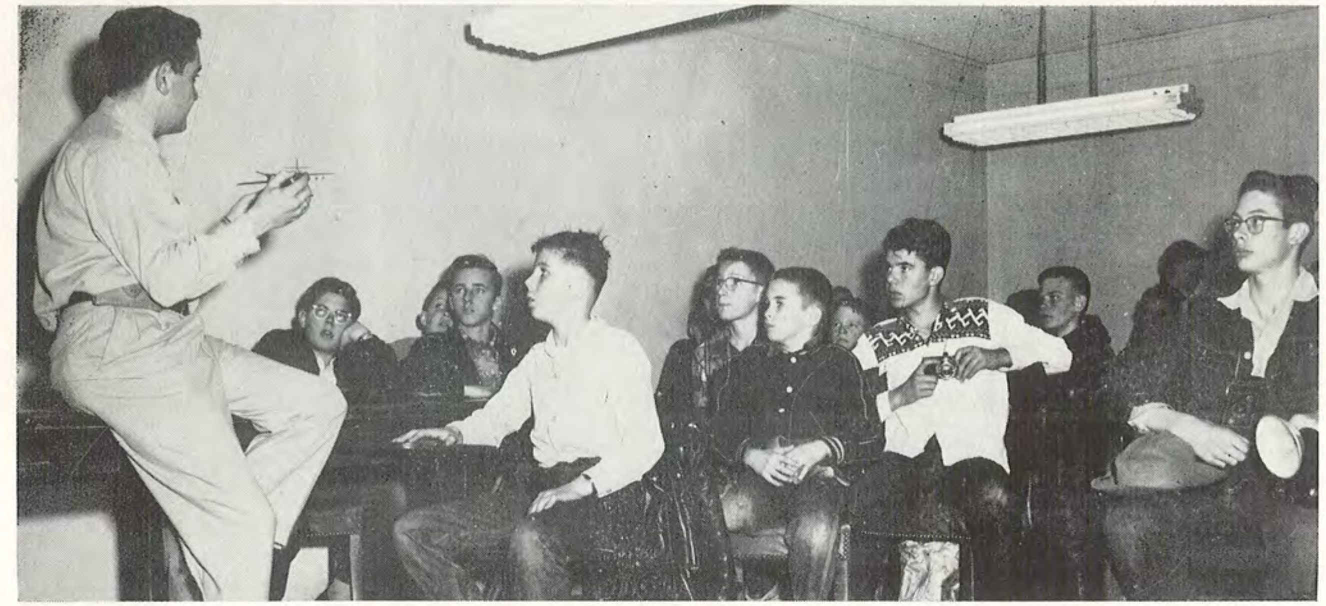
Courtesy "Missile Away!", American Rocket Society

editorial

The FUTURE State of Technology



IT is a trite and well-worn statement to say that the future is in the hands of the youth of today. Unfortunately, and in spite of its triteness, it is very true.

Coupled with the figures on the annual enrollment of students in engineering and scientific curricula, it should be enough to cause us to worry. And when compared with figures showing how many students actually graduated with college degrees in the sciences, it should be the cause for considerable alarm.

In 1949 and 1950, engineers and scientists were begging for jobs. Now, some six years later, there are enough engineering and scientific jobs that it would take the entire graduating classes for the next four years to fill them. Of course, by the time those classes graduate, the number of vacant jobs will have doubled.

There were not enough jobs available in 1949 and 1950 because this country was still making up for lost time due to the effects of World War II. The graduating classes of 1942-1945 were five or more years late in getting out into the field with their technical training because most of them had had several years taken out of their lives by service during the war.

But when things got rolling again—and the Korean War was not the principle cause—there weren't enough technical people to go around.

So what? The problem exists right now. But what is its effect on the future of our technology, the one thing that we can count on to keep us ahead of the rest of the world?

It has been pointed out by many people that our rate of technical progress approximates an exponential curve. At the present time, the curve is rising rapidly. By 1964, by conservative estimate, the curve will be nearly asymptotic.

It will probably never even get there, and here is the reason:

We have a crying shortage of technical people today. Eight years from now, the shortage will not be improved; it will be worse. Without people, trained and experienced in the many fields of science engineering, our technical output cannot reach that which is possible to it.

It takes men to make discoveries, to perform the tedious and laborious research work, to tinker and figure and work out the endless little details of development or engineering evaluation. Machines can and will help, but for a long time to come, machines will not replace human beings. They can be made to perform routine jobs and tasks which would require a large number of humans. But human beings must always be there to tell them what to do . . . and to keep a watchful eye on them. Anybody who has ever had anything to do with an automatic machine knows that it requires al-

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THE FUTURE STATE OF TECHNOLOGY—cont'd.

most constant watching and maintenance.

A mathematician who is neither ignorant nor surrounded by an ivy-covered wall remarked to us recently that large electronic calculators would soon approach the human brain in complexity. The human brain, he pointed out, has some four billion neurons or nerve cells in it; electronic calculators, he went on to say, will approach and achieve four billion analogous circuits within six years. But we seriously doubt if the machine will be able to compose music (although the present day Dyseac can play music) or exhibit the flash of genius that made relativity or the rocket motor into permanent concepts. If such a machine is ever built, it will give us the answers on how we think, how we create, and what kind of screwball, non-Aristotelian logic we use in the process of creation. Or maybe we will figure it out for ourselves in the process of building such a machine.

This is leading us far afield in our philosophical discussion of the effect of a shortage of trained people on the future of our technology. It will take men to build these machines, and—let's face it—we just ain't got 'em right now! And we don't see prospects of getting them in the numbers necessary in the time required.

We cannot learn without limit and we cannot produce the results of our learning without people. Young men today are not going into engineering and the sciences. Why not? Why are they turning to such things as business or the social sciences?

Engineering potential may be heading for the social sciences because there is a great challenge there. We have filled our world with washing machines, automobiles, intercontinental bombers, hydrogen bombs, indoor plumbing, and a host of other devices for use by human beings to ease their toil, or fight their battles. But we haven't learned much about human beings in the process. We have turned loose the rocket in a world torn with strife, apparently caring little about the consequences of the ICBM which is the inevitable result. Many proto-engineers now becoming or going to become social scientists perhaps feel we need to pin down some of the laws of human beings before we go much further with the physical laws. Maybe this is a good idea.

The ones going into business are motivated by one of the by-products of the world made possible by physical science: Money. Scientists and engineers are notoriously underpaid in comparison to the salesman who sells the things the engineers and the scientists make. Money means one can have more of the wonderful gadgets developed by the engineers and scientists. Even in the various fields of science and engineering one sees the results of this: Engineers and scientists, working like mercenaries, selling themselves to the highest bidder, always keeping their eyes open for a better job, always on the lookout for a better deal. An engineer with twenty years tenure in a company is very very rare these days. The average runs something like two years. It is probably because physical scientists, like other people, developed the strange habit of eating three times a day and got the urge to raise families, too.

How, then, can we make the available jobs interesting to potential technologists?

Maybe we should help the youngsters get their training in the first place, breaking the eternal circle of, "You can't get the job without experience, and you can't get the experience without the job." Scholarships will help, but we also need a frank reappraisal of the training methods. In other words, a man with top grades should be favored, only if the grades mean something. Oftentimes they do not, being merely the result of a concentrated effort of rote memorization. In our acquaintance are several top-flight people who just barely squeezed through with passing grades; yet they are people with a lot more "on the ball" than several Phi Beta Kappas we know. Are we really teaching these youngsters what is necessary if such examples as those exist?

Perhaps we need to place more emphasis on the art of creation itself. A man who can create things of value to his fellowman deserves something a little better than he is getting right now. We need a revision of the patent laws into something that is really workable. We need a recognition of the creative technical man, a respect for him, and a respect for what he does. Most of all, we need to get the stress off the material things by better salaries and put the stress on the additional satisfaction of creation of a useful item or idea.

Whatever we do, we must do **something.** And we haven't got a lot of time to sit on the problem, either. The clock doesn't stop just because we want it to, and the problem of the shortage of technically-trained people can cause our technology to grind to a shuddering halt.

—G. H. S.

"See yer badge . . . . . sir?"

"MISSILE AWAY!"

WINGS Over White Sands . . .

FORTY miles from the Headquarters of the Integrated Range, White Sand Proving Ground, and some fifteen miles west of Alamogordo, New Mexico, is an Air Force installation at which some of the most interesting and varied research and tests in the guided missile and space flight field are being carried out. But, as with its brother, White Sands, Holloman didn't just happen.

Holloman Air Development Center, New Mexico, formerly known as Alamogordo Army Air Field, first began to take shape when construction was started on Feb. 6, 1946. Renamed Holloman Air Force Base in September 1948, in honor of the late Colonel George V. Holloman, outstanding pioneer in the guided missile research field, the base became Holloman Air Development Center on Oct. 10, 1952.

It was in the northwestern corner of the bombing range that man saw the first atomic bomb explosion on July 16, 1945. When the war ended, the base was closed until the latter part of 1946 when it was reopened as an Air Force Guided Missile Test base because of the available bombing and testing range. The location was ideal for optical and photographic instrumentation.

The first rocket launched from Holloman was on Sept. 17, 1947. The base was under the Air Material Command until April 2, 1951, when it became an Air Research and Development Command base.

Since being designated an ARDC base, Holloman has been the scene of a number of important classified and unclassified experiments.

Perhaps the best known of Holloman projects is the high-speed sled experiments under the direction of Lt. Col. John Stapp, Chief of the Aero Medical Field Laboratory. These sled tests are conducted to determine the effects of windblast, tumbling and deceleration on the human body during supersonic, high-altitude bail-outs.

Traveling at 750 miles per hour, the sled can simulate conditions similar to those experienced by a pilot bailing out from an aircraft taveling at 1,800 miles per hour at 40,000 feet. This is possible because air density is considerably less at 40,000 feet than at 4,100 feet—the elevation at the sled site.

Presently the sled track extends 3,600 feet and consists of rails similar to those of a wide gage railroad. A trench between the two rails extends the entire 3,600 feet. In this trench water is dammed in by a series of thin dams which hold the water back at graduated levels. The sled decelerates abruptly as water-brake-scoops beneath the sled break the dams and force the water through a duct before expelling it in a mountainous spray.

It was on this sled track that Col. Stapp established the present speed record of 632 miles an hour in December, 1954—the fastest man has traveled on land.

Through these experiments, new protective equipment for pilots can be developed and the effects of bail-out upon one's reasoning, consciousness and memory can be determined. The chances of survival for air crewmen who must bail out at supersonic speed will be enhanced by information gathered through these experiments.

A 26-foot long vehicle 15 inches in diameter, the Aerobee rocket is used solely for research work at Holloman, although many of these rockets are sent aloft to obtain scientific information for other units of the Air Research and Development Command.

