

ROCKETS AND MISSILES

Space Age Art

The rockets launched from test firing sites are decorated with black, white and colored designs that have no meaning as art, but add significant scientific meaning to firings.

By DAVID PURSGLOVE

► THOSE BLACK AND COLORED stripes, squares and odd geometrical shapes you see in pictures of rockets fired at Cape Canaveral or other sites are not just decoration to make the rocket attractive to the eye, or even to help identify it.

Nor are the strange markings there to help track the missile. It is easier to track and photograph a solid white missile.

Viewed only as artistic designs, the strange markings have no significance. However, for scientific purposes, they have been very carefully planned. Each enables scientists and engineers to gain valuable information from a missile in flight.

The black bands painted around a rocket's girth and the long straight or spiraling stripes are motion picture photographic reference points from which missilemen can compute the rocket's rate of rotation, its pitch and yaw, angle of flight at a specified point in flight, and even deviation from predicted course.

Although most of the stripes are black, some are colored for greater clarity in color shots of the shoots.

Occasionally a rocket will carry small, round or square patches of paint. These are protective paints either to resist corrosion at sensitive points, or to protect delicate instruments inside the rocket at that point from excessive heat.

Since, in the case of large missiles, about ten pounds of propellant are needed to move one pound of paint, paints generally are used sparingly. Most large missiles either remain unpainted, or are protected with a very thin coat of lightweight lacquer.

However, protective paints do guard against corrosion and high temperatures to some extent, although their advantages sometimes are offset by their weight. Small, short-range missiles in which weight is not such an important factor usually are painted. Sometimes paint is used to make the missile harder to see.

"Operational" Means Olive Drab

Test-firing models of the Army's Redstone may be marked distinctively for scientific purposes, but operational models now in the hands of our overseas troops are painted olive drab to help prevent their detection by reconnaissance forces or aircraft.

The Navy's Vanguard satellite vehicle is basically olive drab, except for the unpainted stainless steel second stage. There are black reference lines on the first stage and near the top of the second stage. In launching site pictures the second stage usually looks white instead of silvery. This is the stage

that holds containers of extremely cold liquid oxygen which causes that stage's exterior to become coated with frost.

Vanguard officials considered painting the entire vehicle white as an aid to photographers. However, as one official told SCIENCE SERVICE, "the photographers bowed to the scientists' information requirements."

The highly polished spherical satellite is "glass coated" with a very thin coat of silicon monoxide for heat protection by reflection.

Vanguard, incidentally, carries no letter or numerical marking. Neither the words "Navy" nor "Martin," the builder, appear anywhere on the rocket. The nose cone of

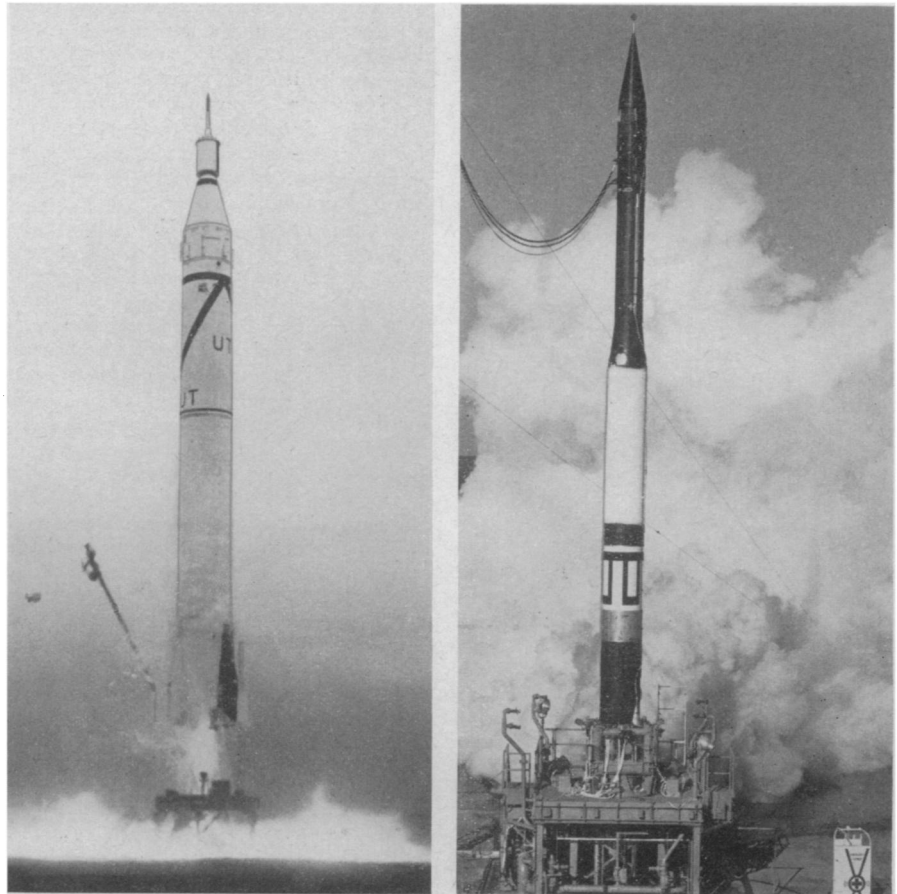
the Vanguard launching vehicle is black for no particular reason.

