

MIRRORSCOPE MOON SPECIAL

A AFTER Apollo 11, which will touch down on Apollo Site Two, successive landings will concentrate on Sites One to Five. Apollo 16 will move north or south of these sites, and Apollos 17, 18, 19 and 20 will have as their targets Copernicus (the size of Wales with a crater 56 miles wide), Tycho (54 miles across, high terraced walls), Aristarchus (29 miles in diameter and 5,000 feet deep) and Birt, an 11-mile-wide crater in the Mare Nubium with unusually high walls.

Surveyor 3 (launched April 16, 1967) landed in the Eastern region of the Ocean of Storms, televised 6,315 pictures, mechanically clawed four trenches in the surface and photographed solar eclipse. Surveyor 4 (July 14, 1967) impacted in Central Bay. Surveyor 5 (September 8, 1967) sent 18,006 pictures from the Sea of Tranquillity and made a soil analysis.

Surveyor 6 (November 6, 1967) televised 30,027 pictures from Central Bay and actually moved across the surface.

Surveyor 7 (January 6, 1968) landed on Tycho Crater's north rim, returned 21,091 pictures, dug trenches, used an atom-scattering device, checked magnetic properties of the soil and picked-up two laser beams transmitted from Earth.

S ONE-TON robot spaceships designed to test ideas ultimately used in the Apollo Moon Bug, the Surveyor series, proved the feasibility of safe manned Moonflights. Surveyor 1, launched May 1, 1966, landed nine miles off target in the Ocean of Storms, sent back 11,150 pictures and made colour composite of lunar surface. Surveyor 2 (September 20, 1966) landed south-east of Copernicus.

O THESE robot spacecraft scouted ahead for Mooncraft to come. Five Orbiters photographed the Moon's entire surface in detail and all finally crashed on the Moon. Orbiter 5 photographed 51 sites on the near side of the Moon, photo-scanned virtually the whole of the far side and sent back superb photographs of the Craters of Copernicus and Aristarchus, the likely landing sites for Apollos 17 to 20.

Mirrorscope
GIVES YOU THE MOON

THIS four-page map will help you follow all future lunar explorations. Paste together the two double pages (11/18) and (13/16) for a complete wall map. Cut out the flags to pinpoint the missions to come.



14.32. BST. JULY 16, 1969: APOLLO 11 BEGINS HER AWESOME VOYAGE TO THE SEA OF TRANQUILLITY.

Mirrorscope

● FOR millions of years men have looked up at the Moon and wondered.

Some romantics have merely longed to go to the Moon; others, with a more practical turn of mind, have made precise calculations to see how they could get there.

This year, both the romantics and the practical engineers will have their way—men will go to the Moon, our closest neighbour in the heavens.

It will be the first stepping stone in a cosmic journey which will ultimately take Man to the explorable limits of the Universe.

The first men to disturb the lifeless surface of the Moon will be Neil

Armstrong and Edwin Aldrin. They will not be the last.

Whether critics like it or not, men will continue to explore the Moon.

Russians will follow the Americans, and we may one day see a truly international scientific station there, expanding Man's horizons and preparing him for greater steps.

● IN the immediate future, the American Moon landing and exploration programme will gather momentum for at least the next three years.

After Apollo 11, there are nine other Saturn V rockets and Apollo spacecraft ready to go to the Moon—eight of them to land and one to photograph every

square foot of the lunar surface during a 28-day orbital flight.

When the 363ft. Saturn rocket roars off from the flat, sandy fringe of the Atlantic at Cape Kennedy at 2.32 p.m. on July 16, one epoch in Man's history will be at an end.

From that time on Man will have reached a new maturity. He will be ready to tackle the endless sweep of the Universe, not as a mysterious object of awe but as a problem to be studied and solved.

Armstrong and Aldrin are the pioneers of a new way of life. Mankind will never be quite the same again after they have successfully set foot on the Moon and returned to tell the tale.



Neil Armstrong, Apollo 11 commander



Apollo 11

MAN ON THE MOON



Edwin Aldrin

HE has the test pilot's detachment, an insatiable appetite for detail, a reputation for being socially "cold," a certain bashfulness in dealing with people, a deep-rooted individuality.

The kind of ennobling features of manhood, in fact, that might characterise a comic-strip astronaut.

One little wrinkle of gentle humanity, however, dispels the case-hardened image of the first man on the Moon.

● **NEIL ALDEN ARMSTRONG** blushes. Often, compulsively.

According to Dr. Charles (Chuck) Berry, the U.S. astronauts' doctor, he is very sensitive indeed, and, by

his build, features and characteristics, does not give the same appearance of strength as his Apollo 11 colleagues.

That image is deceptive. Inevitably.

At 39 (11st. 11lb. and 5ft. 11ins. tall) he has had a lifetime of testing himself and machines to the limit.

