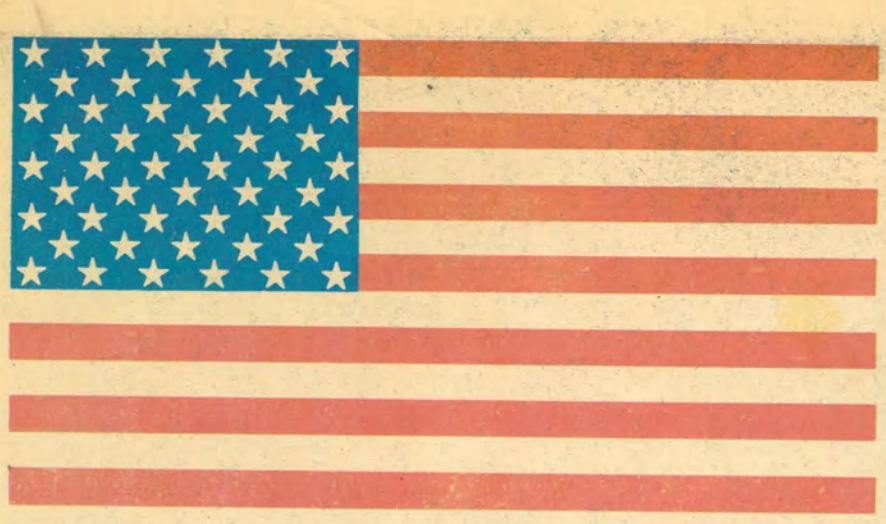


MOON TOUCH DOWN

1/-

A YORKSHIRE POST SPECIAL PUBLICATION JULY 1969

FIRST FLAG ON THE MOON

Moon explorers Armstrong and Aldrin stake earth's claim to the moon with the Stars and Stripes

Text by DEREK HUDSON, from information supplied by the American Embassy, United States Information Service, NASA (Houston and Paris), Novosti Press Agency, Moscow, and Tass. Cover picture arranged with the co-operation of Thames Television Ltd., and Long Acre Colour Laboratories.

LIVING IN SPACE

A National Aeronautical and Space Administration technician tries out the orange juice in a space capsule.

The absence of ground level comforts such as a knife and fork main meal are among the basic sacrifices that Moon explorers have to make. Life in a spacecraft is a crowded existence. Cramped as the men are in their combined living and working quarters, there is no room for extensive food preparing facilities.

And the crew's larder itself only takes up the area of a small bookcase.

Just the same, there is no real dietary hardship.

Considerable planning has gone into the development of a suitably nutritious, easily served and varied menu for the three men who have thrilled the world by their visit to Earth's only natural satellite.

An American Embassy official in London explained: "A great deal is done to give the astronauts their particular food preferences."

Like other long-range teams they were able to select from a choice range of food.

Their three full meals a day provided a balanced diet of 2,500 calories.

During extended space voyages food is usually either freeze - dried or concentrated and then preserved in vacuum-packaged plastic bags.

Concentrated food comes in bite-sized portions, but the freeze-dried items have to be reconstituted.

Hot or cold water is injected through a one-way valve by means of a hand water dispenser.

After the bag has been kneaded for three minutes to moisten the food and make it edible, it is cut open and the contents squeezed into the crewman's mouth.

This process was also used on previous Apollo missions, and has proved the most convenient method yet devised of overcoming the special problems of dining in the sky.

Having breakfast or dinner in a manner similar to over-indulgence with a mouth spray might sound to be an unusual habit, but it beats the dried biscuit and salted meats of past adventurers seeking knowledge of new territory.

Apollo 11 crewmen had one slight advantage over their predecessors. Through a newly devised method, they could use spoons for some of their food.

The containers are then rolled up and stowed in waste disposal compartments.

Water for drinking and rehydrating foods is obtained from three sources in the command module.

There is a dispenser for drinking water and two water "spigots" at the food preparation section, one supplying water at 155 degrees F and the other at about 55 degrees F.

A similar hand dispenser is situated in the lunar module to provide cold water rehydration of food packets stored there.

Both the United States and Russia have developed their own versions of food for space, but techniques and make-up are very similar.

They usually aim at a nutritional breakdown of 17 per cent. protein, 32 per cent. fats and 51 per cent. carbohydrates.

Russian cosmonauts and American astronauts receive about the same amounts of food during their rival space trips.

Restricted storage room in a spaceship capsule makes the need for space food to be compact and lightweight of paramount importance.

Dehydration is an ideal method because 9/10ths of vegetables and 4/5ths of meat and fish are water.

Scientists can remove the liquid from food without damaging it or changing the chemistry.

Usually about 70 per cent. of the bulk can be reduced in this manner.

There is no need to carry extra for foods because of the relative abundance of water available in fuel cells.

Spacemen choose their own meals in advance, and scores of different items are prepared for them in individually marked packs.

Breakfast selections include: peaches, grapefruit, orange drinks, sugar-coated corn flakes, bacon squares, sausage patties.

Typical main meals could be: salmon salad, chicken and gravy, beef roast hotpot, spaghetti with meat sauce, beef hash.

To begin with, there might be shrimp cocktails, cream of chicken soup, and for sweets, butterscotch pudding, sugar biscuit cubes, strawberry cereal cubes.

On early short-term space flights undertaken by the United States — when storage of full meals was not required — eating tests were carried out.

It was all part of the thorough build-up for the big step to the Moon.

Mercury astronauts were the first to test the physiology of swallowing solids and liquids in a state of weightlessness.

Tubed foods and compressed dry food mixes in cube form were used for these experiments.

There were no problems experienced in chewing, drinking and swallowing, and the tubed foods were similar to those previously developed for use by Air Force pilots at high altitudes.

The system was improved during the Gemini Programme when better quality food was provided through the freeeze-dehydration process.

All space food is prepared and packaged to withstand the following conditions:

Temperatures ranging from about 20 degrees F to 135 degrees F;

Pressures between 19.7 pounds per square inch to a state approaching vacuum;

Relative humidity which may vary from 30 per cent. to 90 per cent.;

Cabin atmosphere of 100 per cent. oxygen; and acceleration forces of up to 7.25 times more powerful than gravity.

Experience gathered during the Mercury and Gemini missions in the preparation, handling and consumption of space foods provided a valuable background for the development of supplies for the Apollo Programme.

Studies carried out by the United States National Aeronautics and Space Administration into nutritional aspects showed that the value of space flight food was as good as the equivalent fresh produce.

Crew members are also given equipment for personal hygiene, including tooth brush, wet cleansing cloth, dry cleaning cloth and towels and chewing gum for after meals.

Solid body wastes are collected in Gemini-type plastic defecation bags which contain a germicide to prevent bacteria and gas formation.

These bags are sealed after use and stored in empty food containers for post-flight analysis.

Urine collection devices are provided for use either wearing the pressure suit or while in the "inflight" overalls. The urine is dumped overboard through a dump valve in the command module, and stored for later removal in the lunar module.

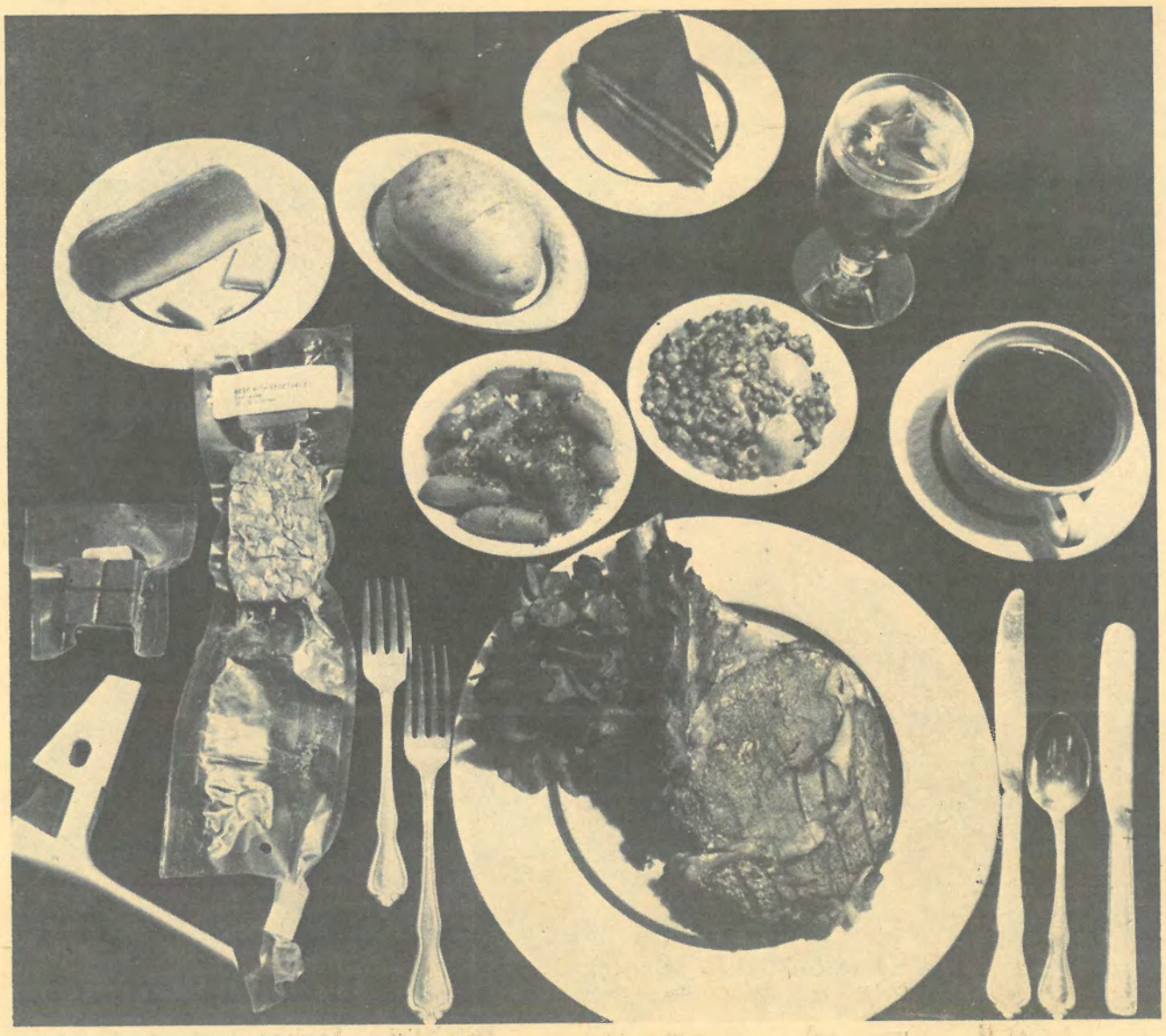
Medical kits will always be carried aboard the moon ships (other American landings are planned to follow this historic touchdown).