What happens to life and equipment 100 miles up? What is the measure of sky brightness? How much solar radiation is present and what effect does it have on human beings? How do conditions of zero gravity affect human beings? What effect will meterorite particles have on future upper air vehicles? All of these questions and many more are being explored through use of the Aerobee rocket—technically called the Aerobee High Altitude Sounding Rocket. Carrying a pay load of 120 to 300 pounds, the Aerobee has a liquid fuel rocket motor within the body of the vehicle and a solid fuel rocket booster is added to attain higher altitudes. Most famous of the Aerobee rocket flights was one in which monkeys and mice were taken up to 40 miles altitude to determine the effect of zero gravity upon these mammals. Subjects in the rocket are recovered in good condition suffering no ill effects as they, along with delicate telemetering devices, are parachuted back to earth.

A newer, larger version of the Aerobee, called the "Aerobee Hi", which can attain altitudes of 135 miles, was launched in 1955.

It was an Aerobee rocket which released the sodium vapor in the experiment at Holloman on October 11, 1955. This experiment was erroneously called the "Artifical Moonlight" test.

The Matador is one of the earliest guided missiles tested at Holloman. The new model, the TM-61B, fea-

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Lt. Col. John P. Stapp with a scale model of the famous rocket sled, the "Sonic Wind No. 1." On this sled, Stapp reached the speed of 632 miles per hour, the fastest speed ever travelled by a man on the ground. The sled slammed to a stop in slightly over one second, thus providing additional information on the human reactions to decelleration and jolt.

WINGS OVER WHITE SANDS—cont'd.

tures greater length and a larger nose section than the type currently used by the Air Force overseas. Built by the Glenn L. Martin Company, the Matador has an airborne guidance system for tactical missions. It is powered by a J-33 engine, has a ceiling over 35,000 feet and a speed in excess of 650 miles an hour. The Matador is about the same size and weight as a jet fighter. It is guided electrically from the ground to its target and hurtles downward toward its goal in a power drive at transonic speed.

The newest air-to-air guided missile of the Air Force, the Falcon can be carried and fired by a fighter-interceptor. The Falcon's combined electronic brain and radar set guides the missile to the enemy plane regardless of the evasive action taken by the target. It weighs little more than 100 pounds, is only six feet in length, and travels trough the air at supersonic speeds. The Falcon is built by the Hughes Aircraft Company.

The first launch of the OQ-19 propellor-driven drone at Holloman took place in 1947 when the drone was of a fabric and tube metal construction. The project was halted shortly after but reactivated in 1951. The OQ-19 is built by the Radioplane Company and is now made completely of metal. Besides being used as gunnery practice, the drone serves a test vehicle for automatic pilots, servo systems and gyroscopes. With radar pods added to the wings, the OQ-19 can be used to test the effectiveness of interceptor radar units on the ground. It can be launched from an airplane in the air, from a ground launch using jato tubes, or from a rotary launch on the ground which releases the drone after it has reached a certain speed. On the average flight, they are flown around an hour at between 5,000 and 10,000 feet at a speed of 185 miles an hour. The drones are usually recovered by parachute, although in high winds they have been glide-landed successfully.

Much apprenhension connected with the exposure of crews in high-flying aircraft to primary cosimc radiation in the stratosphere is being eliminated by Air Research and Development Command projects being conducted in the Space Biology Branch of the Aero Medical Field Laboratory at Holloman. Studies made on mice, monkeys and guinea pigs sent aloft in balloon capsules have answered many of the questions scientists had about cosmic radiation. Balloons hold the animals at altitudes higher than 90,000 feet for periods over 28 hours, long enough to expose them to primary cosmic radiation in the stratosphere.

From results gathered on body systems tests, it appears that the biological effects of cosmic particles are no greater than the minimum values expected, except for positive results on hair graying. Black rats have incurred some damage to hair follicle pigment cells, causing the affected cells to produce white hair.

There is still much to learn about cosmic radiation, but by the time man flies into higher altitudes he will know what to expect and will be better prepared as a result of these Aero Medical Field Laboratory experiments.

One of Holloman's more colorful projects is the Q-2 "Firebee", the only pilotless, jet propelled, high-speed target drone of the Air Force. The idea for a pilotless drone came a few years after the Second World War when the government found it necessary to create a target capable of competing in a supersonic era. The Air Research and Development Command has conducted an intensified test program on the Q-2 at Holloman. The drone is less than half the size of present day jet fighters and is powered by a Continental J-69 turbo-jet engine of about 1,000 pounds thrust. Packaged like a model airplane kit, the complete target is shipped from the Ryan factory in a group of five containers weighing 2,500 pounds. Command signals are transmitted from the ground to the "Firebee" by means of a black box containing a stick and switches to govern engine speed and other flight conditions. It can be launched air-to-air by means of a "mother ship" or ground-to-air by means of JATO rocket boosters. Ryan and Air Force technicians have developed a parachute recovery system to decelerate the drone from its 600 miles per hour speed and lower it safely to the ground without harm to the delicate equipment inside.

Holloman has the job of learning the secrets of the upper air where Air Force men and machines will some day operate and be exposed to rarified atmosphere, extreme cold and other high-altitude phenomena. Through necessity, a means of sending instrments aloft for several hours had to be conceived. Rockets could not accomplish this because they remain aloft for a relatively short period of time. Solution to the problem was in the form of huge polyethylene plastic balloons, which have attained altitudes of over 132,000 feet and have stayed aloft for as long as four days at 109,000 feet. The average flight is between 75,000 and 95,000 feet. Balloons used in these operations are up to 172 feet in diameter. The larger balloons, of course, carry the heaviest payloads which weigh one-half ton or more. Among the

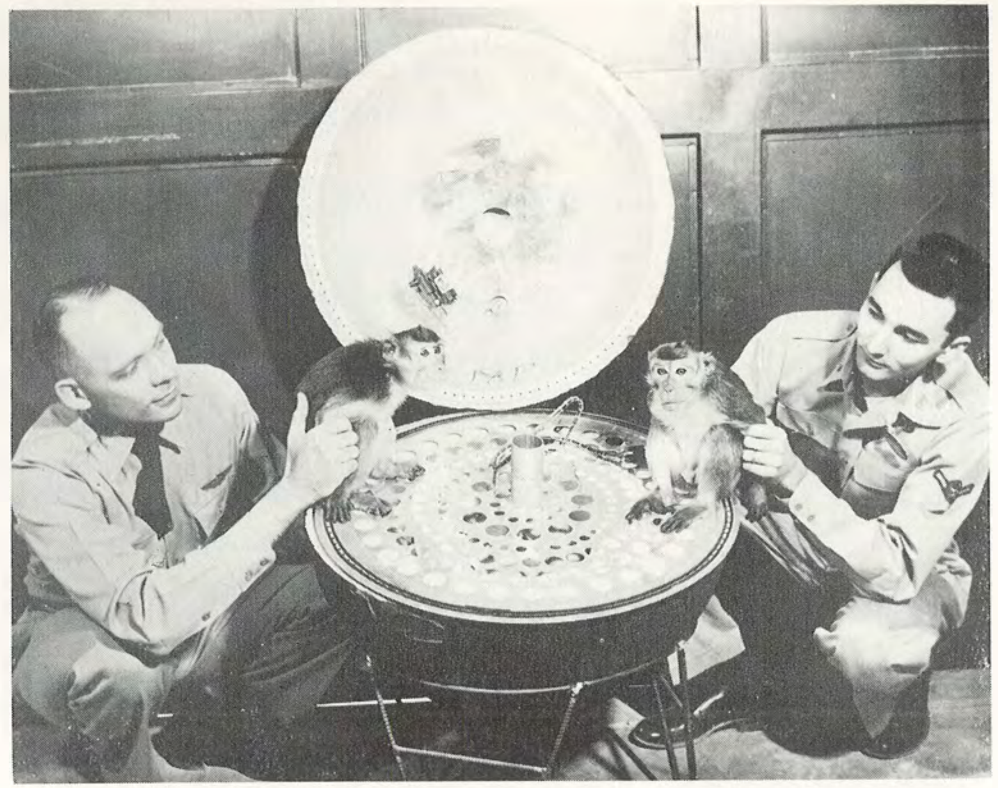
The launching of a high altitude balloon under the direction of people from Holloman Air Development Center. Using these vehicles to carry monkeys, mice, and hamsters, much has been learned about the effects of cosmic radiation on living organisms up to altitudes of greater than 100,000 feet.

payloads carried in these experiments are instruments for determining composition of the atmosphere at high altitudes; to take measurements of carbon dioxide and rare gases in the atmosphere; to measure sky brightness at high altitudes; to obtain data on the vertical distribution of ozone in the atmosphere; and to record the intensity of solar radiation. These instrument packages are released from the balloon in one of three ways—the first, by an explosive charge which is activated by an aneroid device; second, through a special radio command cut down system; third, by the use of a special-purpose clock which closes the circuit on the explosive charge which is used to sever the load line. The package is released, and parachuted to the earth. The first such balloon launched at Holloman was July 3, 1947, by a New York University research team. It was found that weather is the worst enemy of these balloons at launching time because they are fragile and easily damaged. As a result, balloons are launched shortly after dawn when winds are shifting and surface winds are relatively calm. At times the balloons are caught in high-altitude wind streams and may travel as far as Europe before the payload packages are dropped. Some packages have been returned from Norway, Sweden and Algiers. Parachutes used to recover these ballon packages are designed by Holloman's unique Missile Recovery Systems section. This branch also designs parachutes to recover instruments from the Aerobee and to bring down safely the Q-2 pilotless drone and the OQ-19.

The Automotive Crash Program was authorized for the Aero Medical Field Laboratory at Holloman because of the laboratory's extensive experience in investigating the nature of mechanical forces applied to the human body and because of the excellent test, engineering and instrumentation facilities which provide an ideal research background. The program involves prearranged collisions of salvaged service vehicles into 30-ton barriers. Factors investigated in this program are the rate of onset and peak of deceleration, angle and area of impact, use of restraining devices, number of occupants and other variable factors. Cornell Crash Injury Research supplies statistical data from actual highway crashes for the basic planning of crash configurations. Cameras are set up to photograph the crash at normal speeds as well as in slow motion. Doors are removed from the vehicle so the dummy occupants can be seen during the smash-up. Usually four dummies are placed in the vehicle—two strapped in and two unstraped. By conducting the experiments in this manner, the practicality of safety devices and the need of safety devices can be determined.

Many other projects are under way at Holloman Air Development Center, projects which cannot be revealed as yet. Working as part of the Integrated Range of White Sands Proving Ground, the Air Force is working hand in hand with the Army and the Navy toward conquering the last frontier of all and toward providing our nation with guided missiles for both offense and defense. • • •

The result of crashing an automobile at 30 mph into a brick wall. The dummy, instrumented to determine the shocks on a human being, is pinned between the seat and the broken steering wheel. In addition to improving crash protection for aircraft, such studies at HADC will pave the way for safer automobiles.



AN ATMOSPHERIC SATELLITE STATION

by

B. D. GILDENBERG
Balloon Branch, HADC

WE are about to witness a significant evolutionary step in rocket science; the evolution from sounding rocket to satellite vehicle. This offspring of the V-2, the Aerobee and the Viking family should indeed be precocious. The most spectacular consequence of the operational phases will be an introduction to some of the techniques required to buy us Christmas in Copernicus Crater.