He flew the experimental X-15 rocket plane at 4,000 mph almost forty miles above the Earth and brushed death very closely in the Gemini 8 spaceflight which had to be ended early because of a control problem.

Armstrong, a civilian, is married and has two sons. His companions match

him, in physical terms, quite remarkably. All three men were born in 1930, all weigh precisely the same, all were test pilots

● **EDWIN ALDRIN**, the Lunar Module pilot and Air Force colonel, was an athlete in his college days, flew as a pilot (like Armstrong) in Korea and interrupted a brilliant career to take a doctorate at Massachusetts in the subject of orbital rendezvous.

He flew his first Space mission in 1966 aboard Gemini 12 and set up a record for Space-walking of five and a half hours.

Aldrin has a daughter and two sons.

● **MICHAEL COLLINS**, the Command Module pilot, who will sit in orbit round the Moon while his buddies go walkabout on the surface, was born in Rome.

He became a Space-walker himself—he left the vehicle twice—on the Gemini 10 mission of 1966.

An Air Force lieutenant-colonel, with two daughters and a son, Mike Collins has taken something of a back seat in terms of the lime-light centred on his Moon-walking friends.

In fact, his job will be formidably nerve-racking. He will be very much the man alone.



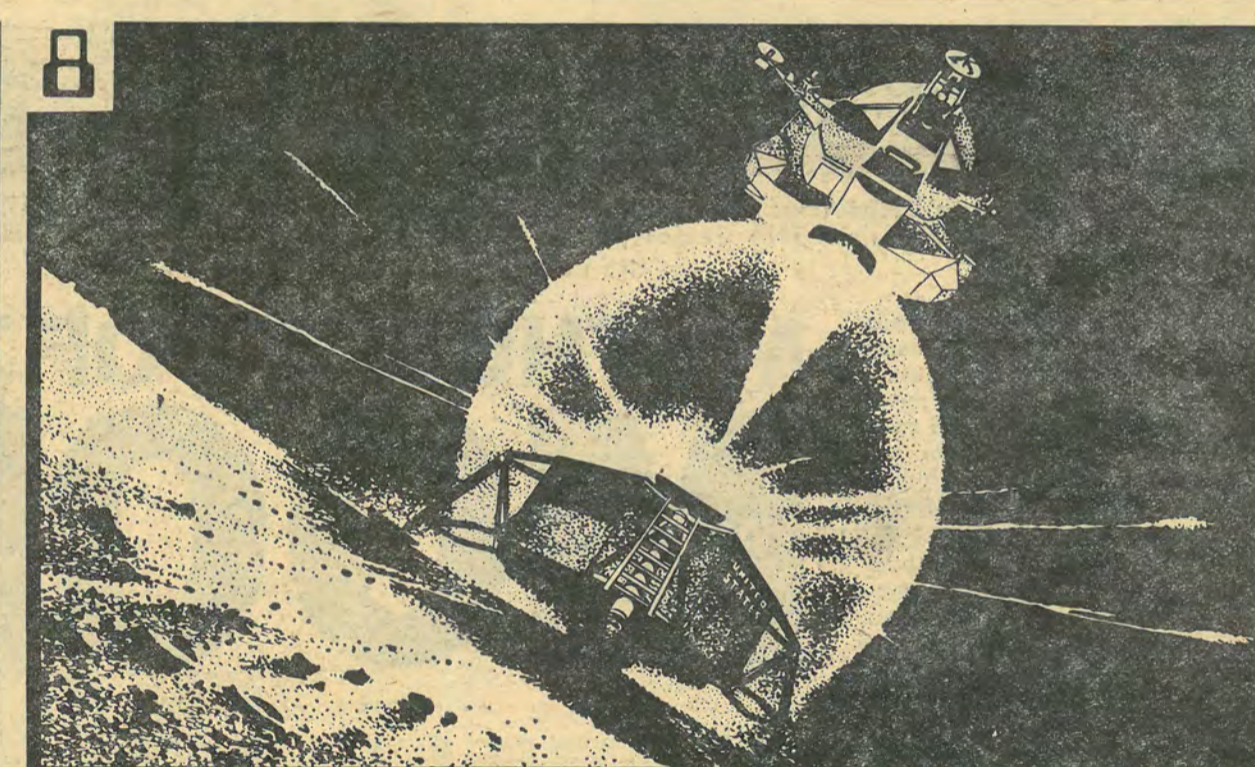
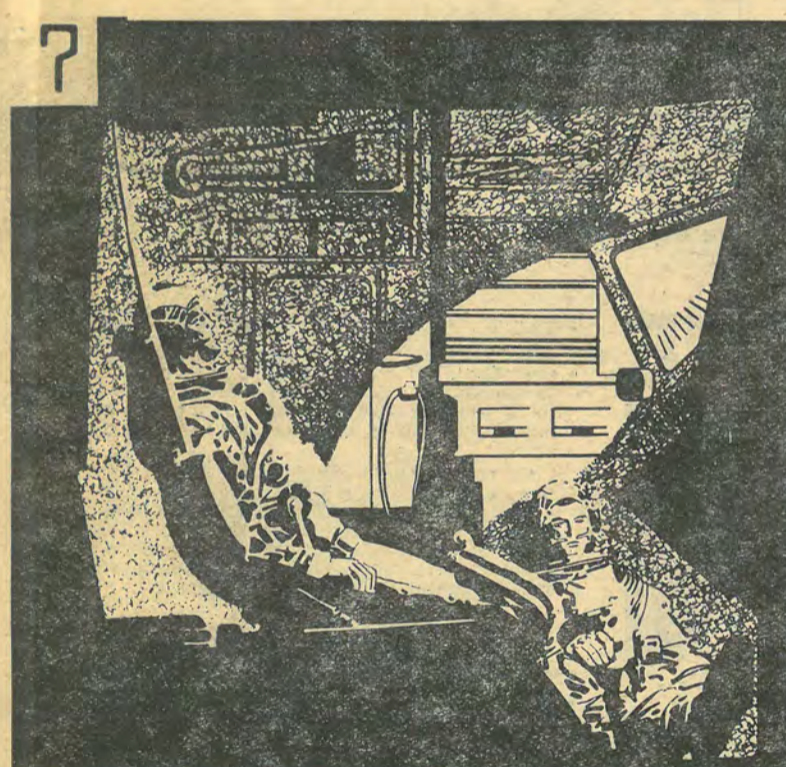
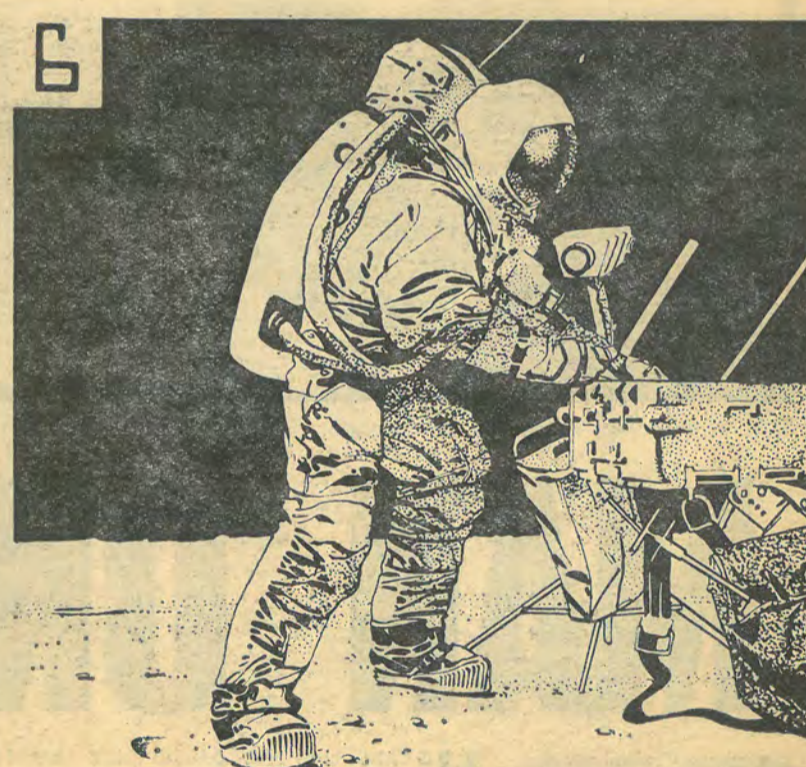
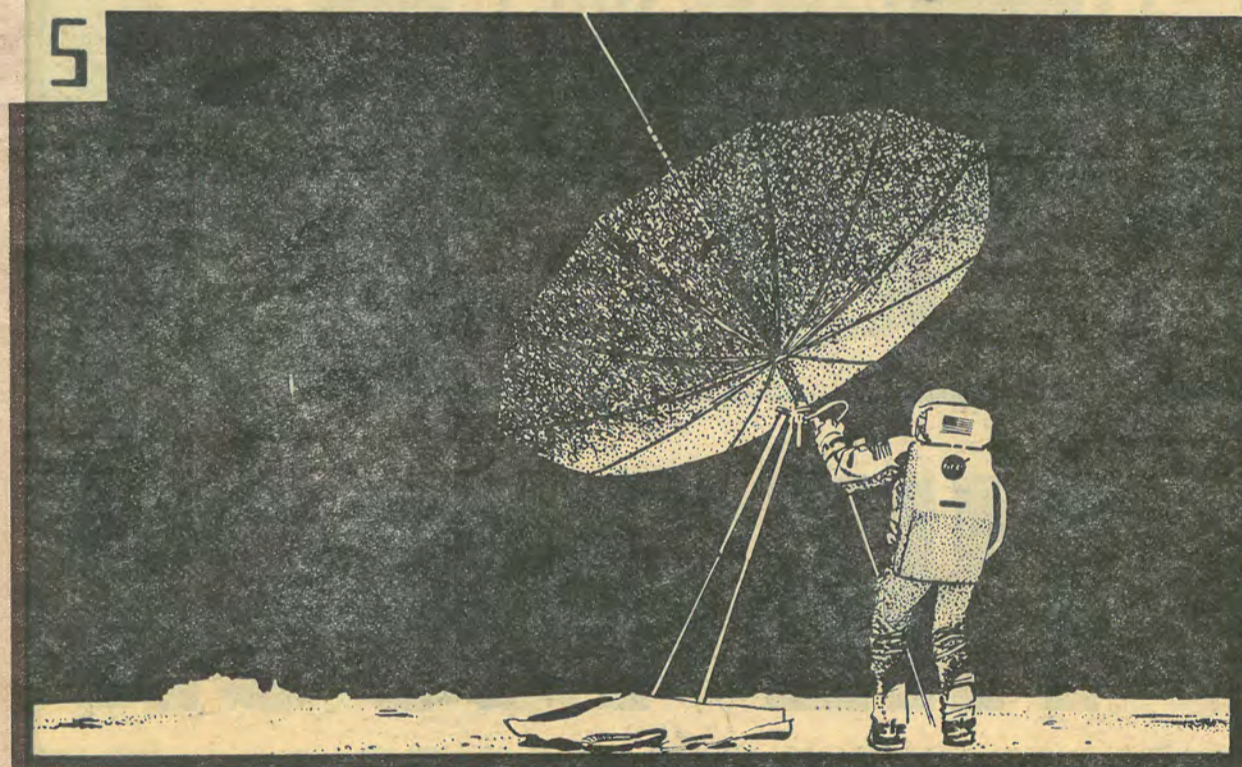
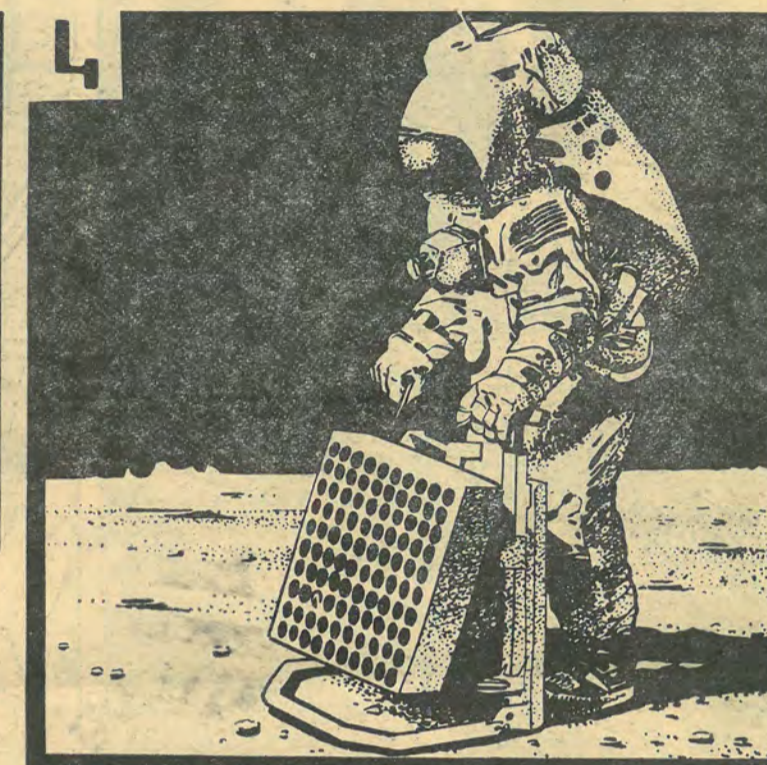
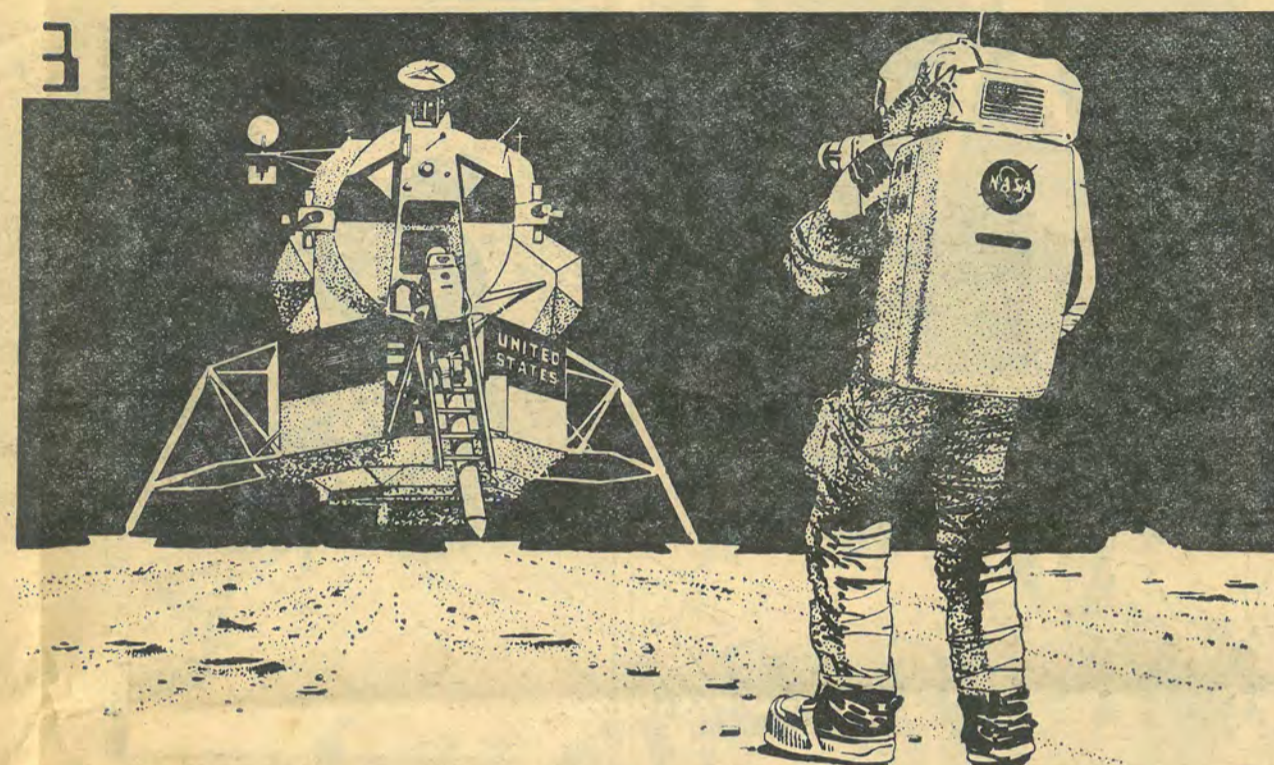
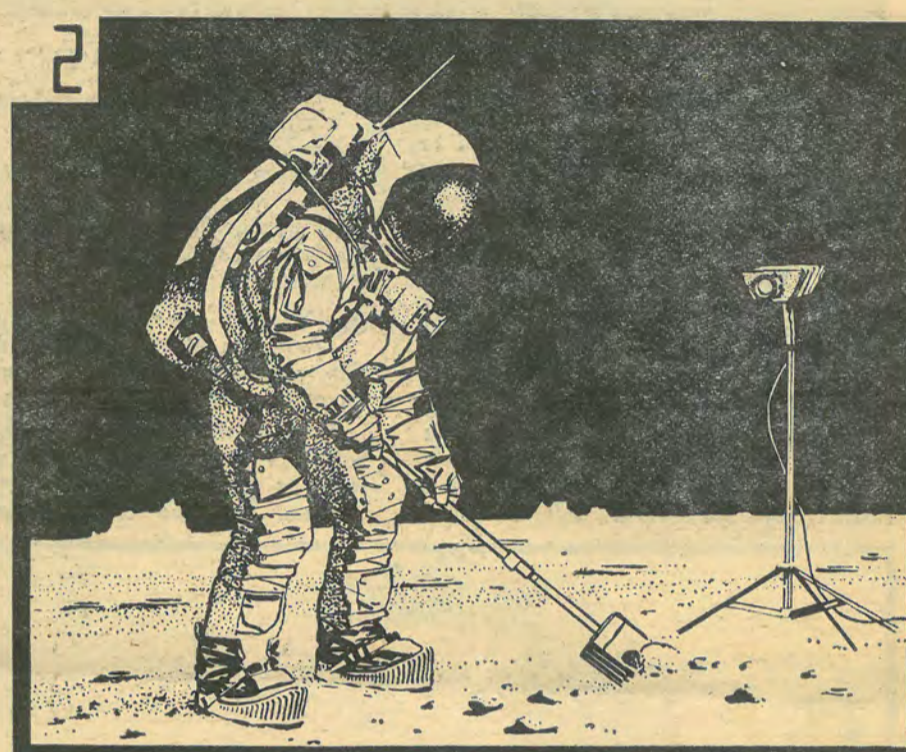
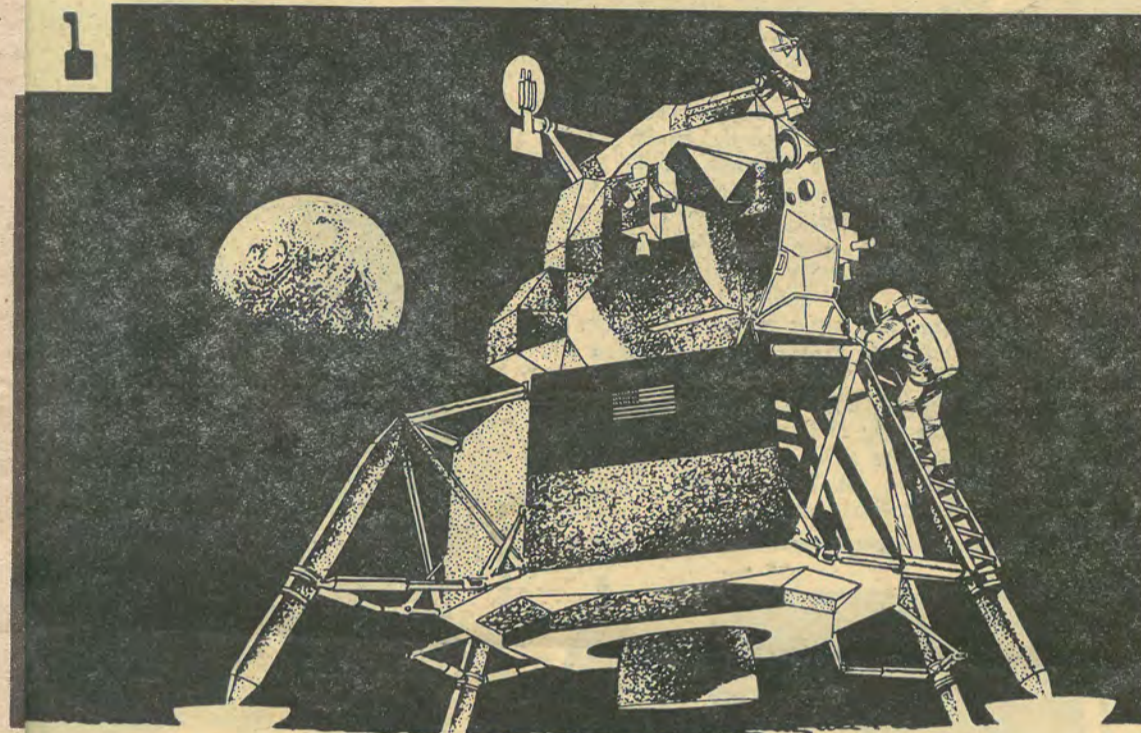
Michael Collins