They contain motion sickness injectors, pain suppression injectors, ointment, eye drops, nasal sprays, compress bandages adhesive bandages and an oral thermometer.

These space first-aid chests also include a selection of pills sufficient to stock a small chemist's shop — antibiotics, nausea, stimulent, pain killer, decongestant, diarrhoea, aspirin and sleeping.

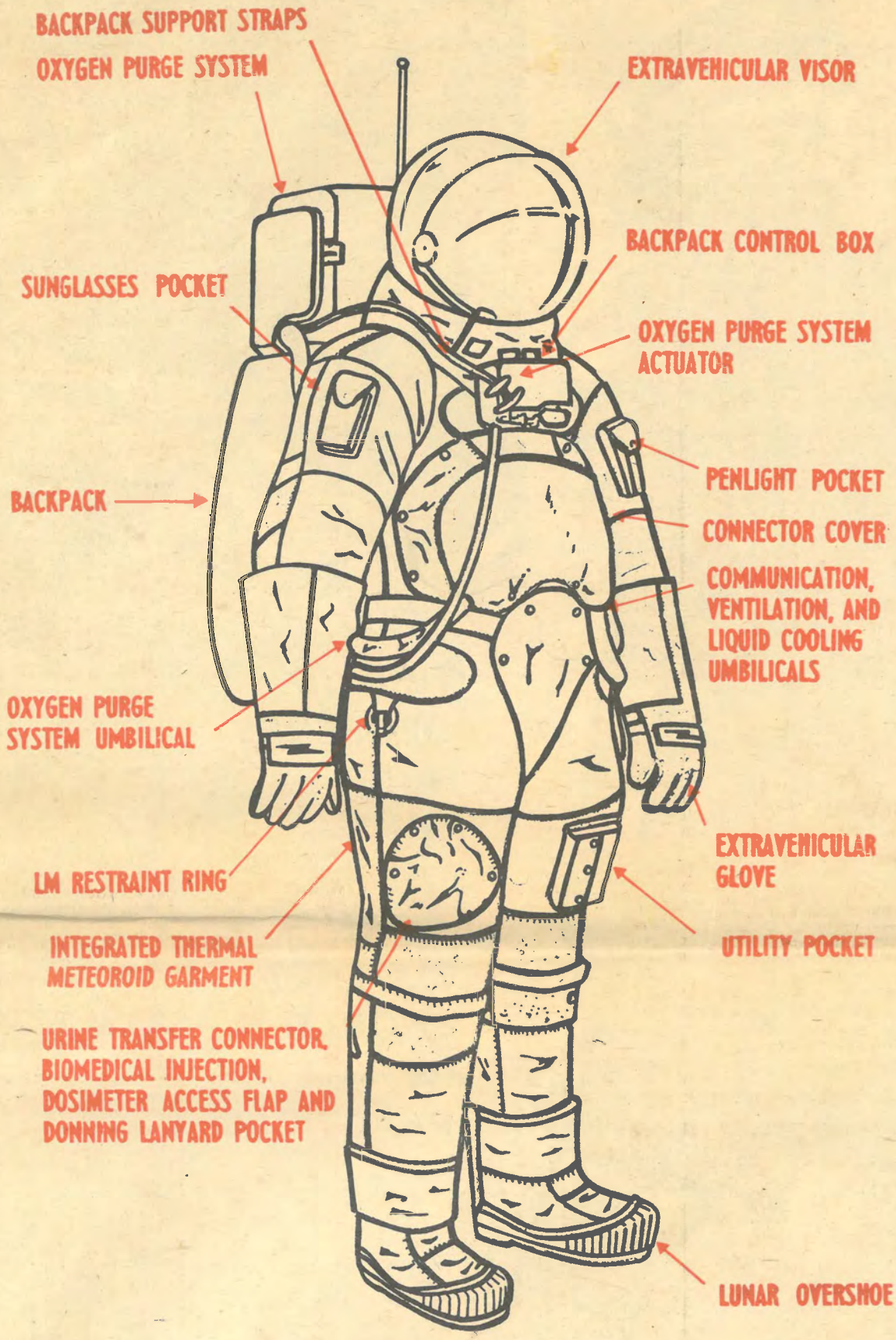
Men who break into the unknown have never been able to enjoy life's luxuries during their adventure.

But much has been done in the way of everyday living facilities to assist the magnificent journey of the first two men on the Moon, and their equally heroic partner who could only go as far as the doorstep.



A typical Apollo meal with its packaged space-food equivalent. On the left is the freeze-dehydrated beef, vegetables and dessert. With the special water pistol (lower left), a prescribed amount of water is injected.

The suit for survival



NOON in the Sahara is like a spring day, and an Arctic winter is just a light frost compared with the savagely contrasting conditions with which man has to contend on the moon.

Lunar temperatures vary from 250 degrees F. (119C.), during the day to minus 250 degrees F. (155C.) at night.

Because the moon is so hostile to men, the world's most complicated garment has been developed. This is the space-suit which astronauts wear during their sorties on the moon's surface.

It is more of a machine than a garment, providing the man inside with fresh air and temperature control, and protecting him against the special hazards prevalent on the moon.

Intense research and continuing changes in construction and material content have been carried out for several years.

All this skill has produced a sophisticated piece of equipment which serves as a coat of armour, personal radio station and mobile home all at the same time.

It provides the wearer with atmospheric pressure air for breathing and heating or cooling as required. Another essential facility is the radio communications link with other astronauts or earth stations.

Outside the spacecraft the astronaut must carry a backpack—sometimes called "a little silver box" — containing gas and fluid tanks, electrical power supply and parts of the communications system.

These components include a miniature radio receiving and transmitting station. This pack weighs 120 pounds, but the load is offset by low gravity—only one sixth as much as earth's.

Closest to the skin is the liquid cooling garment, made of nylon netting supporting a network of tubing. Water circulates to maintain body temperature.

Next section is the torso limb suit enclosing the entire body except head and hands. It is the basic pressure envelope and is custom-built for each astronaut.

The limb suit has three layers — an inner pad-like cloth of "comfort lining," a bladder which retains gas to maintain pressure, and a restraint layer that keeps the bladder from deforming under pressure.

On the outside is the many-layered "integrated thermal meteroid garment" with an outer shell of silvery fire-resistant beta cloth.

Inside are seven layers of a film known as aluminium kapton separated by six skins of neoprane-coated nylon.

Knees, elbows and shoulders are reinforced against abrasion with a woven metal known as chromel-R.

Critical flight phases such as launch and re-entry and operations near and on the moon are the only periods when all this bulky space gear is worn.

When astronauts do not intend to leave their craft they leave off the liquid cooling garment and wear constant wear garments, similar to long underwear.

During most of the travelling time the men wear the underwear under coveralls.

With the space suit goes a pressure helmet—a dome that from science fiction to fact has come to symbolise the spaceman.

It consists of a bubble-like shell attached to an aluminium neck ring that fits into and locks with a similar neck ring on the torso limb suit.

Special gloves and boots are designed to protect astronauts from burns or cuts or sharp-edged moon rocks.

How to eat when food floats

HOW SPACE-FARERS overcome the eating problems which occur beyond gravity has been explained. Sample meals have been discussed.

Here, in more detail, is a four-day menu, itemising the kind of provisions stored aboard during a moon voyage.

Permutations of the lists over a longer period — such as the nine days taken between Apollo 11's blast-off and splash-down — avoid monotony.

At the same time this system of one dish cropping up three times on the trip simplifies meal planning arrangements.

DAY 1

BREAKFAST — Peaches, bacon squares, cinnamon toasted bread cubes, grapefruit drink, orange drink.

LUNCH — Salmon salad, chicken and gravy, toasted bread cubes, sugar cookie cubes, cocoa.

DINNER — Beef and gravy, beef sandwiches, cheese-cracker cubes, chocolate pudding, orange-grapefruit drink.

DAY 2

BREAKFAST—Canadian bacon and apple sauce, sugar-coated corn flakes, brownies, grapefruit drink, grape drink.

LUNCH — Tuna salad, chicken and vegetables, cinnamon toasted bread cubes, pineapple fruitcake, pineapple-grapefruit drink.

DINNER—Spaghetti and meat sauce, beef bites, bacon squares, banana pudding, grapefruit drink.

DAY 3

BREAKFAST — Fruit cocktail, bacon squares, cinnamon toasted bread cubes, cocoa, orange drink.

LUNCH—Cream of chicken soup, beef pot roast, toasted bread cubes, butterscotch pudding, grapefruit drink.

DINNER—Beef hash, chicken salad, turkey bites, cracker cubes, orange drink.

DAY 4

BREAKFAST — Sausage patties, peaches, bacon squares, cocoa, grape drink.

LUNCH—Pea soup, chicken and gravy, cheese sandwiches, bacon squares, grapefruit drink.

DINNER — Shrimp cocktail, beef and vegetables, cinnamon toasted bread cubes, date fruitcake, orange-grapefruit drink.

Today's designers gear up to tomorrow's world

IT IS REALLY not so nonsensical to be contemplating fashions for the moon. Already there are reports of insatiable tourists requesting seats on the first civilian flight, and presumably they intend to go clad in something—if only on the off-chance of bumping into some other form of life.

To the rag-trade, of course, the moon has always been a source of ideas.

Moon Fashions Romantic have probably been with us since Eve dicovered the glowing effect of moon-beams on a bunch of leaves.

But Moon Fashions Proper only appeared in 1964, when clothes of taut, architectural precision shot from Andre Courrèges's launching pad.