The proud parents, however, were primarily engaged in an honest occupation which must not be forgotten; namely data sampling. This sounding rocket group provided information describing various phenomenon, which was, so to speak, frozen in time and space. The extracted value of the magnetic flux at 100 kilometers elevation was an instantaneous reading for a point over New Mexico. Now, the scope of information transcends to a higher order, with the satellite progeny offering both time variation and geographical distribution for phenomenon at a constant altitude.

The first few satellites are apparently destined for an orbit some 200 miles above the earth's surface. At this altitude, however, atmospheric drag is still sufficient to seriously limit flight durations. 800 miles is the elevation prescribed for latter phases of the program. Indeed, for practical purposes, the rocket satellite will always be a child of the exosphere; that fringe area somewhere above 400 miles, where the affiliation of air particles with this planet becomes problematical.

As far as upper atmospheric research is concerned, therefore, the gifted progeny of the sounding rockets may be jumping a little bit too high. Far below the exosphere, in the homelier depths of the ionosphere and

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AN ATMOSPHERIC SATELLITE STATION—cont'd.

stratosphere, many a secret lies hidden from the pages of the physics text books. What is yet required, is an intermediate, or atmospheric satellite.

Happily enough, a vehicle exists which can satisfy most of the requirements for an intermediate satellite. But, let all stalwart rocketeers restrain their horror, for said vehicle is a—balloon!

How crude, how provincial, a mere toy, you say; but listen.

The 1930s saw the termination of the first Golden Age of Ballooning. Now, however, a renaissance is in full bloom, spurred by a corresponding surge in plastics development. Of principal interest is polyethylene, the material which is currently enveloping any newly purchased product, from Cadillacs to pajamas. Ten years ago, somebody suggested wrapping helium in same, and lo! The constant level balloon was born.

The constant level balloon (CLB) has three primary qualities which elevate its usefulness many strata above the common garden variety of balloons.

1. Constant level performance

This attribute is achieved as a result of two factors. First, CLBs are non-extensible cells, usually constructed of polyethylene plastic. Secondly, the appendix is flown open; that is, the balloon is not sealed off so that the lifting gas would pressurize.

During inflation enough lifting gas is inserted to support the balloon, rigging and payload. Now, the configuration is in equilibrium. Next, a small additional volume of lifting gas, termed the free lift, is supplied. This initiates an unbalancing force in the upward direction. Upon release, the cell accelerates, but atmospheric drag results in an ascent which increases only gradually with altitude. As the ambient pressure decreases, the volume of gas within the balloon increases until "pressure altitude" is attained. At this altitude, the plastic envelope is completely inflated and lifting gas commences to valve through the open appendix. When a quantity of gas equal to the free lift has been ejected, a state of equilibrium is once more attained. With no force available to induce vertical motion, the volume of gas remains constant within the plastic container, and the flight levels off on a constant density surface. This floating altitude can be pre-determined by selection of the balloon size and payload weight. The volume of lifting gas provided serves only to determine the ascent rate.

2. Great load carrying capacities.

At present, the CLB has the same payload capabilities as the Viking Rocket, with ¾ tons being the top operational figure.

3. Extensive flight durations.

As late as four years ago, there was a large scale CLB project (Moby Dick) in which all the flights were set for 3 days duration. Constant altitude for long flights is maintained by servo or ground command of fine steel shot ballast.

The logistical tracking problem substantially lags the vehicle potentialities in this category. Seven years ago, a balloon launched from Holloman Air Force Base, New Mexico, landed in Norway! Others from this site have impacted in New Jersey, Canada and Africa.

The resolute rocketeer, however, is not distraught. "So," he articulates, "this bag of gas can stay up n times longer than a Viking. But, even that peanut of a WAC Corporal can go higher!"

Now, gentlemen, we must not completely forsake the formal rules of Aristotelian logic. The statement of contention is that the CLB satisfies most of the requirements of the atmospheric, intermediate satellite. It can provide both time change and geographical distribution data at a constant level. It can probe the troposphere, the ozonosphere, but not the ionosphere. The latter discrepancy is the factor responsible for the qualification, "most of the requirements."

The largest operational models available currently, can reach 120,000 ft. MSL, with a useful payload of 150 pounds. At this altitude, 99.6% of the atmosphere has been expended. But rocketeers, be of heart, for the base of the ionosphere is still some 22 kilometers higher, at 196,000 ft. MSL; rather an abstract altitude for a balloon.

Evolution can embrace any field of science, however, if proper concentrations of effort and expenditures are applied. And perhaps the CLB with some "applied evolution", can spawn progeny with as exciting possibilities as the rocket satellite.

Consider this statement in the October 1955 issue of Weatherwise magazine, by J. J. Kelly, of Martin Co., in an article entitled "Earth Satellites; What will they mean to meteorology?"

"An appreciation of the mechanical capabilities and limitations involved in sustaining a stable platform in an earth-circling orbit is necessary in formulating the meteorological programs. For example, when it becomes possible to launch satellites for solely meteorological purposes, the particular altitude, period and flight path must be chosen to get the best results from the instrumentation. It is interesting to note that, while the proposed orbiting altitude is 300 miles, almost 90% of the atmosphere is below 10 miles. In this case measurements would be taken 290 miles above the bulk of the atmosphere in contrast to our present intra-atmospheric methods. The question arises, which is at the core of the meteorological problem, "Is it worth the trip?"

Thus another good argument for the intermediate atmospheric satellite. In fact, one might even suspect that a CLB Project Vanguard would exceed the rocket version, at least as far as data gathering is concerned. Let us supply some "slide rule evolution" and examine the possibilities.

In lighter-than-air science, the most direct method of obtaining increased performance, is to increase the size of the vehicle. How large a CLB could be constructed and made operationally feasible in a few years of development?

More than twenty years ago, a lighter-than-air vehicle, 811 feet in length was successfully constructed and operated. This was the dirigible Hindenburg, which made 17 ocean crossings. The Graf Zeppelin ran over

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balloon away!

The modern progeny of the Mongolfiers' gas bag goes aloft. (USAF photo)

AN ATMOSPHERIC SATELLITE STATION—cont'd.

700 feet, and 48 years ago, a dirigible 450 feet long was flown. Having to start with some dimension and conservatively not wishing to exceed the feats of our ancestors, let us choose the Hindenburg length as our initial parameter.

An uninflated length of slightly more than 800 feet would indicate a balloon diameter of roughly 600 feet; the inflated volume, computed as a perfect sphere-113 million cubic feet.

Oh, oh, things no longer appear as conservative as our initial nomination. The Hindenburg was only 7 million cubic feet; the largest balloon constructed to date, 210 feet in diameter. The handling problems of large balloons, however, are perhaps more a function of the area involved, than anything else. In this example, adding 10% to the radius, to allow for deviations in construction from the perfect sphere, we obtain an area of 1,370,000 square feet. This is about 4 times greater than the similar Hindenburg dimension and certainly less appalling than the volumetric comparison. In this size category, adding 10 feet to the diameter adds 3 million cubic feet in volume.

Finally, the weight must be considered. Using the current .002 inch operational thickness of polyethylene, we obtain 7.5 tons. This is heavy, when one thinks of contemporary models. But we are searching for a vehicle to perform in the satellite era. The mass is less than that of an F-104, one quarter the weight of a B-17, and a featherweight compared to the 220 ton Hindenburg.

Extrapolating the cost of a 113 million cubic foot model is precarious at least. We can start by using the present approximation of three times the pounds weight of the cell, in dollars. Add 5000 dollars, to be on the safe side and 50,000 dollars is our guess. Add another million for development, plus half a million for ten models, and we have a roaring CLB satellite project underway. Cheap, as satellite programs go, but what will the taxpayers be buying besides an occasional polyethylene rainstorm? Let's look at performance curves.

The maximum attainable altitude with 130 pounds of payload would be 144,000 ft. MSL.

Trapped—50,000 feet below the ionosphere, and with a payload only a few orders of magnitude greater than the rocket satellites. We must admit, this is no bargain.

But wait. This load-altitude curve is happily, flat in the right direction. Come down a mere 4000 feet, and now 2600 pounds may be lifted. The 1.3 tons is greater than any load yet handled by a sounding rocket. With this sort of capability at 26.5 miles, 42.7 kilometers, above 99.8% of the atmosphere, the 7.5 ton CLB looks considerably more interesting. For instance;

1. The balloon is 12 miles above the maximum layer of ozone concentration.
2. Ultraviolet spectra as low as 1900 angstroms may be obtained.
3. We are 20,000 feet above the lower limit of unimpeded cosmic ray activity.
4. The day time air glow intensity is at a minimum which apparently persists to at least 135 kilometers.
5. Line of sight to the horizon is about 445 miles.

If half the payload were ballast, perhaps 3 days of flight could be managed. Three days with 1300 pounds of equipment at 140,000 feet could provide sufficient data to keep the upper atmospheric physicists busy for a long time.

There is, however, another possibility, which makes this 43 kilometer flight attractive to an even larger number of research people. 1.3 tons is sufficient weight to lift human beings in a pressurized gondola. In fact, three people could be flown for eight hours at this altitude, 20,000 feet higher than the record elevation where an experimental manned rocket spent a few seconds.

This satellite, therefore, may be intermediate in several senses of the word. Not only can it probe these intermediate altitudes, but it can serve as a test platform for true manned space travel.

Data gathering, also, can be increased many times with manned vehicles. The 8 hour Explorer 2 balloon flight in 1935, collected as much data as could be obtained by a motor pool full of sounding rockets.

2600 pounds at 26.5 miles invite a multitude of ideas. If a rocket of said mass were launched from this elevation, would the atmospheric drag be low enough to eliminate the need for streamlining?

As stated previously, a balloon of this volume results in remarkably large increases of load capacity with small decrease in altitude. Dropping down to 130,000 ft. MSL, therefore, we find a payload capability of 11,200 pounds. Select a comfortable pressurized, air conditioned gondola, plus two men and sundry instrumentation totaling 4000 pounds. This leaves 3.6 tons available for ballast. The result would provide a flight duration of roughly two weeks. (Performance of such a huge balloon at this high altitude is hard to estimate at this stage of the game, but one can figure an accuracy of plus or minus one week, depending upon the consistency with which the balloon holds altitude.)

Now we have purchased two weeks of data at an altitude above 99.7% of the atmosphere; with at least 1000 pounds of instrumentation attended by personnel; with said personnel having the capacity for visual observational techniques to provide a wealth of additional data. Furthermore, consider the problems involved in maintaining a comfortable environment within such a gondola for 336 hours. The outside air pressure is a gasping .09 inches of mercury, and several miles below the subject's feet lies most of the ozone required to keep one out of the ultraviolet soup. Here, indeed, is a full scale introduction to the Aero Medical problems of space flight. Orbital "calisthenics" could be checked, for instance, by having the men climb in and out of the gondola, at peak altitude, preferably with their pressure suits buttoned up.