Contributing writers: Arthur Smith and Lorelies Olslager

Drawings: Frank Bellamy

EARTH	★ JULY 16 14·32 hrs LIFT OFF	17·16 hrs TRANS-LUNAR INJECTION	18·42 hrs SPACECRAFT FREE OF THIRD STAGE	★ JULY 19 18·26 hrs LUNAR ORBIT INSERTION	22·41 hrs ORBIT CIRCULARISED	★ JULY 20 20·14 hrs LUNAR MODULE DESCENDS	21·23 hrs TOUCHDOWN	★ JULY 21 07·17 hrs FIRST MAN ON THE MOON	07·44 hrs SECOND MAN ON THE MOON	MOON	18·50 hrs LUNAR LIFT OFF	22·32 hrs DOCK WITH MOTHERSHIP	★ JULY 22 05·56 hrs TRANS-EARTH INJECTION	★ JULY 24 17·49 hrs SPLASH DOWN	EARTH
--------------	------------------------------------	------------------------------------	---	---	---------------------------------	---	------------------------	---	-------------------------------------	-------------	-----------------------------	-----------------------------------	---	---------------------------------------	--------------

07.17 BST, JULY 21, 1969 : FOOTSTEPS ON THE MOON



FROM start to finish, the period which Neil Alden Armstrong and Edwin E. Aldrin will spend on the surface of the Moon will be a mere 21 hours 27 minutes.

With his first tentative step on an alien surface, 38-year-old Neil Armstrong will begin an era of exploration of which men have dreamed for generations.

Lunar Module 5 will be under the astronauts' control in the last dozen minutes of the flight. Touchdown will be within an elliptical area of the Sea of Tranquility, seven miles by three. They will be able to fly LM-5 forwards, sideways and backwards, like a helicopter, during the last few minutes. This will enable Armstrong to choose a smooth, level landing site free of

craters or boulders. Five-foot-long probes suspended from the footpads will give him the cue to cut the engine when they strike the surface.