However, nose cones of Jupiter-C rockets used to launch the Army Explorer series satellites use a special paint combined with carefully planned art work to help control internal temperature.

Jupiter-C nose cones carry black and white stripes, whose width and spacing are governed by the predicted rate of spin. Black areas absorb heat and white areas reflect heat.

As these areas spin, like stripes that might be painted on an artillery shell, the internal nose cone temperature is held within a desirable range as the rocket passes from the high temperatures of early stage air friction to the extremes of heat and cold encountered in the rocket's orbital path.

Temperature control is aided by the use of a special zirconium oxide paint for some of the stripes. This paint is compounded



SPACE AGE ART—Gaudy designs on rockets are carefully planned to yield valuable scientific information. The Jupiter-C Explorer satellite-launching rocket in the Army photograph at the left carries bands and spiral stripes from which engineers can compute its rate of rotation, pitch and yaw. Different designs perform the same function on the Vanguard satellite vehicle shown in the Navy photograph at the right. The second stage is unpainted stainless steel, but appears white due to a frost coating caused by extremely cold liquid oxygen carried in that section.

to absorb and release heat under various flight environment conditions.

Some of the most important painted designs in our missile program are on the inside of rockets where they never are seen by the public. These are stripes and patches of temperature-sensitive paints that change color permanently upon exposure to varying temperature ranges. They are the same paints used to record variations in temperature along a machine gun barrel or to indicate where a furnace is leaking heat.

These paints reduce the weight and cost of recoverable re-entry missiles such as the X-17 and Jupiter-A by eliminating many thermocouples previously used to record interior temperatures. Thermocouples still are used at points requiring very exact temperature measurements.

The most significant development in missile development is anti-radar paint which greatly reduces chances of radar detection of missiles and aircraft. (See SNL, April 19, p. 245.)

Science News Letter, May 17, 1958

ENGINEERING

"Who Is Safe Driver?" Simulator to Find Out

► DESPITE MILLIONS of automobile accident reports, nobody really knows the answer to the question, "Who is a safe driver?"

Within the next five years, a research team from the Institute of Transportation and Traffic Engineering of the University of California at Los Angeles will try to find out.

The primary research tool will be a driving "simulator," costing from \$250,000 to \$500,000, and so complex that some of its components have yet to be manufactured.

When completed, the simulator will faithfully recreate the sight, sound and feel of driving in actual Los Angeles traffic and make possible the scientific measurement of the driver's reactions to traffic snarls, road signs, long drives and other factors.

Its planners are John H. Mathewson, assistant director of ITTE, Slade Hulbert, assistant research psychologist, Heinz Haber, physicist and lecturer in engineering, and Charles Wojcik, associate research engineer.