Perhaps we should see what the 7.5 ton model can do in one final stratum; 100,000 ft. MSL. A rather dull altitude? Not interested? Hm, how many seconds have men spent at this level, to date?

I think, however, the payload capacity will settle this argument;

—a dazzling 108,000 pounds, or 54 tons!

Now let everyone join in, to be spectacularly inventive. How about lifting 6 F-104s to 100,000 feet, and let them scramble from there! How about a 54 ton rocket ensemble with a lunar date? Nice, but try this for a sample—

gondola—2000 pounds; four men—800 lbs.; food and oxygen—2200 lbs.; instrumentation—5000 pounds; ballast-49 tons.

Observe! This is no longer an intermediate satellite, but a space ship! Employing fine steel shot as ballast, two or three months flight durations would be plausible. And yet, 49 tons, 98,000 pounds, 44 million grams; it seems intuitive that this weight could be employed with greater finesse.

Consider this gambit; actually flying a small plant to manufacture lifting gas chemically, or perhaps with some nuclear technique, or by attraction from the environment. At the very least, liquid helium could be stored, thus resupplying the balloon with lifting gas and later dropping the used containers as ballast. With such techniques, flight durations of incredible lengths might be achieved. A six months flight at 100,000 ft. would, for instance, be worth many times the rough cost estimate for one of these vehicles.

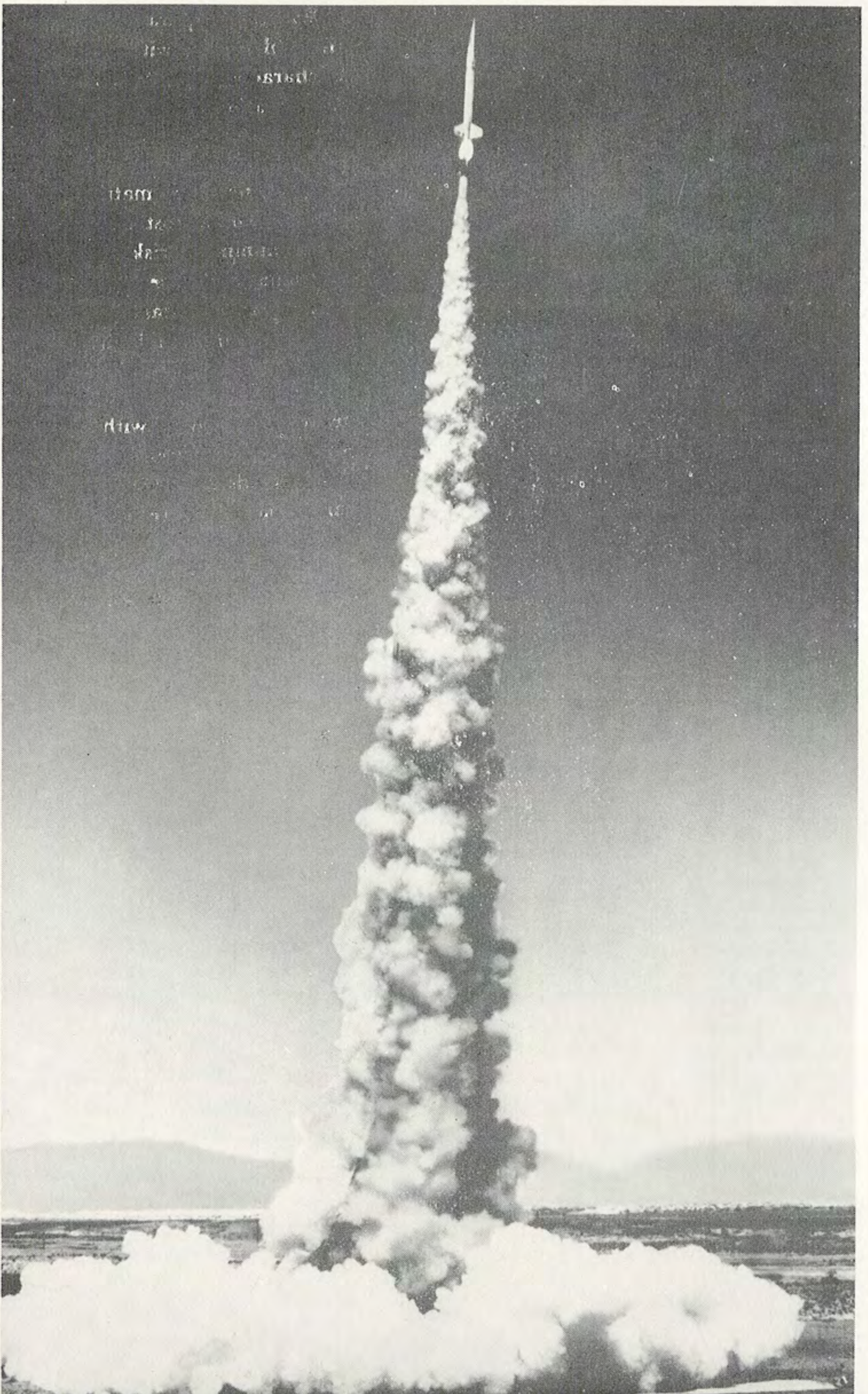
Shall we try another stunt at this elevation? First, limit the ballast to only 9 tons (what luxury, these tons of ballast!) Now, visualize those sketches of proposed manned rocket satellites, where the crew is housed in a spherical gondola, and an atomic power plant located in a separate sphere; a dumbell shaped configuration. Such an arrangement could be realistically checked out in this case, with 40 tons available for the atomic plant.

Try another prospect; a 14 ton rocket ensemble, launched horizontally from 100,000 ft. on a 40 ton short track.

Come to think of it, ten balloons were ordered for this project. Save one for 19 tons of ballast and a 30 ton telescope.

Well, now, if some staunch rocketeers have suddenly been converted into balloonatics, keep this in your hat for 1966. A model 5000 feet in diameter, weighing about the same as an old fashioned Clipper Ship (500 tons), would take approximately 90 tons of payload to the D layer, at 197,000 ft. MSL, or 60 kilometers. There are plenty of 10,000 ft. runways already available for the launch area. If necessary, the middle of the Siberian winter high pressure area can provide a sufficient depth of calm air during inflation. But, dear friends, remember to take a goodly supply of patching tape along for the trip. Sixty kilometers is the lower boundary of meteor penetration!