Many checks will be carried out after touchdown, then the astronauts will eat a meal and have a long rest. When they wake they will eat breakfast and spend two more hours preparing for their Moon walk. At 7.7 a.m. on Monday, July 21, they will release a valve to allow their cabin oxygen to escape and open the hatch. Ten minutes later Armstrong steps on the Moon.

On the Moon they will be protected by £40,000 multi-layered spacesuits. On their backs will be P L S S—Portable Life Support Systems, which will give them oxygen and cooling water.

1 AT 7.17 a.m., Armstrong will go down on all fours in the centre of the Lunar Module's floor, with his feet out of the hatch, and crawl backwards on to the little platform outside. As his feet, shrouded in heavy boots, feel for the first rung of the ladder, he will reach over with his left hand and pull a D-ring on the side of the L.M.

This will open a door in the descent stage and out will swing a TV camera which will transmit pictures back to an estimated audience of 1,000,000,000 viewers on Earth.

When he steps on the Moon, Armstrong will be in a gravitational field one-sixth as strong as that on the Earth's surface. Surprisingly, he will find walking difficult and probably tiring, for we depend on the force of gravity to help us to "fall" forward with each stride.

2 AFTER his first tentative steps, Armstrong will scoop up a "contingency" sample of lunar rocks—just in case a hurried departure from the surface of the Moon is necessary before the full sample is gathered. As the pressurised spacesuit will make it difficult for him to bend, he will be equipped with a long-handled scoop to pick up the sample.

3 ONLY after the sample has been safely stored in a plastic bag, and winched up to the "upper floor" of the L.M. will Aldrin emerge from the hatch. He will back down the flimsy ladder while his commander records the event on film and with a stills camera.

Aldrin will be doing more of the hard work on the Moon's surface than Armstrong. The

mission planners have decided that they must not risk over-tiring Armstrong who will be responsible for seeing that the L.M. lifts off the Moon safely.

4 FOR the next 93 minutes the two men will be busy deploying the experiments in EASEP—the Early Apollo Scientific Experiments Package. EASEP is a masterpiece of compactness and is designed to gain a maximum of scientific information for a minimum of effort.

A sheet of aluminium foil will be unrolled to catch particles ejected by the Sun in the so-called solar wind. A device powered by solar cells will be left a few score feet from the spacecraft to monitor future "quakes" on the Moon. A laser reflector for use in measurement experiments will also be left behind.

5 THERE is one activity which will be optional for Armstrong and Aldrin, and that is the erection of a collapsible aerial close to the L.M. This may be necessary if TV voice and data communications are bad between the L.M. and the Earth.

6 ARMSTRONG and Aldrin will spend half an hour collecting samples of Moon rocks and smaller particles. They will be carefully wrapped in plastic bags and placed in a hermetically sealed box which will not be opened again until it is inside a vacuum chamber in the Lunar Receiving Laboratory at Houston. Scientists of many nations, including fourteen in Britain, will spend years studying these first samples.

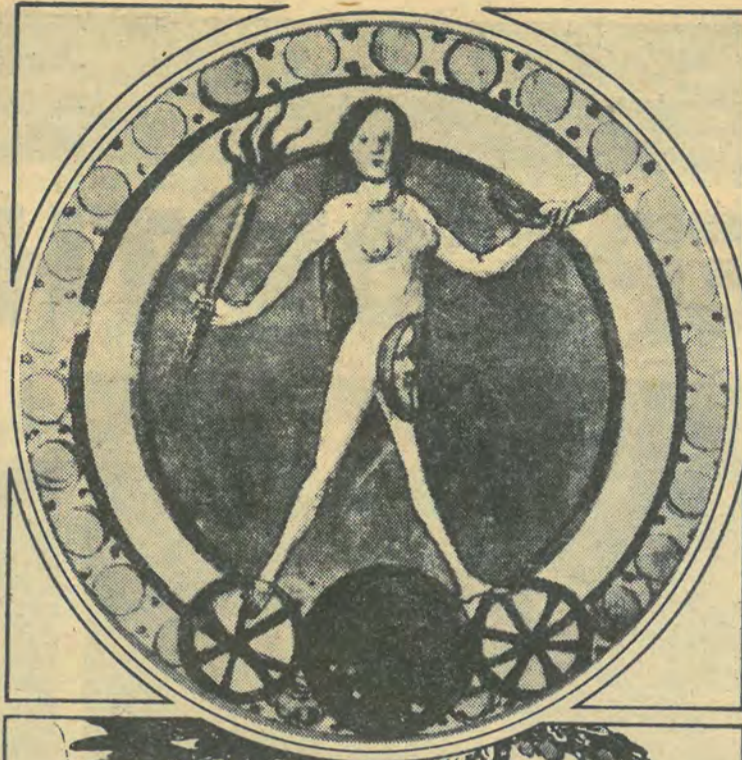
Aldrin will spend an hour and thirty-three minutes out on the surface and will go back into the L.M. at 9.17 a.m. Armstrong will stay out a further twenty minutes and will return

at 9.37 a.m. The hatch will be opened once more, at about 10.54 a.m., to jettison unneeded equipment such as cameras and boots.