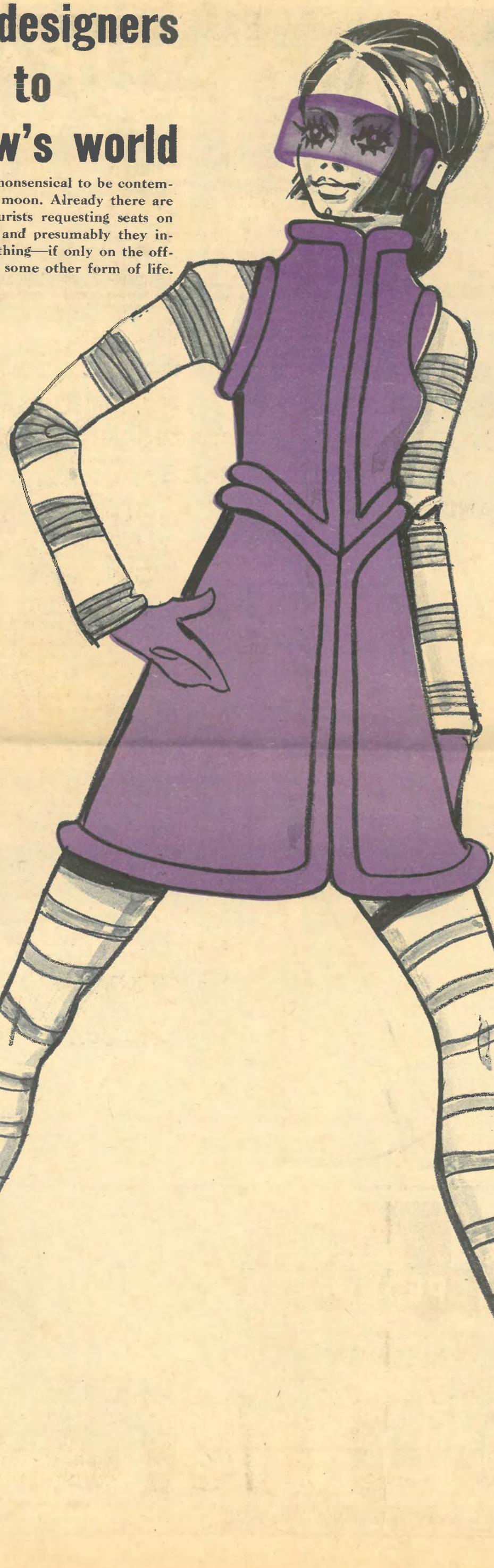
Since then, "space-age" clothes, cut with almost the same clinical spookiness of a lunar-module, have become some of the strongest influences on contemporary dress.

This is as it should be, for fashion—as much as for any other art form—acts as a mirror to the times, plucking inspiration from man-made achievements; reflecting whatever nuance is hanging in the air.

In a few years time, designers may well be creating clothes for humans about to embark on a lunar-package tour. Some are already thinking along these lines, adding artistic flair to the practicalities of heat-welded seams and special synthetic fabrics.

We asked two young Yorkshire designers to illustrate their thoughts on the look of fashions for the future—fashions that may eventually be out of this world.

The results were vastly different. Geoffrey Bubb's outer garments appeared like streamlined shells with underclothes and leggings styled so sleekly that they almost seemed adhesive. Linda Barron's outfits retained a decidedly romantic theme, with more fluid lines and the more obvious femininity of filmy fabrics instead of moulded ones.



THIS IS GEOFFREY BUBB, WHO THINKS MOON CLOTHES SHOULD BE PRACTICAL

GEOFFREY BUBB, of Normanton, is 22 and has just completed his second year as a fashion student at the Royal College of Art. Previously, he spent three years studying fashion at Bradford Regional College of Art, and while there he designed the robe the Prime Minister wore when he became Chancellor of Bradford University.

At Bradford he won also the Wiltex Travel Scholarship which he used to tour the couture shows of Rome, Milan, Florence and Paris. Not long ago he designed a shimmering array of Turkish costumes for "Zaide," an opera by Mozart, which was recently performed in London by the Arcopera group.

At present he is working on the design of an evening outfit in black cloque and white crêpe which will be shown during a British Week in the United States later this year.

What Geoffrey Bubb aims for most in fashion is a "beautiful, artistic look" which is then followed through in every garment in that particular collection. He plans to freelance when he leaves the RCA next year.

"What I find quite frightening about the moon is that it looks such a barren place. I could have gone off into the realms of fantasy and designed something really wild, but I imagine that travel will be difficult even once we're up there, and clothes will need to be of an essentially-practical sort.

"That's not to say, though, that they can't be fashion clothes. Things like bodices, jerkins, skirts and sleeves will be detachable and inter-changeable, so that there will be much more chance to experiment with styles. Colour will also be much more lavish, to make up for the bleakness of the land.

"In the moon garments I've designed, the outer items would all be in moulded, shiny PVC. The invisible zips would be plastic, too, so that they wouldn't tear the skin. The under garments would be like a knitted body stocking so that foundations wouldn't be needed and the denier would vary on places like the sleeves and bodice so that no part of the body would get too hot.

"Stretch-leggings would be designed to incorporate shoes, and helmets would be small and neat, with perspex visors to complete the streamlined look."

THIS IS LINDA BARRON

She likes the romance of it all

LINDA BARRON, of Pudsey, is 18 and assistant to the designer of a large firm manufacturing coats and suits in Leeds. She spent two years studying dress design and garment construction at Leeds Technical College and was once a runner-up in a national competition to design clothes for Georgie Best's boutique.

She has an ambition to study costume design, and thinks that moon fashions will be both romantic and dramatic; moon maidens will dress up in floating, transparent fabrics and use spiky or coiled metal shavings to adorn their hair.

"I think that fashions for the moon will present us with more supple shapes. Our traditional fabrics will be replaced with things like plastics, metallics and glass fibres, all of which demand new techniques in seaming. Welded seams will be a permanent feature, because they add more strength.

"Colours will be metallic, with lots of copper and gold, but there'll also be luminous shades and lots of transparent shades, to make things delicate."

'I THINK THAT FASHIONS FOR THE MOON WILL PRESENT US WITH MORE SUPPLE SHAPES... TRADITIONAL FABRICS WILL BE REPLACED WITH THINGS LIKE PLASTICS, METALLICS AND GLASS FIBRES'

WATCH OUT FOR BLAST OFF FROM CAPE HULL.... AUGUST

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VOLUME 1. No. 1.
August, 1969

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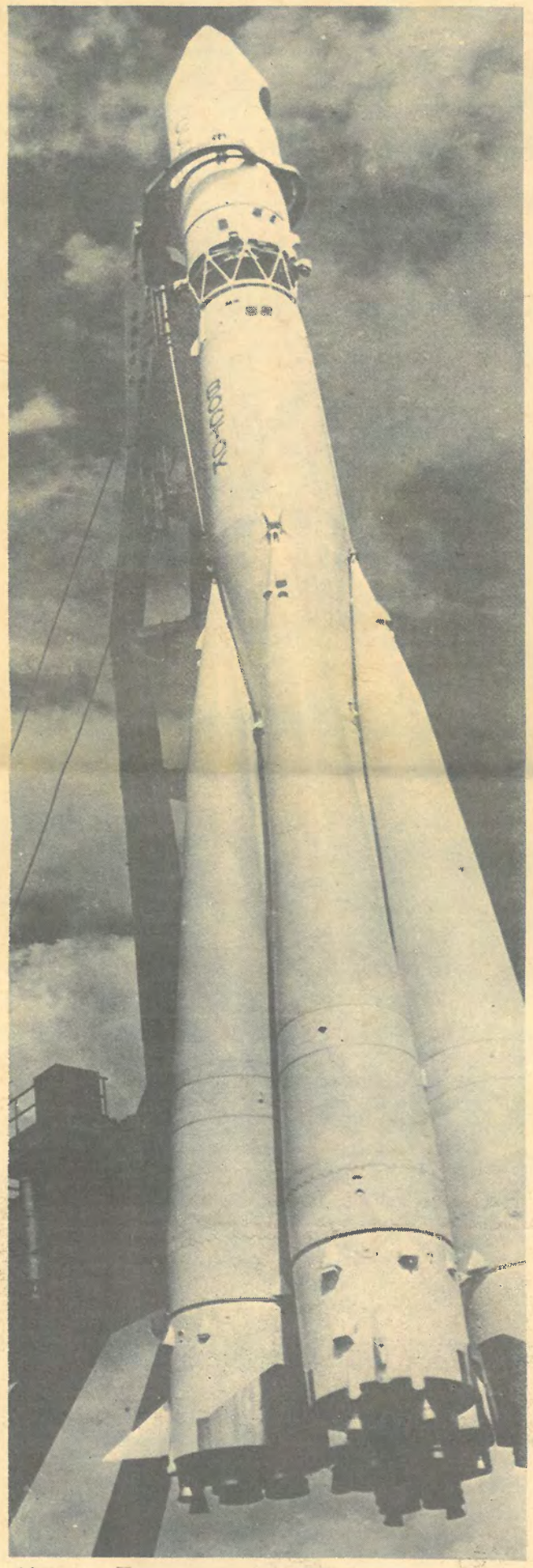
THE STORY OF MAN'S EFFORT TO GET OUT OF THIS WORLD CONTAINS SEVERAL IMPORTANT RUSSIAN CHAPTERS.

EARTH'S FIRST ARTIFICIAL SATELLITE WAS LAUNCHED INTO ORBIT FROM BEHIND THE IRON CURTAIN, AND THE FIRST HUMAN BEING TO LOOK DOWN ON THE WORLD FROM INNER SPACE WAS A SOVIET CITIZEN.



Above: The Vostok rocket that put Yuri Gagarin into orbit.

Sputnik was there first

SECONDS after a blast of flame erupted on a remote Russian plain a "beep beep" cry astounded Western nations. Sputnik 1. had made it. Date: October 4, 1957.

A three-stage liquid-propelled rocket bearing the 184lb. sphere, 23 inches in diameter, blasted off from a base near Tyuratam, 80 miles east of the Aral Sea.

It was the starting signal for numerous countdowns on many launching pads.