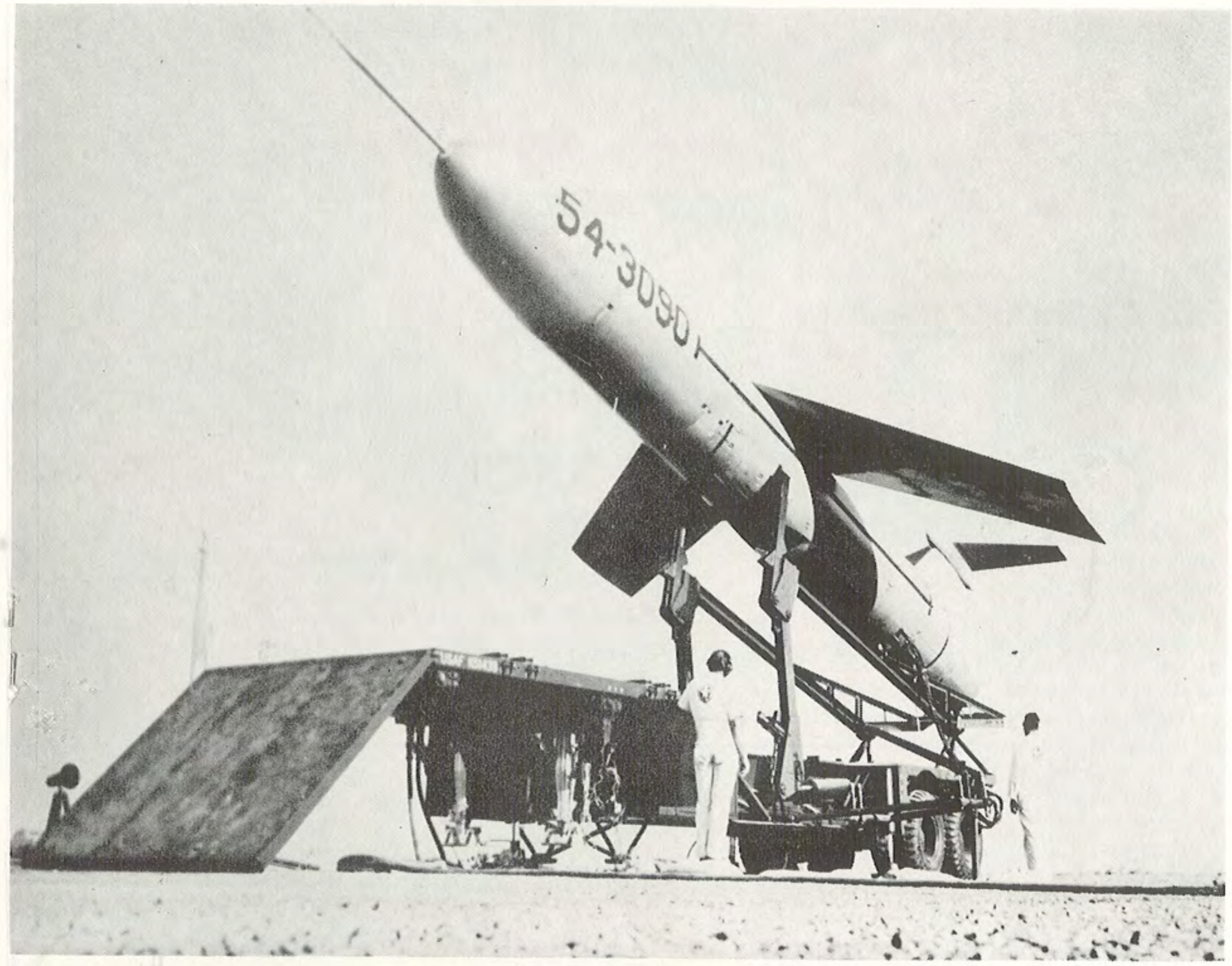
ARDC/HADC

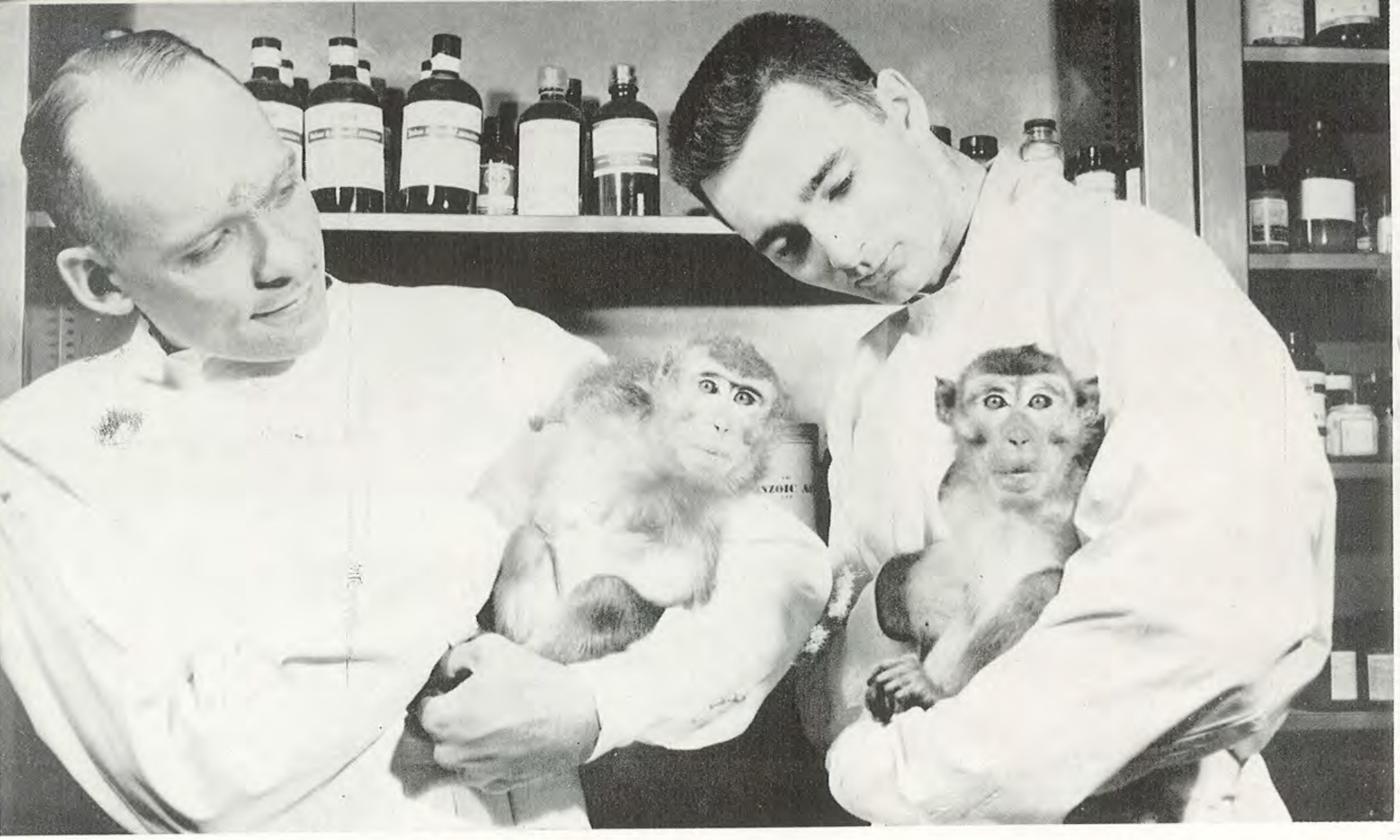


Research

Drones

Missiles





Two space flight veterans are held by the author (left) and A/2c Jerry L. Johnson of the Aero Med Field Lab, HADC.

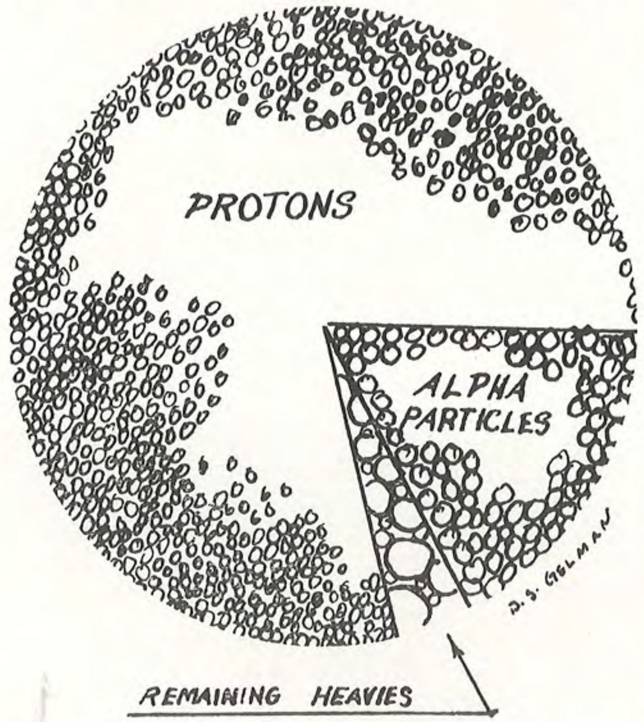
What are COSMIC RAYS?

By Major David G. Simons, USAF(MC)

Aeromedical Field Laboratory, HADC

CONSIDERATION of the health hazards that may be encountered when traveling beyond the earth's atmosphere into outer space includes the effects of primary cosmic particles. A subsequent article will consider the biological implication of these cosmic missiles of outer space which until recent years have been shrouded in a cloak of mystery. But first, what are they, where do they come from, and what becomes of them as they hurtle toward our earth?

For several decades, scientists have been intrigued by single showers of cosmic rays covering many square yards of area and totaling many billions of electron volts of energy. These spectacular cosmic events were observed from high mountains with geiger counter arrays and cloud chambers. Within the last ten years, balloon-borne nuclear track plates, and rocket-borne track plates and geiger counters, have revealed that the showers and other surface phenomena were secondary radiation caused by primary atomic nuclei accelerated to high energies. These primary particles apparently hurtle through space without preference for any direction. With only rare exceptions these nuclei range in weight from hydrogen to iron, 80% being hydrogen nuceli or protons, 16% helium nuclei or alpha particles; all the heavier nuclei constituting the remaining 4%.



They all arrive denuded of orbital electrons. These naked nuclei carry, therefore, a positive charge equal to their atomic number. The total number of incoming nuclei ordinarily shows variations amounting to only a few percent in short periods of time. On occasion, usually associated with solar flares, the intensity may vary up to 150%. In addition, recent evidence indicates that the average primary intensity has gradually increased roughly 30% between 1948 and 1953. The meaning of these variations is not yet clear.

The origin of cosmic rays is described by numerous theories with ardent advocates to argue the cause of each. Enrico Fermi postulated the generally accepted theory that primary cosmic particles originating within our own galaxy are accelerated by magnetic fields over periods of millions of years. In addition to this galactic source there is mounting evidence that cosmic particles are significantly affected if not partly generated by our sun. The absence of all types of particles with energy less than 0.35 billion electron voltes per nucleon may demonstrate a solar magnetic influence.

The different types of cosmic nuclei observed in the region of the earth's orbit may be compared to different types of aircraft flying near a busy terminal. The smallest nuclei, protons, would be represented by the many small private planes. The larger "company" type planes would correspond to helium nuclei, or alpha particles. In this picture, airliners representing carbon nuclei, would be much less common. On rare occasions, one might catch a glimpse of an intercontinental bomber corresponding to an iron nucleus.

Pandemonium reigns! All types of aircraft are flying in all directions without regard to rules, regulations or safety. Harry, the harried airborne traffic cop, finds that not only are the smallest type aircraft much more common, but that each type of aircraft is represented by a range of speeds. The slowest aircraft (nuclei) are most common, the fastest least common, without regard to the type of aircraft. From this pictures, it is quickly seen that "airborne Harry" must contend with many slow speed private planes, occasionally would see a slow airliner or bomber, but would very very rarely see high speed craft of the heavier type. Correspondingly, low energy light primaries are common, low energy heavy primaries less common, and high energy heavy primaries

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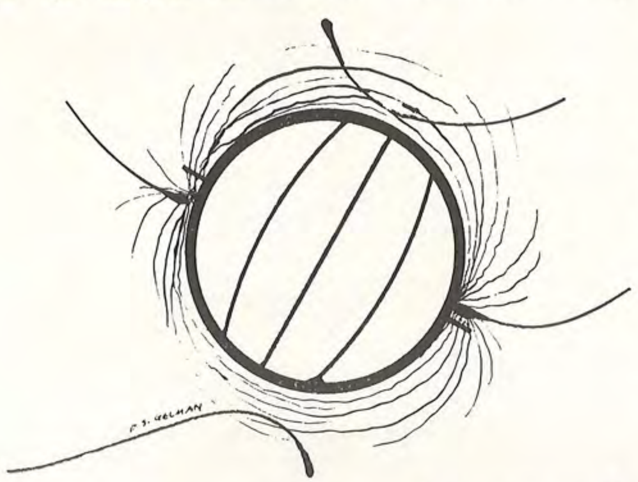
WHAT ARE COSMIC RAYS?—cont'd.

extremely rare. Of the heavy primaries present, most are slow, and happen to be of the greatest biological interest.

Energy is important. The highest energy attainable with modern cyclotrons and bevatrons barely reach the lowest energies observed among cosmic primaries. A high energy cosmic particle has many thousand times the energy of a low energy particle. Billion Electron Volts (BEV) expresses the energy in convenient terms. An electron volt is the energy a singly charged particle would accumulate travelling between areas differing in charge by one volt. Thus a typical low energy hydrogen primary particle carrying a charge of a billion electron volts must have passed through the equivalent field potential difference of one billion electron volts.

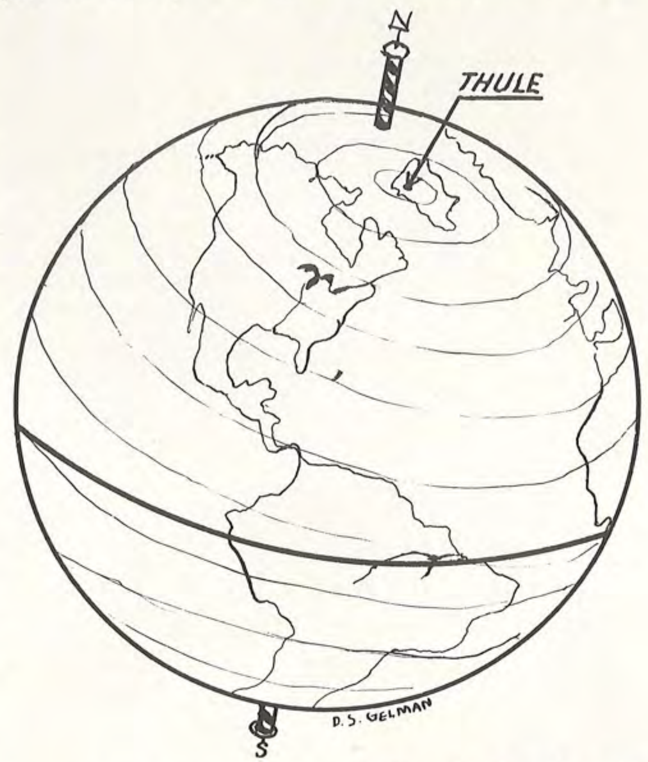
The total kinetic energy of a particle depends both on its mass and velocity. A major influence on incoming particles is exerted by the earth's magnetic field. By expressing their energy in terms of the BEV per nucleon, magnetic effects on nuclei of different weight can be compared directly. The number of nucleons is the sum of protons and neutrons, and therefore is the nuclear weight. Particles accelerated to the same number of BEV per nucleon are influenced equally by the earth's magnetic field. The only exception are protons, which have a one to one rather than the nearly two to one weight-to-charge ratio of all other elements.