The simulator will consist of an integrated system of an actual vehicle mounted on a roller-type treadmill, surrounded by a circular screen, with television projectors and remote TV cameras coordinated with the driver to feed back the changing traffic situations to the screen by way of computers and servo-mechanisms.

In contrast to existing simulators for classroom driving instruction, which show an unchangeable motion picture film, the TV screen on the ITTE simulator will vary the traffic scenes to reflect the responses of the drivers.

The rate of progress and success of the simulator program will depend largely on the amount of funds available to the group.

When all the results are in, the ITTE group hopes to present a set of tested standards for safe driving to control licensing, teach high school students, and cut down costly traffic accidents.

Science News Letter, May 17, 1958

DEMOGRAPHY

Study Red Populations

► NO EVIDENCE has been found that the Communists keep a double set of books on population, one for their own planning use and the other for propaganda and foreign consumption.

We can use the figures published for Russia and for Communist China if we make proper allowance for errors and for their difficulties in collecting data, a group of statisticians of the U. S. Bureau of the Census reported to the Population Association of America meeting in Chicago.

The American statisticians believe they have found evidence that the Chinese have minimized the tremendous numbers in their population. The Chinese announced that on June 30, 1953, their people numbered 582,600,000. Actually, there are probably a minimum of 595,000,000 people in China and possibly as many as 600,000,000, Drs. Lawrence Krader and John Aird reported.

In taking a census, he commented, there are always some people missed and some counted twice, but there is reason to think that in China the number lost is larger than the number counted twice.

In addition to the number who never were found to be counted, there is another reason why the count may not have been complete. The census takers were also listing people for voting purposes. Some of the inhabitants, for understandable reasons, may have been reluctant to give their political affiliations.

METEOROLOGY

Hurricane Paths Probed

► THIS YEAR marks a vastly stepped-up program to probe the formation, structure and paths of hurricanes, the giant tropical storms that roar northward toward the Gulf or East Coasts leaving death and destruction in their wake.

At the American Meteorological Society meeting in Washington, D. C., hurricane experts outlined what they have learned about past storms and how they plan to study future ones.

One experiment the Weather Bureau stands "ready and willing" to conduct is the possibility of changing a baby hurricane's direction of movement or intensity before it develops into a full-scale storm. This could be done by "seeding" the storm clouds, perhaps by spraying water into them from airplanes. It will, however, be done only when conditions are right, and when there is no chance of veering it into a land area.

Another plan is to place in the hurricane's eye, the relatively calm center, a constant-level balloon equipped with a radio transmitter that would constantly send out information on the storm's course.

As in many years past, research aircraft carrying the latest meteorological instruments, accurate navigation devices and

radar will fly into the storms to get an overall picture of its structure.

Robert H. Simpson, director of the Weather Bureau's National Hurricane Research Project, West Palm Beach, Fla., reported evidence that hurricanes do not have the uniform structure they once were thought to have. He said simultaneous flights into 1957's Hurricane Carrie showed systematic eddies, some of which might be identified as false "eyes," throughout the entire storm.

Hurricane movements can be predicted more accurately by determining the winds near the center of the storm's swirling vortex, Robert C. Gentry, also of the Hurricane Research Project, reported. He said by measuring the strength and direction of winds immediately surrounding the center, the hurricane's future path could be plotted mathematically. Although his calculations have so far been made only for past storms, the method will be tested this year for the still-unborn hurricanes of 1958 as they are spawned.

Several scientists also reported greater electronic computers because of continued improvements in the mathematical models of tropical storms.

There has been tremendous growth in Siberia, Dr. Leedy said, but that increase is not high in proportion to the total increase. Despite the Communist programs to encourage larger families, the fertility rate of Russian women is declining, Dr. James Brackett stated.

Two big factors Dr. Brackett believes may be responsible for this drop in fertility. First is the housing shortage. Many young people in Russia live in dormitories. It is very hard to find housing for the couple who wants to get married and start a family, and the accommodations are very poor even for those lucky enough to find something.

The other important factor is the employment of women on a mass scale. Dr. Brackett foresees no alleviation in the employment of women in the next five years.

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