Tri, dva, odin would soon be joined by its equivalent sequence in English, three, two, one.

Certain circles in the United States were intensely disappointed by this Russian "first"—earlier that same year a United States Army plan to send up a satellite had been chopped.

Less than a month later Sputnik 2, weighing 1,120 pounds, was on course round the world. It held the Russian dog Laika, the first earth creature to be sent into orbit.

Premier Kruschev announced in July, 1958, that an obelisk would be erected in honour of those who created rockets and artificial earth satellites.

The promised monument still stands in Moscow's Mira Prospekt.

The 184lb. ball contained a reliable radio transmitter set on two readily accessible frequencies.

Also packed inside were small instruments to gather and send back information on density, temperature, cosmic rays and micro-meteoroid activity.

Sputnik 1 circled the globe once every 96 minutes. The batteries died on November 14; then, no longer broadcasting useful data, it coasted for nine more weeks until its orbit faltered.

In a streak of flame it rubbed itself out against the harsh friction of the earth's atmosphere.

Yuri Gagarin waits for the blast-off that made him the first man in space on April 12, 1961.

Gagarin sure of his place in space history

BORN into the family of a collective farmer on March 4, 1934, Major Yuri Alekseyevich Gagarin was shot into history books on April 12, 1961.

Riding the front of a Soviet multi-stage rocket, Vostok 1, he became the first man to be driven into space.

After surviving the hazards of the unknown he met his death in March 1968 when his aircraft crashed.

His first home was in the Gzhatsk district in the Smolensk region of the Russian Federation.

He was 27 when the spaceship, weighing about four and three quarter tons, was thrown by rocket to a height of between 187 and 109 miles.

Once down on earth honours were pressed upon him by the score.

After a hero's welcome in Moscow, which entailed a demonstrative hugging and kissing session with Mr. Krushchev. Gagarin was bestowed with: Hero of the Soviet Union, Order of Lenin, Pilot Cosmonaut of the Soviet Union (newly minted), and Honoured Master of Sport.

World tours followed, and his receptions during travels included luncheon with the Queen at Buckingham Palace.

When he was in Manchester, Gagarin was made an honorary member of the Foundry Workers' Union.

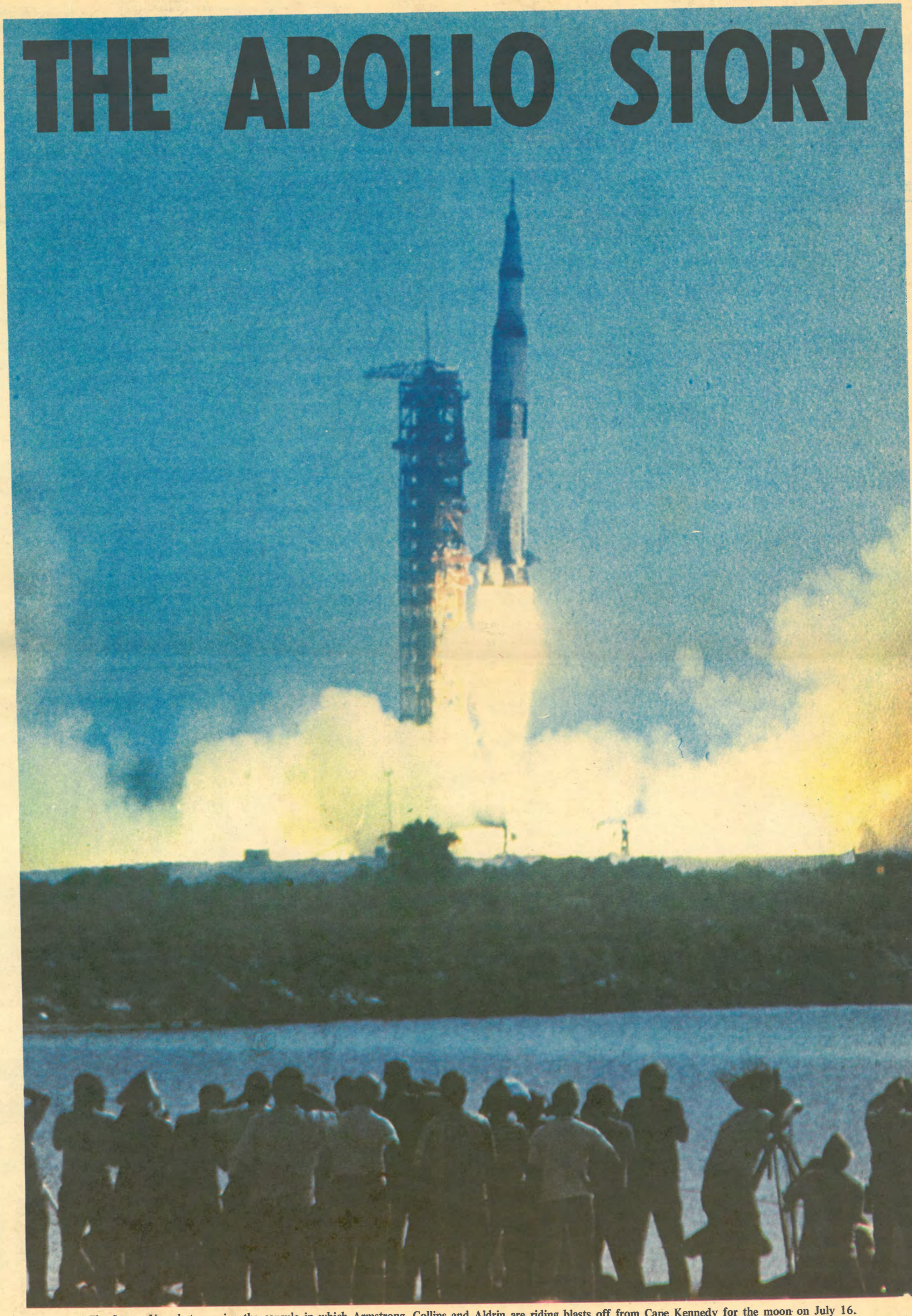
A former moulder, he was presented with a gold medal lettered: "Together moulding a better world."

This brave pioneer and explorer, who has been decribed as the "Columbus of the interplanetary age," won many friends through his pleasant smile in countries including India, Egypt, Czechoslovakia, Canada, the Argentine Brazil and Cuba.

His modest messages from space will undoubtedly be remembered by future space-men looking for a book of words.

The four Soviet Cosmonauts who in January, 1969, took part in the first manned link-up in space between the spaceships Soyuz-4 and Soyuz-5. They are (left to right); Khrunov, Eliseev, Shatalov and Volynov.

THE APOLLO STORY



The Saturn V rocket carrying the capsule in which Armstrong, Collins and Aldrin are riding blasts off from Cape Kennedy for the moon on July 16.

STEPS TO LANDING

'MOON SPEAK

MAKING a target of the moon is an ambition which has created history's most costly experiments. It has resulted in more physical breakthroughs, complicated exploratory probes and far-flung voyages than any other expedition born on this planet.

Single-seat spacecraft were used during Project Mercury—the first high-flown step involving a human rider.

Mercury astronauts established that men could survive the rigours of a journey to and from space and also work alertly as pilots.

Project Gemini was initiated by the United States Space Agency in 1961.

Two-man spacecraft taking the names of the twin constellations, Castor and Pollux, long-known as astrological references, were used.

When spaceflights began, physicians were concerned whether weightlessness—the gravity-free state —would injure a man's heart, blood vessels, kidneys and bones if endured for long stretches. These worries were dispelled by the flights of Gemini, beginning in 1965.

Astronauts James McDivitt and Edward White completed a four-day mission in Gemini IV in June, 1965. Two months later, Gordon Cooper and Charles Conrad spent eight days aloft in Gemini V.

And that December, Frank Borman and James A. Lovell stayed up in Gemini VII for 14 days with no ill effects.

They even shed their pressure suits in space-borne experiments.

Another highlight of their flight was the rendezvous in space, made when Gemini VII met in orbit with Gemini VI, flown by Walter Schirra and Thomas Stafford.

Astronaut White, crewman of Gemini VI, became the first American to leave a spaceship and use a small propulsion unit to manoevre himself freely in space.

The first Apollo flight series began in January, 1964. Saturn 1 was employed to orbit prototype models of the command and service modules to discover how they behaved in flights round the globe.

On January 27, 1967, a fire burst inside an Apollo "ship" during ground testing at Cape Kennedy. Astronauts Virgil Grissom, Edward White and Roger Chaffee died.

Two and a half months of investigation followed, involving 1,500 people, and progress was halted and plans altered.

Apollo 7, in October 1968, crewed by Walter Schirra, Donn Eisele and Walter Cunningham, was the first manned test.

So successful was the mission that space programme planners went immediately to Apollo 8 and a lunar orbit flight.

Frank Borman, James Lovell and William Anders travelled round the moon on Christmas Eve 1968.

Checking of the lunar module was the next crucial stage and this was done with the team of James McDivitt, David Scott and Russell Schweikart in Apollo 9, just over three months later.

Stars of this show were Thomas Stafford, John Young and Eugene Cernan who went even closer to the increasingly familiar surface of the Moon.

Apollo number 11 got there.

ING, MR PRESIDENT'

Left: Split screen TV — half from the moon and half from the White House — as President Nixon talks to the astronauts on the moon. Above and below: Checking a space helmet and the tunnel into the lunar module on board the command ship.

SPACE SKYSCRAPER

SATURN 5, booster of the Apollo Project, is the big one — the world's most powerful flight vehicle put together with the primary object of hurtling a human team away from earth's gravity and through atmosphere and space to the moon.

This "skyscraper" craft has a total weight at launching of 6,100,000lb the equivalent of 25 Boeing 707 jets or a naval destroyer.

In the 17 minutes that it takes to thrust the astronauts on their way to the moon, the three stages of Saturn 5 generate a total of 8,700,000lb. of thrust.

At a cost of well over £2,900m. (seven billion dollars) 15 of these gigantic machines are being built by the United States.

Saturn 5 was conceived and completed at the United States National Aeronautics and Space Administration Marshall Space Flight Centre under the leadership of Wernher von Braun.