Incoming cosmic ray particles are influenced by both the earth's magnetic field and by the atmosphere. The stream of negatively charged electrons which produce the spot on your television tube is deflected in many



sets by a magnetic yoke to form the pattern on the screen. In the same way, the positively charged cosmic particles approaching equatorial regions of the earth cross the magnetic lines of force at right angles and are deflected by them. Particles streaming down upon the poles, hence travelling parallel to the magnetic lines of force, are not deflected. The less energetic, slower, particles are influenced much more by this magnetic effect. Only particles having an energy of at least 10 Billion Electron Volts per nucleon can reach the earth's atmosphere at the magnetic equator. To reach the earth's atmosphere at 55° from the equator, a particle needs only 0.35 BEV per nucleon. Since no particles are observed with the lower energy, there is no magnetic latitude effect between 55° and the poles; hence, no further increase of cosmic radiation exposure between 55° and the poles.

The position of the magnetic field of the earth determines cosmic radiation effects. The geographical north pole or scuth pole of the earth is determined by the



rotation of the earth, and can be thought of as the point on the earth through which its rotational axis passes. On the other hand, the magnetic north pole is determined by the effective magnetic field of the earth and can be related to an imaginary bar magnet in the earth that would produce the observed earth magnetic field. On the surface the magnetic north pole would then be located over the pole of this imaginary magnet. The magnetic north pole is observed close to Thule, Greenland, so that geomagnetic latitudes in the United States are approximately ten degrees less than the corresponding geographical latitudes.

The effect of the atmosphere on light and heavy primary cosmic particles can be compared to the effect of a forest on a bullet or cannon ball or missile fired into it. The cannon ball fired into a dense forest could travel only a limited distance before it would collide with a tree trunk shattering it. Because it is smaller, and therefore presents a smaller cross section for collision, a rifle bullet would usually penetrate further into the forest. In the same way, there is an average distance or range characteristic of cosmic radiation nuclei of each size. Two-thirds of the iron nuclei will have collided with air nuclei by the time they have penerated 15.6 grams of material. Because they are smaller, carbon nuclei can pentrate 31 grams of material before two-thirds of them

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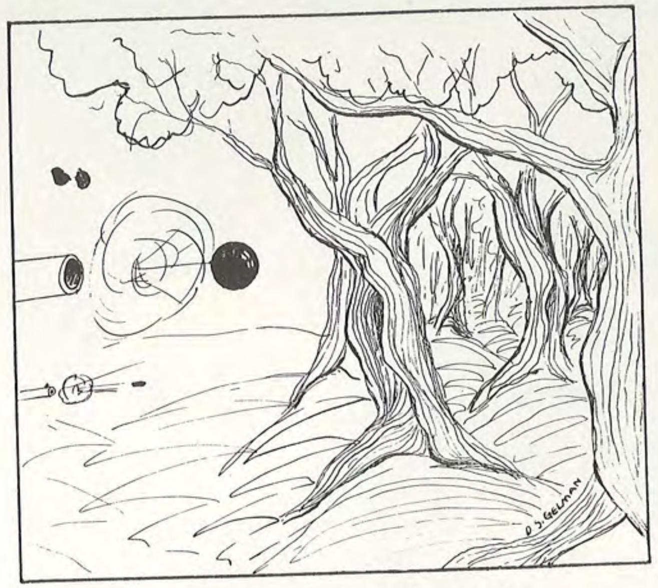
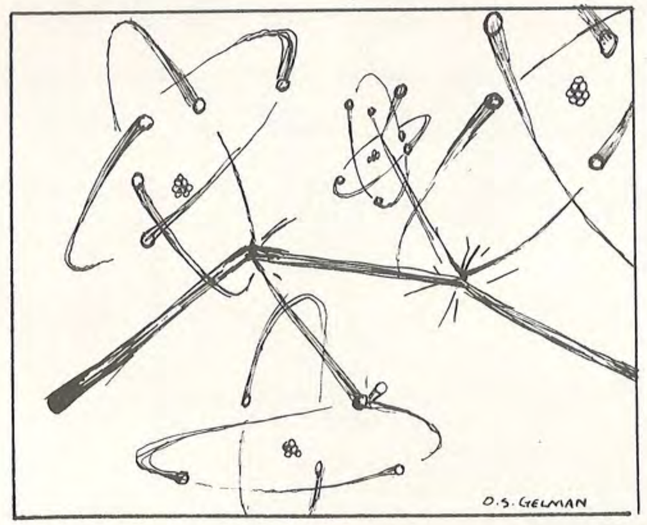


have disintegrated into shattered fragments.

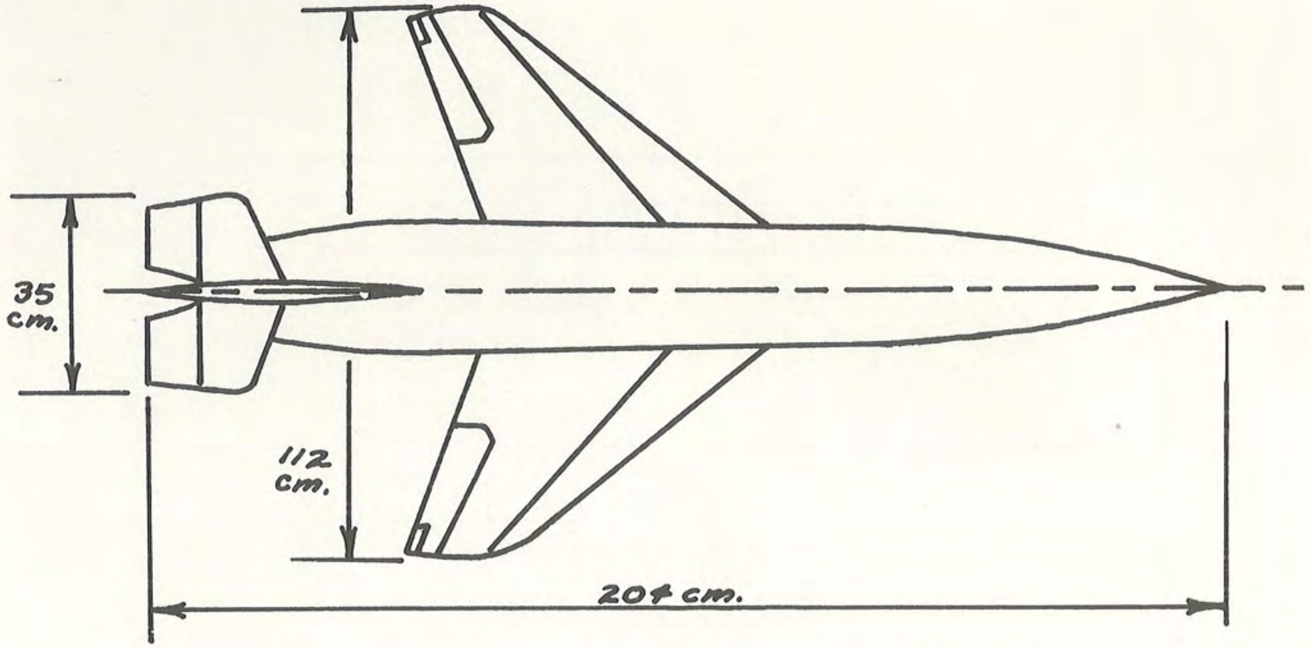
A recent cover of "MISSILE AWAY" carried a dramatic illustration of the nuclear disintegration or spray of nuclei particles following such a nuclear collision. Protons, netrons, alpha particles, various mesons, and higher order nuclear fragments are scattered in all directions frequently with high energy. It is this spray of nuclear debris which is observed from ground level to 75,000 feet. Since many of these secondary nuclear fragments retain sufficient energy to cause tertiary and

higher order star collisions, the ultimate radiation spray resulting from a single primary can multiply the effective roentgen dose produced many times. For this reason, a total number of ionizing events produced per square centimeter of air reaches a maximum at 75,000 feet. Below this altitude the radiation is gradually absorbed by the air; above this altitude the radiation is concentrated in tracks of high energy primary particles rather than distributed through secondaries.



Going back to the cannon ball analogy, before the cannon ball plunks to a halt, it sweeps a path of leaves and twigs through the branches of the trees. Similarly, a heavy nucleus moving with nearly the speed of light swishes through air or other target molecules in its path. It scatters the electrons swirling around the target nuclei, transferring to them a portion of the cosmic particle's energy. This cloud of ejected electrons forms a highly ionized path uniquely characteristic of heavy primaries and commands the respect of radiobiologists. If the incoming nucleus escapes head-on collision with an air nucleus, it continues to dissipate its energy by this ionization process at an increasing rate. Finally, its energy nearly spent, it acquires its own crown of electrons and becomes indistinguishable from any other peaceful law-abiding atom. Only cosmic nuclei having nearly minimum energy (in the neighborhood of one BEV or less) terminate by ionization in this way. As noted before, the lowest energy primaries are found north of about 50° geomagnetic latitude, because the earth's magnetic field deflects the low energy particles away from equatorial regions. The exclusively higher energy equatorial particles have so much energy that they practically always collide with another nucleus before they have lost all of their energy by ionization. Thus, temination of primaries by ionization is observed primarily north of 50° geomagnetic latitude.

In a subsequent article, it will become clear why the low energy heavy primary particles pose the greatest biological hazard. Being heavy, these particles are relatively rare, but the fact that the less energetic ones are of greatest concern means that a considerable number will penetrate a person above 75,000 feet in northern latitudes. How many and what effects they may be expected to produce will be discussed in a subsequent article. • • •



FEUERLILIE F-25

Ground-to-Air Missile Subsonic

Developed by: Dr. Braun

Manufactured by: LFA Braunschweig

Status: (a) Exp. Units built: 19
(b) Exp. Units tested: 10
(c) Exp. Units tested at: Leba, Pomerania
(d) Production contract: None issued

Method of launching: Special launcher

Auxiliary Launching Propulsion System: None used.