STAGE 1 Each of the five rocket engines in this section is fired simultaneously, providing a total of 7,500,000lb. of power. The purpose of this initial furious fuel burn-up is to lift the whole structure — 364ft. high, weighing over 3,000 tons — 38 miles into the sky.

In the process, a speed of 5,360 m.p.h. is reached. It takes only two and a half minutes to achieve this height by consuming kerosene and liquid oxygen at the rate of 15 tons a second.

During this time the 2,250 tons of fuel used up would be sufficient to propel an average family car beyond the perimeter of the solar system.

Altogether the five huge engines realise a strength equivalent to 150,000,000 h.p.

Once its job is done the first stage is jettisoned above the main atmospheric air mass so that it tumbles into the Atlantic.

Before the discarded section falls back to earth, eight retro-rockets are fired. These slow down the first stage so that it splits neatly from its mechanical partners.

STAGE 2 As the 138-feet-long first stage burns out, separates and drops, stage two ignites. Again there are five rockets but of a different type. Fuel content is altered, because now progress is maintained by mixing liquid hydrogen with liquid oxygen.

Each engine achieves 200,000lb. of thrust for a total of 1,000,000lb. This burn lasts six minutes and must lift the vehicle to a height of 114 miles and send up the speed to 15,300 m.p.h.

Nine minutes after lift-off, stage two, which is 82ft. long slips away from the main body.

STAGE 3 Saturn 4B, the third stage, is entirely different from the first two units. It has a single engine of the same type as stage two, generating 200,000lb. of thrust, and another 14 smaller rocket engines for varied functions.

As Stage Two is amputated the task of the remaining main engine is to fire for two and a half minutes.

Although this spell of activity hardly raises the height at all, speed is built up to the necessary orbital rate of 17,400 mph.

Here comes the difference — this stage stays put. But it shuts down after getting to the "parking orbit."

This may go on for three orbits, or four and a half hours, while the spacecraft and its system are checked.

After careful timing the rocket is relit for another five minutes, to accelerate the spacecraft from its earth orbital speed to about 24,400 mph — the velocity needed to escape from the earth's gravity.

With the vehicle heading for the moon at about 11,000 miles from earth, stage three separates. There is still work for it to do.

LUNAR MODULE Still attached to the third stage and protected inside it until now is the moon-landing craft. During flight four panels covering the lunar module are cast off, the Apollo spacecraft separates from the third storey and is turned round.

Then it docks nose to nose with the lunar module. Away goes the last of the booster parts and the re-arranged assembly drives on to the moon.

INSTRUMENT UNIT Brain cells for the launching procedure are installed in this 3ft high and 22ft. diameter section which is stocked with electrical and electronic parts.

These navigate, guide and control the flight up to the point of being discarded with stage three.

SERVICE MODULE Measuring nearly 23ft. long and weighing 28 tons it becomes the engine-room for almost the entire moon mission. Through its jet engine, the spacecraft is put in orbit around the moon, and later transported on the journey home.

Until return contact with the earth's atmosphere the service module remains "twinned" to the Apollo spacecraft command module. After being rejected it soon burns up in the atmosphere.

COMMAND MODULE Now we are talking about the only segment of the original 3,000-ton vehicle which returns to its own world. Weighing six and a half tons, it is the control centre, providing working and living quarters for the three-man crew.

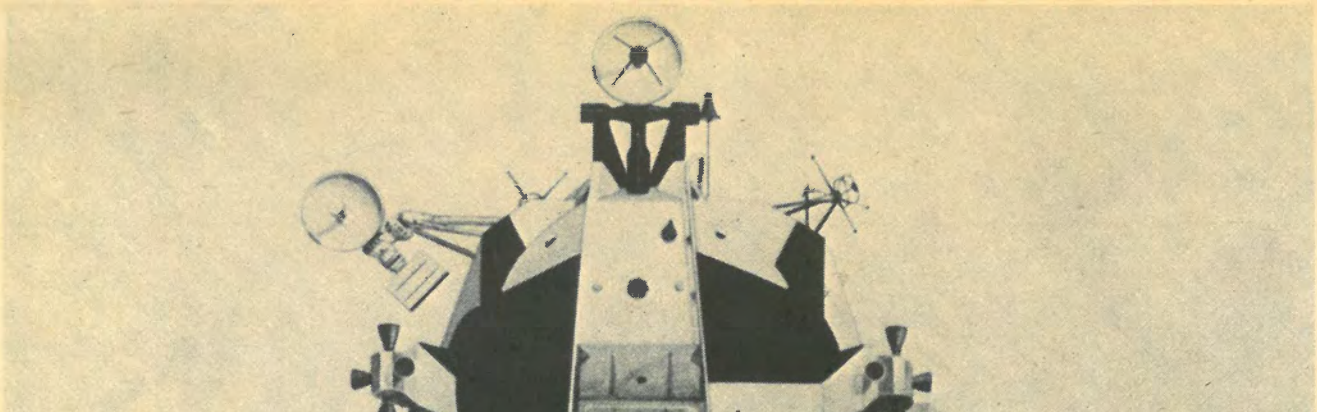
Only when two men descend to the moon and back in the "spider" module is its basic function reduced.

ESCAPE SYSTEM Designed for use in an emergency on the launch pad or during the first 100 seconds of flight, the escape tower measures 33ft. long and weighs four tons.

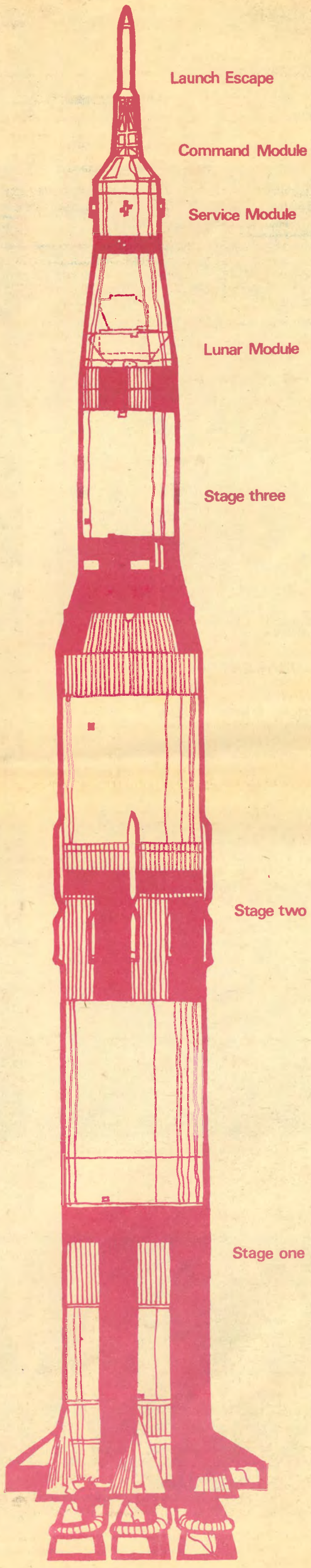
The procedure is: if Saturn 5 catches fire or threatens to blow up, the escape system can be operated by the command pilot hitting the "panic button."

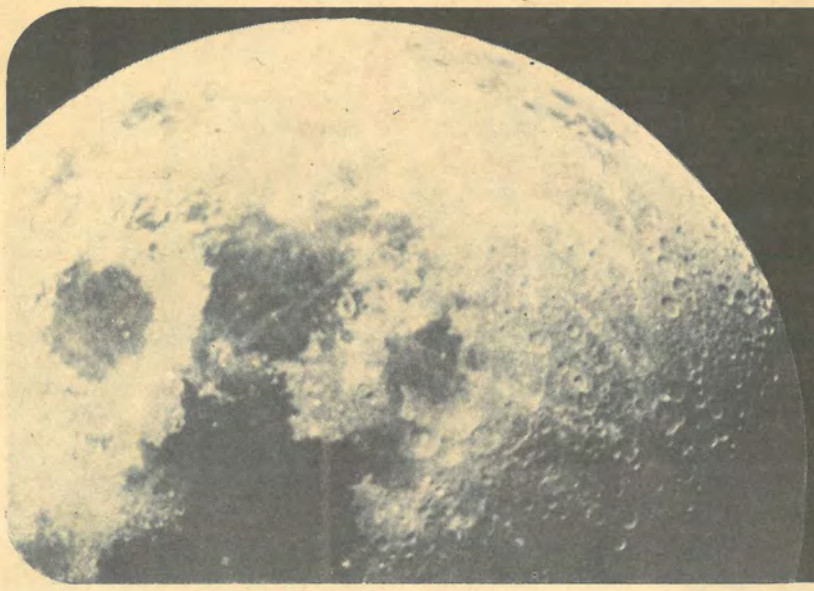
Instantly the Apollo spacecraft is rocketed away from danger — one mile high if there is an abort on the launch pad. Parachutes would be used for a safe descent.

Once in flight, half a minute after the first stage has separated and the second stage started, the escape tower is automatically jettisoned.



A drawing of the lunar module, which has its own guidance, propulsion, communications, and environmental control systems. This vehicle separated from the orbiting command ship and descended to the moon's surface with astronauts Armstrong and Aldrin aboard. Called the "bug" because of its appearance, it has two windows that serve as "eyes" for the landing manoeuvres, a "mouth" for entry and exit, and four spider-like "legs" for steady support after the lunar landing.





BEYOND THE MOON

FACTS AND FIGURES

DISTANCE from Earth: Maximum 252,710 miles; Minimum 221,463 miles.

DIAMETER: 2,160 miles (3,475 km) about a quarter size of Earth.

CIRCUMFERENCE: 6,790 miles, a quarter of Earth.

TEMPERATURE: Maximum 250 degrees F (Day); Minimum minus 280 degrees F (Night)

ATMOSPHERE: Believed none.

LUNAR DAY: 14 Earth days.

LUNAR NIGHT: 14 Earth nights.

WATER: Ice might be present beneath the poles. Certain theories suggest that the Moon has a history of holding water.

GRAVITATION: One sixth of Earth or 5.31 feet per second per second (1.62 metres per second per second).

ROTATION round Earth: 27 days, seven hours, 43 minutes.

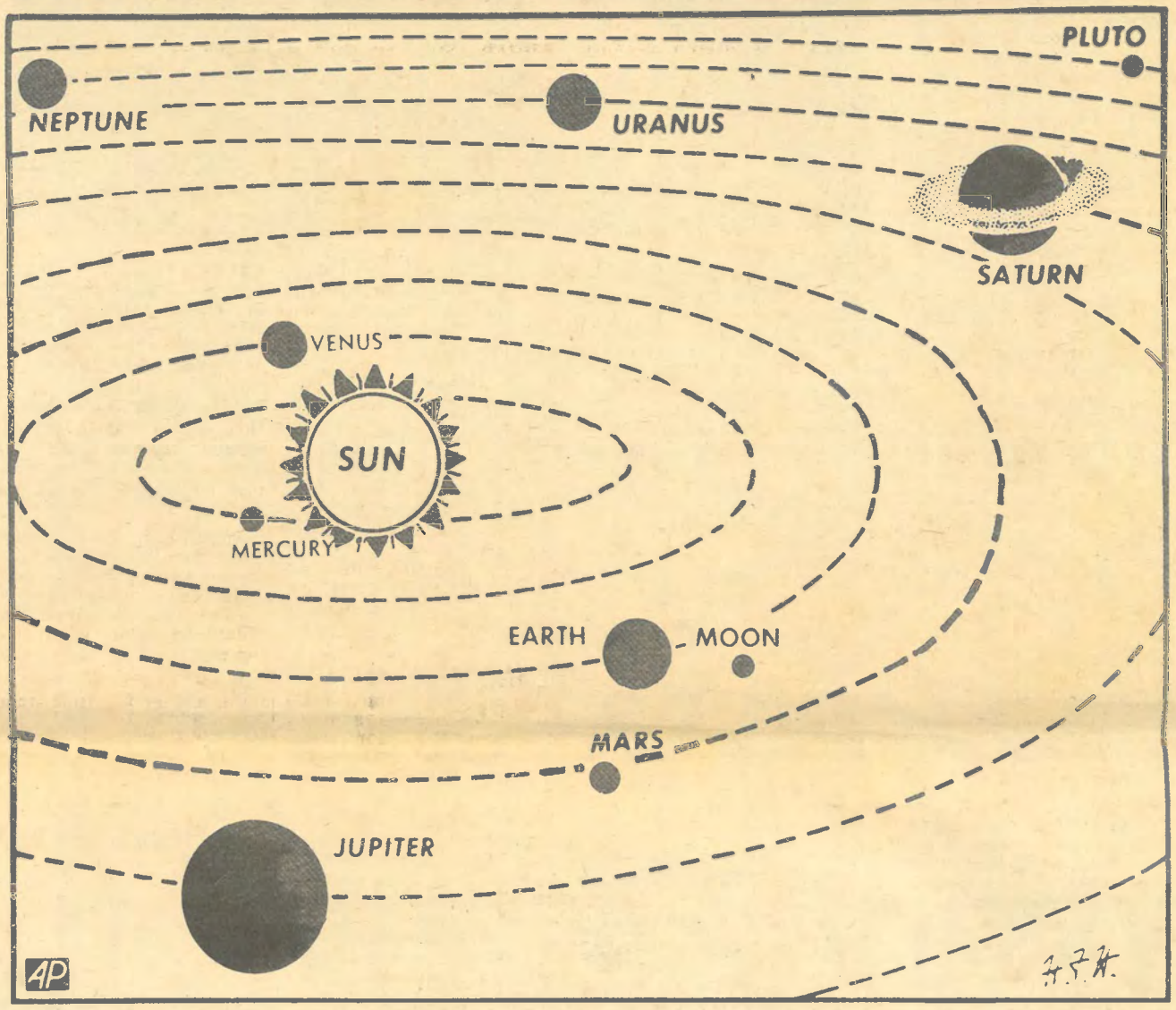
CRATERS: Largest, such as Tyco or Copernicus cover over 50 miles (80 km) in diameter.

MASCONS: A major Moon mystery. Short for mass concentrations, 12 areas of high density have so far been detected. They lie under large craters suggesting formation by impact.

SURFACE MOVEMENT: Detectors left on the Moon by Apollo 11 crew will record quakes and send information to Earth.

OWNERS: Like Antarctica it is international territory. Treaty signatories include United States, USSR and Britain.

ORIGIN: Unknown. Many theories. Newest is that the Moon, Earth and Mars were formed when a large planet separated.

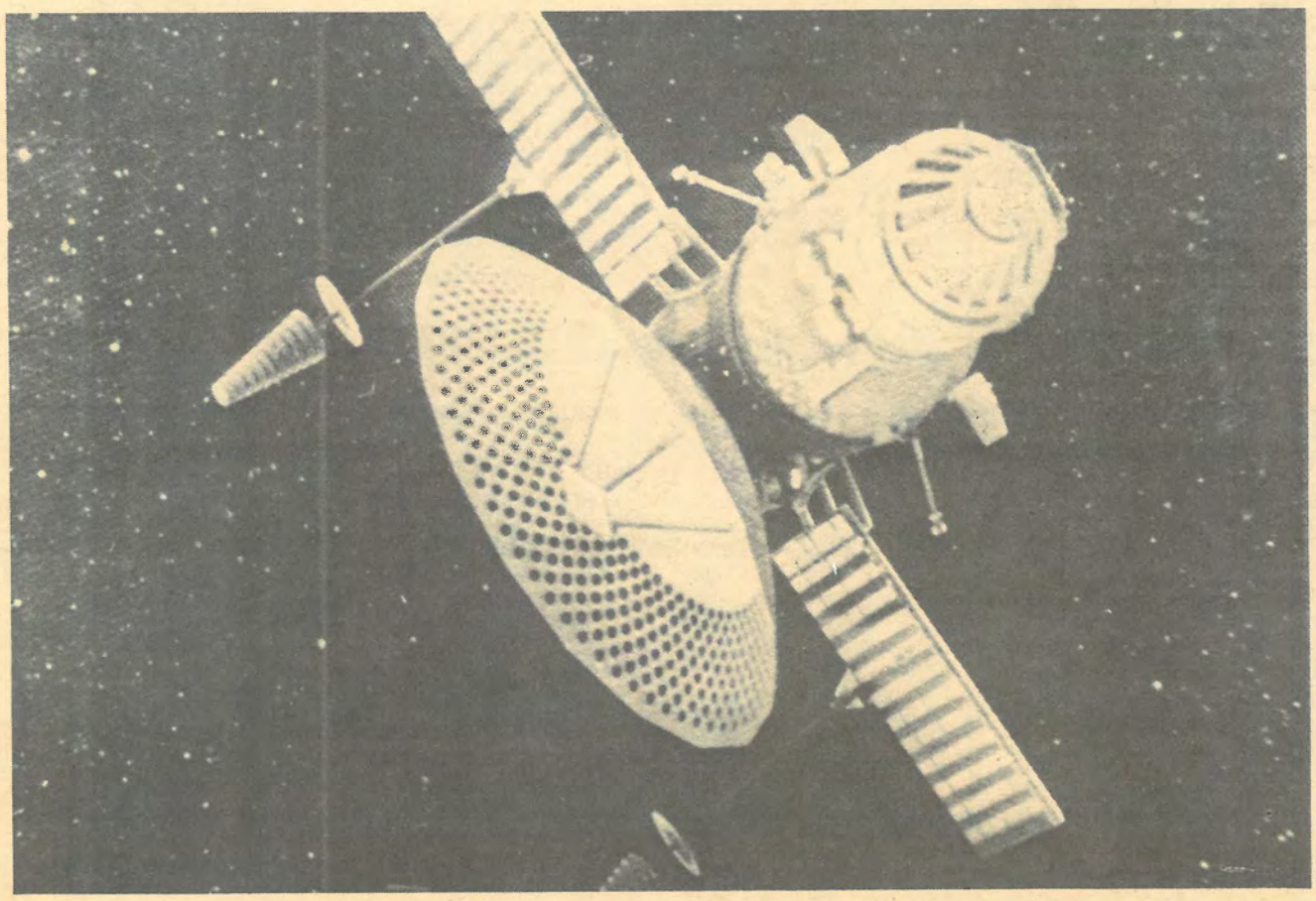


THIS DRAWING shows the earth and the moon, in relation to other planets. Man will continue to reach for new worlds, as he once set out for fresh continents.

Wernher von Braun, the rocket pioneer, summed up the attitude:

"As true men of the world, as loyal citizens of that blue planet called earth, we must then go on and probe more deeply into Man's mysterious and exciting extra-terrestrial future. Man's destiny is in space."

Colony in space



An artist's impression of one of the two Russian space capsules heading for Venus.

EARTH has a colony on the moon, but robot explorers sent out by the United States and the USSR space programmers have travelled much further than that.

Until earlier this year the majority of theories about progression deeper into space involved manned landings on Mars and Venus. Now Mars seems the only near possibility.

In May two Soviet Space stations — Venus 5 and Venus 6 — completed a cross-space journey of 220m. miles which took about four months

They were swallowed up in the dense and carbon-monoxide atmosphere of Venus as they were being soft-landed by parachute.

Almost as soon as information began flowing back to earth from the machines their broadcasting equipment was smothered.

Tass quoted the chief designer as saying: "As a result of the research carried out by the Soviet stations, it is clear that Venus is not suitable for human life."

Russia has now announced a plan to fire automatic probes to Jupiter, so another series of space facts might be brought back to earth by radio signals.

American scientists expect that manned landings on Mars might be made within the next decade.

This all goes to prove that Man is looking beyond the moon, but there is a lot to be done before the world has created a link outside the "twinning" connection with its nearest neighbour.

Comparing the lunar journey with the unimaginable vastness of space makes it appear almost a trivial step — and this remark is not meant to disparage the extent of the achievement.