Launching Attitude: At angle (10-30 degrees Vertical)

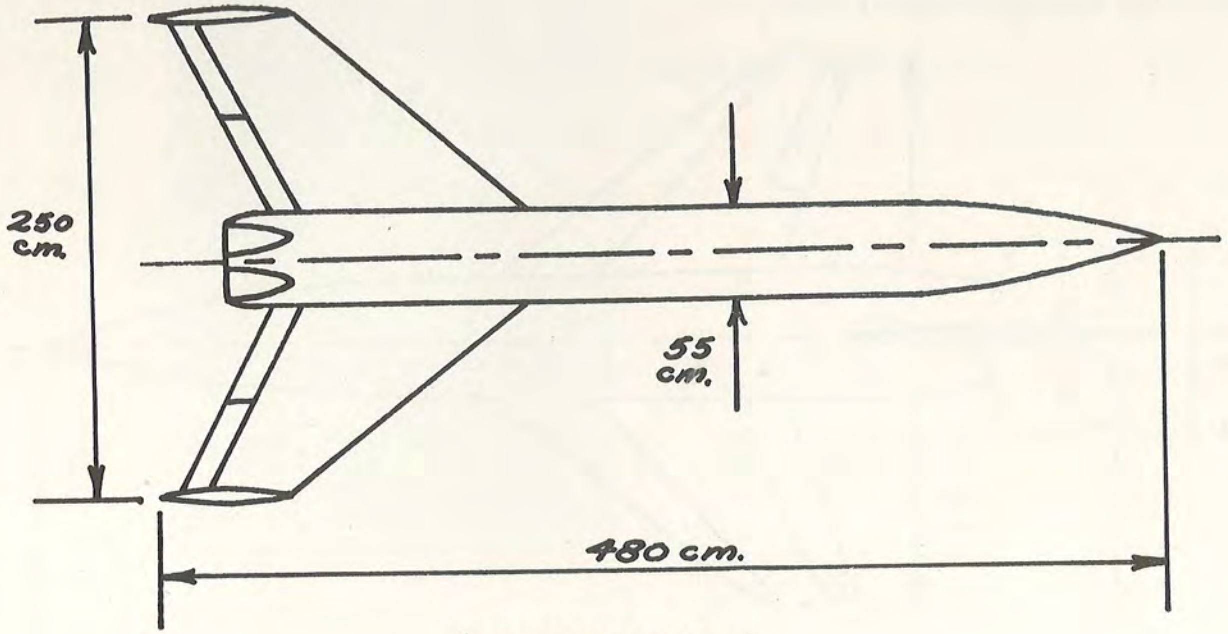
Launching Mechanism: Modified 88 mm. gun mount

Velocity, Maximum: Mach 0.70

Propulsion Unit:
(a) Make: Rheinmetall-Borsig
(b) Manufactured by: Rheinmetall-Borsig
(c) Type unit: Solid rocket
(d) Burning time: 6 seconds
(e) Weight: Not known
(f) Total impuse: 3000 Kg. sec.
(g) Fuel type: Diglycoldinitrate
(h) Fuel capacity: 16.5 Kg.
(i) Thrust: 500 Kg.

Missile Dimensions:
(a) Total weight: 118 Kg.
(b) Empty weight: 101 Kg.
(c) Warhead: None used
(d) Length: 204 cm.
(e) Span: 112 cm.
(f) Diameter: 35 cm.

Control:
(a) Type in use: Gyro stabilization
(b) Code name: Not known
(c) Manufactured by: DFS Fischel
(d) Proposed types: None



FEUERLILIE F-55

Ground-to-Air Missile Supersonic

Developed by: Dr. Braun

Manufactured by: LFA Braunschweig

Staatus: (a) Exp. Units built: 3
(b) Exp. Units tested: 2
(c) Exp. Units tested at: Leba, Pomerania
(d) Production contract: None issued

Method of launching: Special launcher

Auxiliary Launching Propulsion Unit:
(a) Type: ATO solid rocket unit
(b) Make: Pirat
(c) Manufactured by: Rheinmetall-Borsig
(d) Total Impulse: 27,000 Kg. Sec.
(e) Duration of thrust: 2.7 Sec.
(f) Thrust: 10,000 Kg.
(g) Weight of unit: 365 Kg.

Launching Attitude: At angle (20-degrees vertical)

Launching Mechanism: Modified 88 mm. gun mount

Velocity, Maximum: Mach 1.25

Propulsion Unit:
(a) Make: SG-20
(b) Manufaactured by: Conrad
(c) Type Unit: Liquid rocket
(d) Burning time: 7 sec.
(e) Weight: 240 Kg.
(f) Total impuse: 45,000 Kg. sec.
(g) Fuel type: Salbei, Tonka
(h) Fuel capacity: 210 Kg.
(i) Thrust: 6400 Kg.

Missile Dimensions:
(a) Total weight: Est. 1000 Kg.
(b) Empty weight: Est. 640 Kg.
(c) Warhead: None used
(d) Length: 480 cm.
(e) Span: 250 cm.
(f) Diameter: 55 cm.

Control:
(a) Type in use: Gyro stabilization
(b) Code name: Not known
(c) Manufactured by: DFS Fischel
(d) Proposed types: Gyro and radio
(e) Code names: Papagei or Mamagei
(f) Status: Development

Five space hounds pose before departing on the First Annual Solar System Tour of the NM-WT Section. In the usual cameraderie of space travellers, Space Bum R. G. Fisher chats with the Galactic Overlords, Mr. and Mrs. L. W. Gardenhire, and Luna-tics Mr. and Mrs. Paul Hill. (Photo by Roger Mayfield).

"MISSILE AWAY!" *goes to a Party!*

(Life Magazine, take note)

ON the evening of 3 March 1956, the Navy BOQ at White Sands Proving Ground saw a party the like of which had never been held anywhere. From all over the Solar System, spacemen, rocket stewardesses, space rangers, space bums, and other assorted characters gathered for the First Annual NM-WT Section Space Ball. Credit for originating the party goes to Past-President Frank L. Koen, Jr., now with Ramo-Wooldridge in Los Angeles, who first proposed the idea to the Section Board two years ago. In that two years of time, ideas were consolidated and committees formed. The final Space Ball was the work of many people, not the least of whom were Russell Sherburne, Nat Wagner, Gil Moore, Sorine Jellison, Jim Sims, Phyllis Moore, Chuck Moser, and Keith Hennigh. Wives and girl friends chipped in to provide decorations, costumes, and other niceties which are in the field of feminine endeavor.

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1956 SPACE BALL

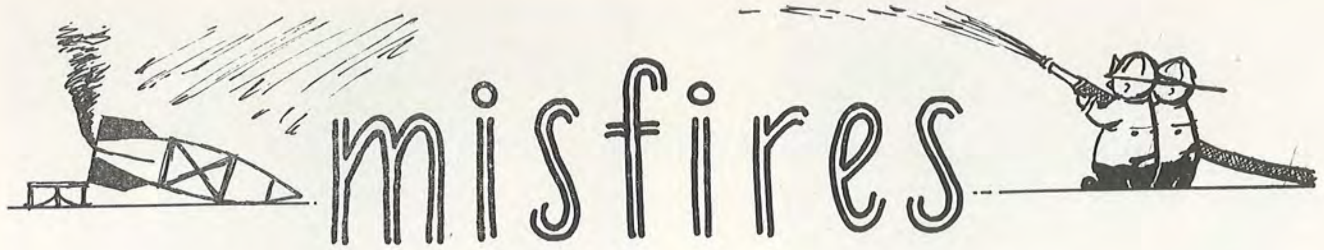
Enjoying uramium highballs in the lounge of the good ship SS Balustrade at the Navy BOQ before take-off, Mr. and Mrs. Larry Gardenhire (left) swapped space yarns with an old spinner of space yarns, science fiction author Robert A. Heinlein, who appeared as ambassador extraordinary and minister plenipotentiary of Arcturus IV. (Photo by Roger Mayfield)

Manning the ticket desk at White Sands Spaceport were the two venerable Mars-keteers, Russ and Brownie Sherburne, who punched tickets with fervor for space tourists. (Photo by Chuck Moser)

One of the more spectacular groups gathered in outer space, led by Brig. Gen. Davis of HADC (in crash helmet and oxygen equipment) and accompanied by their green ladies from Venus. The couple in the fuelling suits were out to make certain none of the highly toxic "propellants" served got on them. (Photo by Chuck Moser)

Astronomer Clyde W. Tombaugh, accompanied here by Mary Lou Sornisky, appears to have quite a siderial rate. Clyde's head did not prove shiny enough to provide a good reflecting mirror. (Photo by Chuck Moser)

In the fuelling room sampling the "propellants", Mrs. Clyde W. Tombaugh, G. H. Stine of the Space Navy, and Mrs. Ana Gardiner of the Physical Science Lab of N. M. A&MA, take part in a spirited discussion. Other interplanetary tourists can be seen in the background. (Photo by Chuck Moser)



ATTENTION ALL WOULD-BE AUTHORS

or . . .

A Short-cut to Fame and Fortune

(Presented as a service to all our readers)

In the past, many people have written technical or semi-technical papers on subjects in their fields for presentation to a group or for publication in well known technical journals. Many of these papers have been rejected on the basis of "not technical enough". After a study of back issues of a representative technical magazine, it is indicated that the criteria for acceptance is two-fold, in the case of rocketry:

1. The topic is restricted to propulsion and associated subjects. No valid reason can be found unless by chance other topics of general interest and pertaining to the field of rocketry are outside the realm of understanding of the editorial staff who, instead of facing the facts of having to live with such fields as guidance, instrumentation (both ground and missile borne), safety, and high-altitude research, have chosen to play the role of the ostrich whose head is buried in the sand.

2. The paper must be written in such a maner as to be almost incomprehensible to the average reader. In this way, one may acquire a reputation as a scholar who is above the mundane facts of the work-a-day world—a real story-book scientist. The paper must be liberally sprinkled with equations using as many Greek letters as possible. This makes the paper more difficult to read for everyone except Greeks. The mathematics may or may not be necessary but, in any event, can help to create the desired atmosphere of erudition. In this manner, you are concentrating your efforts on reaching this minority group, safe in their ivy-covered towers, rather than writing for the enlightenment of the masses—in this case, the rest of your friends.

With these facts in mind, the following is presented for the benefit of those who desire the honor of having their literary efforts published in such a journal. Your degree of success in using this method will be a function of your ability to follow the simple rules. Read it through carefully in the quiet of your own home. Jot down ideas on subject matter. Then copy the following form, filling in the blank spaces as you go. Or, if you wish, the blank form itself may be used. Complete the form, mail it, and you will have become an author.

(Any resemblance in the foregoing to the policies and practices of any magazine, journal, or publication is purely intentional and constitutes many hours of research and attempts at reading unintelligible gibberish on the part of the thoroughly-disgusted inventor of this form.)

SOME CONSIDERATIONS__________
REGARDING THE__________ DURING__________
AND ACCOMPANIED BY__________
UNDER CONDITIONS OF__________

by

____

(author)

According to the work of__________, it is apparent that:

__________ (1)

(Equation here)

hence:

__________ (2)

(Equation here)

thence:

__________ (3)

(Equation here)

therefore:

__________ (4)

(Equation here)

and taking into consideration the conditions at__________:

__________ (5)

(Equation here)

Therefore, the following graph was plotted using __________ as x according to the function X =F (__________):

(Graph here)

The experimental set-up was as follows, after__________:

(Line diagram, drawn in waterpoof black ink on plain white 100% rag content paper, size $12\frac{1}{8}''$ by $25\frac{3}{4}''$, lettering done in block Gothic.)

It is therefore evident from this that the__________ Number for the__________ of the__________ is __________according to the equation:

__________ (6)

(Equation here)

therefore:

__________ (7)

(Equation here)

thence:

__________ (8)

(Equation here)

Otherwise, the unit will be operating on the portion of the curve labeled__________.

It is hoped that this investigation will illuminate some of the problems of__________ which have been encountered in__________.