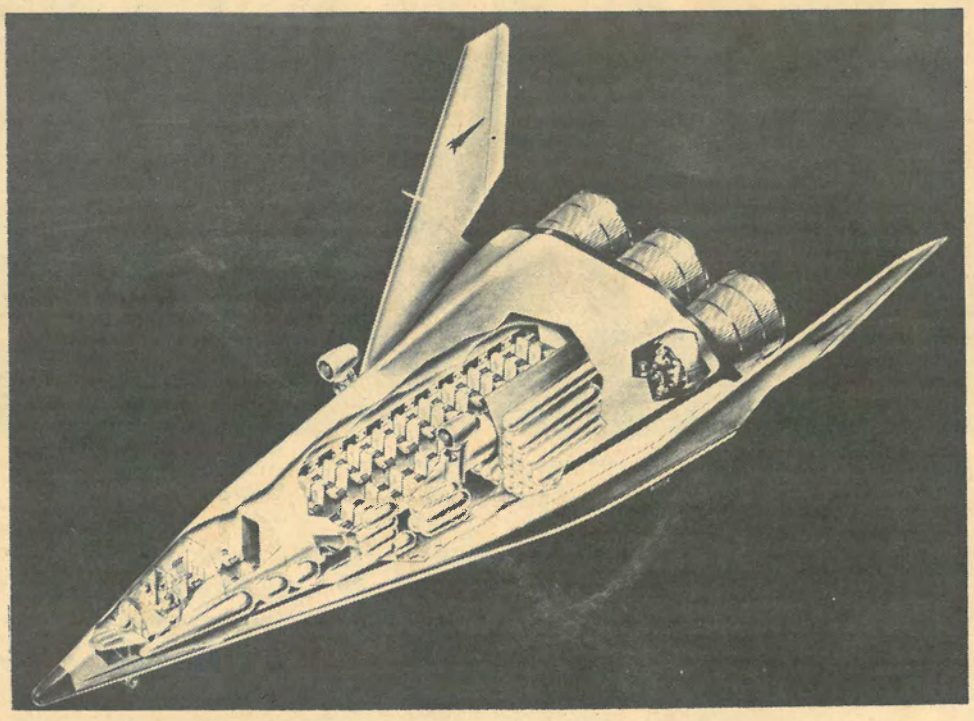
But when talk turns round to interplanetary flight and forecasts of conquests in the heavens, there are many facts to place matters in perspective.

Alpha Proximi is the nearest star — 42 million million kms away.

Velocities attainable by present rocketry would mean a 150,000-year journey before the nearest sun-like star with a possible planetary system could be reached.

In the lifetime of present generations new and exciting discoveries of the universe must be opened up to the men — and their millions of watchers — who are intent on reaching for the stars.

SPIN-OFF FROM SPACE



Space research is far from being an adventure with the uncomplicated aim of scooping major propaganda coups.

Scientists, replying to allegations that thousands of millions of dollars of Apollo money has just been shot into the sky, could list many benefits to mankind which have already been achieved.

They could also talk in terms of fascinating new possibilities of knowledge expansion.

Exploration of space has created advances in numerous fields, including computers, materials and propulsion systems. Insistence on perfection led to one of the "spin-off" rewards of the Apollo project.

When they stand on the launch pad the Saturn V rocket and the Apollo spacecraft contain about 5 million separate parts.

Previously, a production process resulting in 99.9 per cent reliability was considered the ultimate, but this was too low for the demands of manned space trips.

Saturn - Apollo flights would have meant — on a reliability percentage — an intolerable average failure of 5 000 parts on each journey. So space planners called for a reliability percentage of 99.999 per cent.

Apollo 8 can be used as an example of efficiency — on its entire six-day and 550,000 miles round-the-moon outing only five "non-critical" parts failed to function properly. This is a reliability of 99.9999 per cent.

Products

From United States space research more than 2,500 new products and important manufacturing improvements have emerged.

These include: new alloys, non-inflammable cloth, miniaturised electronic components, new medical and surgical equipment and inorganic paints.

Because of the wide range of breakthroughs, manufacturing concerns have sprung up, formed specially to produce and market the discoveries.

Men behind the space programme see the innovations as only a glimmer of insight, compared with an anticipated catalogue of new technological truths.

Products inconceivable in conventional earth manufacturing may lend themselves to industrial techniques out in space.

The principle that liquids allowed to solidify in the weightlessness of space would form perfect spheres could lead to the casting of perfect ball bearings.

Through such a process friction and noise could virtually be eliminated in factories. Silent machinery with greatly prolonged life and reduced energy requirements could result.

Using the same methods large virtually perfect mirrors and lenses could be produced in space.

Another forecast is that because of the unique "mixing" processes possible out of gravity's range, alloys with the strength of steel and the weight of balsa wood could become possible. But to make the point there is no real need to gaze into the zone of what-might-be.

Among the realities of technical development are:

COMMUNICATIONS: Many of the nations of East Asia, Latin America, Europe and Africa are now linked through the commercial satellites of the 63-country International Telecommunications Satellite Consortium (INTELSTAT).

Television, telephone and data messages are carried through the satellites.

Located 35,200 kms. up they cover a third of the globe.

There are four commercial satellites now in service — two over the Atlantic and two over the Pacific.

A number of countries, including India, are looking into the practicability of national educational television networks, that would operate via domestic satellites.

WEATHER FORECASTING: The entire earth's cloud cover is photographed daily by the mechanical "eyes" of United States weather satellites.

They gather weather facts from the two-thirds of the world covered by oceans and the unpopulated areas that previously went unreported.

Planned for the early 1970's is a system of long-range weather forecasting, up to two weeks, using larger satellites.

A total of 52 countries use the United States weather satellites.

BIOMEDICAL: As a straight bonus from man's flights into space many advances have been made, particularly in the area of mechanical devices.

A switch operated simply by eye movements was developed for NASA and has now been adapted for use in a motorised wheelchair.

Plastic

Aluminised plastic—only a thousandth of a centimetre thick — created for super-insulation in space is now being used in blankets for emergency rescue and similar purposes.

The material has unique heat-reflecting properties, surprising strength, can be made into full-size blankets that fold into pocket-size packages, and can serve as windbreaks, water containers or stretchers.

Of great promise for internal diagnoses such as viewing the interior of the stomach is a microlamp developed for illuminating panel dials. Small enough to pass through the eye of a needle, it produces a brilliant light.

Looking to the future again, a new satellite, the Earth Resources Observation Satellite (EROS), is planned by the United States for the early 1970s.

Possibly, this could be the most important satellite of all.

EROS would use remote sensing equipment to make large-area surveys of land-use, detect forest fires, help predict crop yields, warn of insect plagues, locate fish schools, chart dangerous icepack distribution in the oceans, monitor water resources and map the continents.

One such satellite, for example, could map land areas of the entire earth in less than a year.

WHAT WILL follow Apollo? Here is one suggestion by the Lockheed Missiles and Space Company — a proposed re-usable spacecraft. The cutaway drawing of "Starclipper," a forecast of large-scale space travel, shows airliner-style seating for 46 passengers and two pilots. Lockheed say that the craft would be launched like a rocket, drop its auxiliary tanks and return to land on a conventional undercarriage like an airliner.

One possibility is that "Starclipper" could be used to ferry between earth and space stations, carrying relief crews and supplies.

How the moon colour came to Yorkshire

COLOUR pictures of the first human contact with the lunar surface are published by the Yorkshire Post following the greatest photographic venture ever.

As the televised images began to stream back to earth from the moon, they were starting a journey of nearly a quarter of a million miles, which would end after a transformation from black and white to colour.

The Yorkshire Post, which has been working in close liaison with the United States Embassy, linked up with Thames Television, London.

New techniques developed by Thames, and a process provided by the Long Acre Colour Laboratories, London, made it possible for readers of this special publication to see what the moon landing really must have been like at first hand.

The camera work itself was in the heavily-gloved hands of the American astronauts. Neil Armstrong and Edwin Aldrin were provided with colour equipment for "still" shots, but NASA experts announced two weeks ago that the Lunar Module's cargo would be 31b. over the safe weight limit if colour TV cameras were carried.

After being beamed to earth, the moving moon pictures were picked up by the 210ft. diameter radio telescope of the National Radio Astronomy Observatory, Parkes, Australia.

From Parkes, the signals were passed to Sydney, in a form suitable for United States TV reception.

The next stage of the transmission was through the INTELSTAT artificial communications satellite above the Pacific Ocean to the NASA moon control centre, Houston.

Then they were made available to the many millions of viewers throughout the world.

For most people in Britain, it was well before breakfast time when the men of Apollo stepped out to provide the world with its first really close look at the moon.

At the Teddington studios of Thames TV a newly-invented electronic shutter enabled photographs to be taken singly from a television screen.

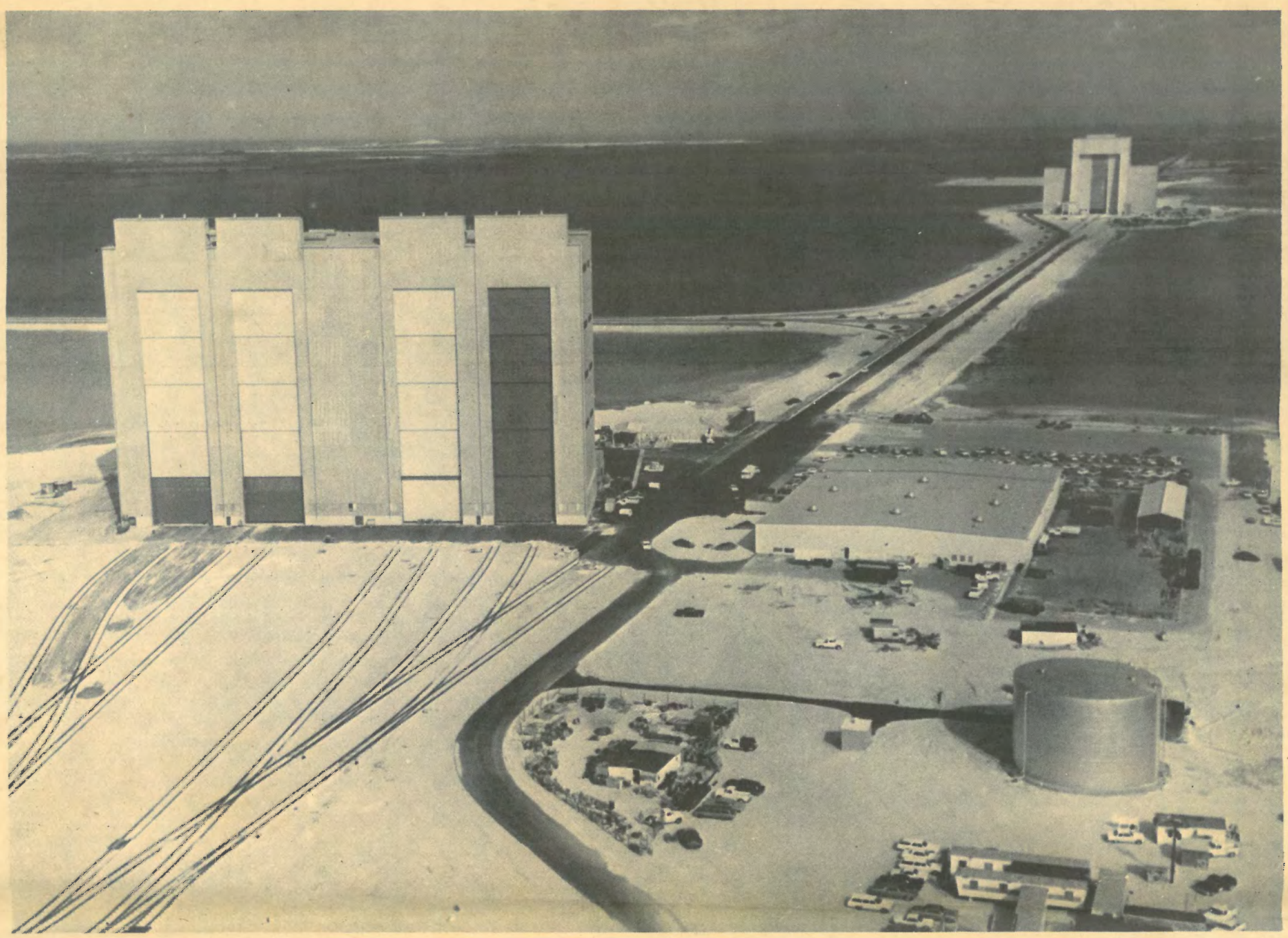
Here the big programme organised by the Yorkshire Post went into top gear. A despatch rider hurried the 12 miles to the Long Acre colour studios in the heart of London where a "Flexichrome" specialist was waiting.

Through previously known information and new details given by the astronauts, he was able to turn a black and white picture into a true-to-life likeness of how the moon landing appeared.

By the middle of the afternoon of Monday, July 21, his completed work was ready to be carried by car to the Leavesden landing field, North of London.

Ticking over on this airstrip was a Cessna 175 four-seat aeroplane, chartered by the Yorkshire Post to fly the picture to Teesside.

Ahead lay only the last stage of the journey, a road trip to Middlesbrough where this special issue was printed.



The Vehicle Assembly Building at Merritt Island, Cape Kennedy.

They call it Cape Kennedy

CAPE KENNEDY, from which astronauts journeyed to the Moon, spreads its environs only a few miles from a busy tourists' sun and fun trap, Cocoa Beach.

Sightseers, sipping their chilled canned beers in "lunar-bars" and nibbling their "moon-burgers" as they wait for blast-off time, always add a carnival and side-show atmosphere to the nerve-racking situation of any major launching.

Most of the waiting world relied on journalists at the scene for information about the momentous Apollo 11 flight.

But thousands of lucky tourists and nearby residents positioned themselves on the Atlantic Ocean beaches and at other vantage points. Many of them carried binoculars to follow the Saturn V vehicle as it raced skyward.

Easily spotted among the many space centre installations is the world's largest building. VAB is the hub of "The Cape."

Translated from the jargon of the space planners and pilots, this means that the Vehicle Assembly Building, a huge hangar, is the dominant feature of the John F. Kennedy Space Centre, Florida.

VAB has to be big. It accommodates the lofty Saturn V/Apollo spacecraft. Together they stand as high as a 30-storey block.

VAB looms 52 storeys up —nearly as high as the Washington Monument — and contains 129,482,000 cubic feet of interior space.

The vast premises contain two operational areas. There is a low bay area going up to 210 feet and a bigger bay area stretching to 525 feet high.

Eight preparation and checkout cells for the second and third stages of the rocket are contained in the low bay.

Four spaces for assembly, joining and inspection of the launch vehicle and spacecraft are contained in the high bay.

VAB is an integral part of the mobile launch concept favoured by the United States space programmers. Mobility is a keyword considering that the great structure is three and a half miles from the launch pads.

Saturn V/Apollo space vehicles are assembled inside the VAB high bays on mobile launchers, stacked with complicated ranks of fuel feeding equipment and necessary preflight analysis and testing aids.

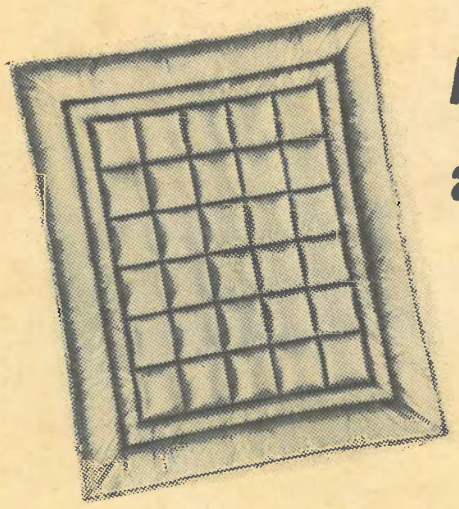
Two tracked vehicles known as transporters, each measuring 131ft. long, 114ft. wide and weighing about 6 million pounds, are available to transfer the mobile launchers inside the VAB to serve as assembly platforms.

After the five million different components of the Apollo spaceship have been put together and subjected to the most intensive scrutiny, the huge transporter reappears to propel the assembled rocketry to a launch pad. This slow excursion takes place over a specially constructed roadbed, approximately eight feet thick.

Immensely strong road thicknesses are needed because the combined weight of the transporter, mobile launcher, and Apollo/Saturn V space vehicle mounts up to a staggering 18 million pounds.

Cape Kennedy is an important launching site for the United States space and missile programme. To the east is the Atlantic Ocean and the Banana River runs on the west. Before 1950 the 27 square miles it encompasses was mostly uninhabited scrubland.

Now this famous chunk of Florida's eastern coastline symbolises the wonders of the space age by being the base for the latest sophisticated methods of exploration.



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- ★ The trading profits amounted to £1,071,314 against £903,895 for the previous year.
- ★ The overall sales increase amounts to 16.7%.
- ★ The Board recommend a final dividend of 8½%, which makes a total of 12½%, the same as last year.
- ★ The factories at Speke and Mitcham will be completed and in production during the current year. I do not anticipate that the benefit of these additional production facilities will reflect in profits until 1970/71
- ★ Strong measures are being taken to control constantly increasing costs and consequently narrowing margins and every effort is being made to improve profitability.

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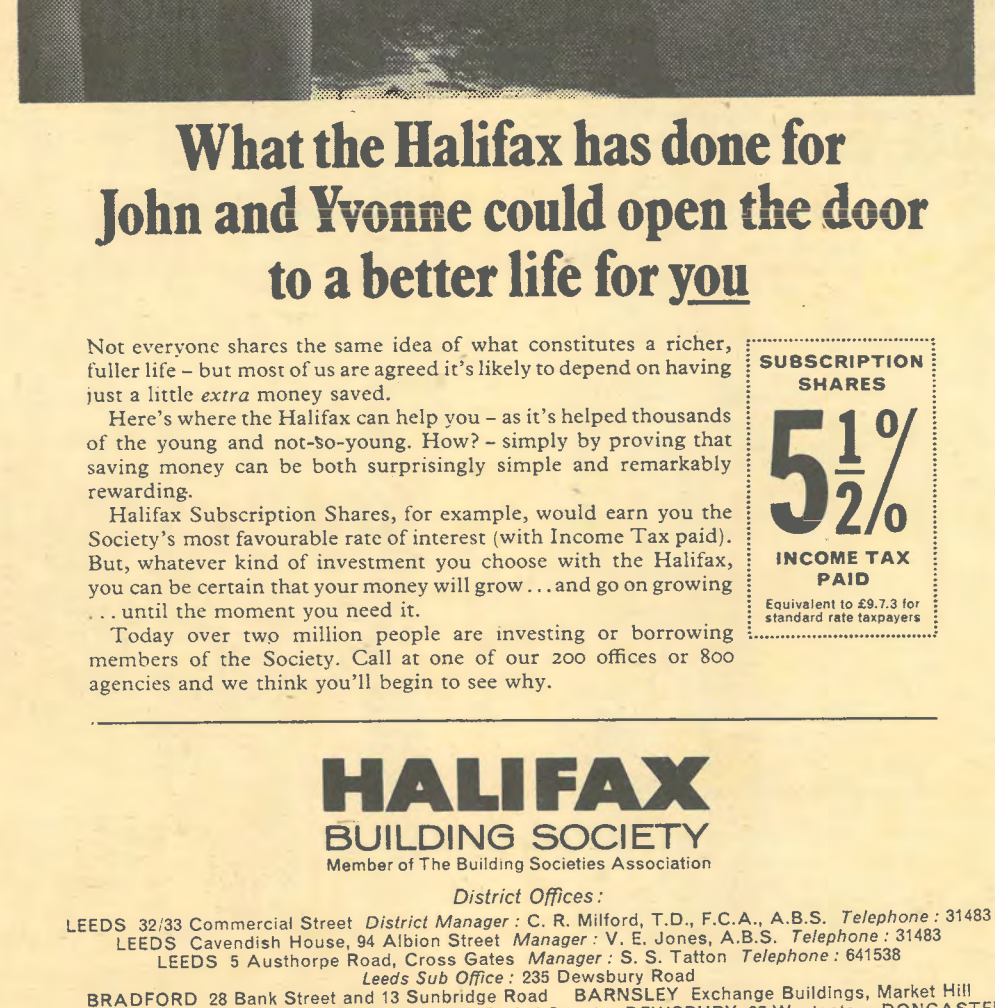

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Published by Yorkshire Post Newspapers Ltd., and printed by North Riding Publishing Company, Ltd., South Bank, Middlesbrough, Teesside. July 1969.