The author wishes to thank__________ for their help and criticism.

References:
1. __________, JRIC, ex. trid. mat. och fys.__________
2. __________, URDN Ark. f. rock., 1948, Unv.
Inst.__________.

TECHNICAL REPORTS—

The following tech reports were reviewed by your competent and widely-read staff. Availability is questionable without clearance for DBR (Destroy Before Reading).

1. The Effect of Surface Winds on Aerobee Launches, Including a Study of the New Air Conditioning System in the PX.
2. Investigations of Micro-lateral Accelerations on the High Speed Track; a Trip to Tularosa at Mach 1.5.
3. Testing a New Lunar Navigation System; accompanied by Astounding Illustrations of Plutonian Flora and Fauna.
4. Riding the Jet Stream in a Polyethylene Balloon; Thrills at Mach Zero.
5. Testing Opening Shock of Personnel Chutes at High Altitudes; a Eunuch Experience.
6. Survey of Topology; Inside Outside, by Ron Gunther.
7. A New Use for Orbital Space Suits: Interplanetary Maternity Dresses.
8. Pell's Probability Method for Navigating Within a Globular Cluster; Good to Plus or Minus One Solar System.

ENGINEERING TYPES

— by Wagoner —

LIFE IS SIMPLE WHEN YOU ADAPT YOURSELF TO IT.

Rare Birds of the American Southwest

Compiled by

R. K. AUDOBURNE

WHITE BREASTED STRIKE: dea victoriae

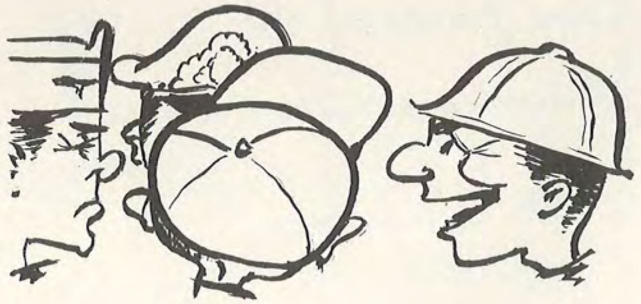
Field Marks: Very long and slender with overall length about 20 feet and diameter of 1 ft. Coloring is entirely white emphasizing its sleek beauty. Small control wings far forward distinguish it from many common birds.

Similar Species: This bird has few close relatives, although there are others such as Rhinetochter, Talos, and Falcon, that behave similarly. Once seen or even described, it is nearly impossible to identify this bird incorrectly.

Range: Originally seen in Southern New Mexico during the latter part of the 1940-50 decade. During recent years, there has been a rapid spread to all parts of the United States. In spite of its desert origin, it tends to settle around large cities when it migrates from the Southwest.

Comments: Although beautiful, this bird is a killer. It lies near the ground in wait with others of its kind until a larger but slower bird comes within its range. It then leaves rapidly with the aid of a booster to encounter the encroacher. During its flight, it is constantly receiving signals from the ground to assist it in the attack. A few years ago, an avid bird watcher was able to focus his telephoto camera on this bird at the moment of its attack on a much larger enemy. The rare scenes illustrating the ferocity of its attack were recorded on film and have enriched the lives of the many people who have seen them.

Other Names: White Breasted Scooter, Ny-Kee, Kee-Bird, Douglas-Bell Strike.



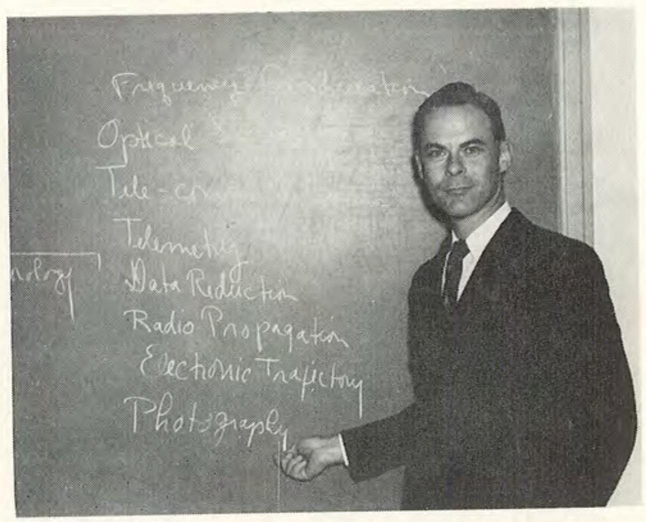
post shoot conference

The Section is now offering a $200 scholarship to a college student in his junior year. It will be paid for out of the proceeds of this magazine. This is only the first of a number of deals the Section has cooking at the moment. In the future, look for other scholastic assistance, public relations, and better liaison between rocket men all over the country.

Latest news from Southern California indicates that the SoCal boys are going to rise to the challenge and start a brother-in-printer's-ink for this magazine. Plans thus far look rather grandiose to us as we look back at our own struggles. Maybe we didn't do it right, or maybe they are hoping to profit from our mistakes, but we would urge on them a more conservative approach. Things we planned four years ago are just beginning to jell right now. Not that we are trying to beat down competition—if there is any—but that we have been through the mill, boys, and it ain't as easy as you think!

It isn't often that we laud a book on space flight in these pages, since a good percentage of them are merely a re-hash of old ideas. But we just got through reading two of them, both by the same author and both supplementing each other. They were written by Lloyd Mallan who made an 18,000 mile trip around the United States talking to rocket people, taking with him a recording machine and a camera. Somehow, he caught many rocket people, test pilots, aeromed men, and others with their guard down, and their comments regarding space flight are indeed heart-warming. In these two books, you will find people you know. If we ever recomended two books to you, we recommend these. Be sure and get both **Men, Rockets, and Space Rats** (published by Messner) and its companion, **The Secrets of Space Flight** (published by Fawcett) by Lloyd Mallan.

Word was received from Hugh C. Robbins that Ed Francisco came down with a critical case of pneumonia during the first part of February and was confined to the hospital. If Ed isn't feeling chipper as usual by now, we wish to extend the hearty best wishes of the Section for a speedy recovery. Come on, Ed; you're too mean to be flat on your back for very long.

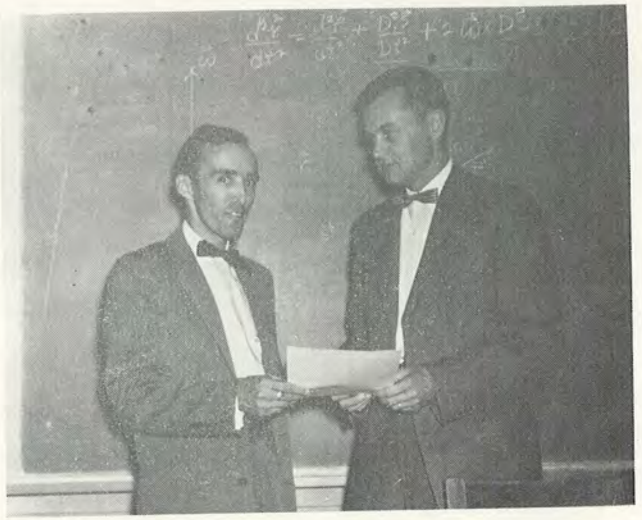


At the January meeting of the Section in Las Cruces, the featured speaker was CDR. Lewis J. Stecher, Jr. who had been our program chairman during 1955. Understand there was quite a battle to see who would introduce him to the audience. Lew, as program chairman in 1955, had the job of introducing the speaker at each meeting, and Lew is a master of the veiled insult. So a number of people wanted to get back at him. Lew's topic was "The Inter-range Instrumentation Group", and Gil Moore, present program chairman, did the honors by introducing Lew in a regal manner and stating that his topic for the evening would be, "Confessions of a Navy Commander." Lew has now left the NM-WT Section, "Missile Away!", and the post of exec of the Naval Ordnance Missile Test Facility at WSPG to become the gunnery officer of the guided missile cruiser **Canberra. Bon voyage,** Lew! Don't try to shoot down any Air Force planes!

(next page, please)

POST-SHOOT CONFERENCE—cont'd.

This issue was partly put together by the boys from our Holloman-Alamogordo Region, and a fine job they did, too! If we don't watch out, they are going to get active enough that they will be a full-fledged Section all their own! Go to it, boys!



February's Section meeting featured as speaker Dr. Harold Dawes of the Physical Science Lab, N. M. C. A. & M. A. On the evening of 23 February 1956, Dr. Dawes told the section about Coriolis Effect and what it might do to an ICBM. Sparking his talk with a number of fascinating demonstrations—including one in which he actually isolated pure Coriolis experimentally—Dawes left the members of the Section with a good idea of what Coriolis really is and what causes it.

The First Annual NM-WT Section Space Ball has come and gone and was, in the opinion of everyone who attended, a tremendous success. The lobby of the Navy BOQ at WSPG was decorated as a space travel terminal complete with checkout desk and travel posters (It's Raining on Neptune Now!"). The small lounge held various rocket fuels such as "liquid oxygen" and "red fuming nitric acid" as well as a number of other posters (a photo of Halley's Comet with the inscription, "Unretouched photo of one of our space blazers entering the Earth's atmosphere. All our equipments are aerodynamically heated. Space Blazer Non-Skeds.") But, since a picture is worth many, many words, turn back to page 29. See you there next year, huh?

One of your staff men was badly shaken just the other day. He was in the blockhouse for a missile firing when the project officer came in munching a sandwich at X-minus five minutes, tossed him the key to the firing desk, and remarked, "Lunch time. You fire this one." Badly shaken by the thought that he had a hot missile on his hands for the first time, our boy got nervous, particularly because weather was fouling things up and forcing the project to hold on five minutes. When weather finally forced a cancellation, he turned to the project officer and said, "Well, better go out and disarm the missile, huh?" Whereupon the project officer pulled the jumper for the igniter out of his pocket with a grin. Our boy could not have fired said missile if he had leaned on the switch all day! Now I ask you, was that a dirty trick or not?

Thus far, your Section Board of Directors has lost four men this year. Captain Smith, Lew Stecher, Allen Niles, and Dudley Cottler have all left the Proving Ground for other duties and jobs, thus leaving the Board rather short handed. President Sherburne will probably exercise his appointive rights to fill out the Board with new members, so don't be surprised if you are called upon. With the loss of so many good men here recently, we are all going to have to pitch in a little harder to keep this Section the best in the whole doggone ARS.

WSPG's fourth commander, Maj. Gen. William L. Bell, Jr., died of a cerebral hemorrhage on 19 March 1956. Gen. Bell was recently transferred to Washington as Assistant Chief of Ordnance for research and development. His death is certainly a great loss to this country and to its rocket and guided missile program. Those of us who knew Gen. Bell will always remember him for the zeal and enthusiasm with which he served his country, and for the warmth and friendship he extended to those of us in the New Mexico-West Texas Section of the ARS. We have all suffered a great loss in his untimely death.

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Photo at left was taken at an altitude of 158 miles from an RMI powered Viking research rocket . . . world speed and altitude record holder for single stage rockets.

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