7 FOR the two men one "activity" will be more important than anything else. The flight plan tells them to sleep for a total of eight hours and forty minutes during their stay on the Moon. There are no beds in the L.M. and one astronaut will have to lie down on the floor in front of the hatch, while the other slumps on the cover of the ascent engine.

8 IT WILL be at 6.50 p.m., after a sleep and two meals, that the astronauts will fly the L.M. ascent stage off the Moon. Using the descent stage as the launch pad. After 3½ hours of complicated manoeuvres their strange-looking craft will rendezvous and dock with the command module at 10.32 p.m. The most hazardous part of the epoch-making voyage will then be over.

ALL TIMES ARE B.S.T. AND MAY BE SUBJECT TO ALTERATION



Left: 1865, To the Moon with Jules Verne. Top centre: 1458, The Moon in astrology. Below centre: 1835, Inhabitants of the Moon, through a hoaxer's telescope. Top right: 1873, the Cow jumps over the Moon. Below right: 1638, Space Traveller on his way to the Moon.

CAIN and Judas Iscariot, lecherous and incestuous gods and goddesses, dead souls, monsters half beast and half man, creatures made of metal and feeding on clay, huge insects with super-human brain power — over the centuries these have all been inhabitants of the Moon, born of the fertile imagination of men.

To most heathen peoples the Moon has been a god or goddess, sometimes inferior, sometimes superior to the Sun god.

Without knowing it, even modern Britons pay homage to the Moon. Hot-cross buns existed before the crucifixion of Christ and are the descendants of a cake with two horns (symbolising the Moon) which the ancient Egyptians and Greeks used to bake.

Man has not only populated the Moon with gods. In various parts of our globe its spots have meant that there is a man, a woman, a hare, a toad, a cat or even a rat up there.

In Britain an old legend says the Man in the Moon was sent there by Moses as punishment for gathering wood on the Sabbath. In France he is Cain or Judas Iscariot atoning for his sins.

To many, the Moon was peopled by dead souls. Some South American Indians believed it to be a paradise without mosquitoes, but in medieval Europe it was often taken for Hell.

Although it has symbolised fertility and tranquillity, the Moon has mainly been considered an influence of evil rather than good.

The term "lunatic", an 18th century archbishop declared, "arose from the widespread belief of the evil influence of the Moon on the human frame."

Looking into the moonlight was once said to cause blindness; in Iceland pregnant women did not dare sit facing the Moon for fear that their babies might be born mad.

The Moon was of prime importance in

MYTHOLOGY OF THE MOON

astrology, the purported science of reading Man's fate in the stars. An 1821 Manual of Astrology says: "Cynthia, the Queen of Heaven (as the ancients called the Moon) is a cold, moist, watery, phlegmatic planet . . ."

"She produces a full stature, fair, pale complexion, round face, grey eyes, short arms, thick hands and feet, smooth, corpulent and phlegmatic body . . . She is said by the old astrologers to govern the brain, stomach, bowels, left eye of the male and right eye of the female".

MUCH superstition has attached to the Moon's phases. The old Greeks considered the date of a full Moon as the best day for weddings.

Even such a respected essayist and philosopher as Francis Bacon could advance the theory in the 17th century that "it may be that children and young cattle that are brought forth in the full of the Moon are stronger and larger than those that are brought forth in the wane."

Johannes Kepler, a famous German astronomer, thought there were rational beings up there. But they were "creatures less noble than men." Grotesque in shape,

they grew up and perished very quickly because of extreme heat and cold. They dug deep furrows into the surface to protect themselves from the sun and some of them lived permanently in water.

Kepler's speculations were followed by a series of fictional trips to the Moon, many of which were less concerned with what it was really like than with parodying and criticising conditions on Earth.

Among the most famous Moon travellers was Domingo Gonzales, a creature of 17th century British bishop Francis Godwin.

Gonzales was supposed to have been carried to the Moon by wild swans. The first building he saw was a humble lunar hut but to him it appeared of "a beauty and largesse as all our world cannot show any neerer comparable."

The lunar people, 30 feet tall, sent their bad children down to Earth for punishment. The next human visitor was French author Cyrano de Bergerac who travelled there in a flying machine powered by fire crackers.

In 1757 a Yorkshire curate called Miles Wilson sent the "wandering Jew" to the Moon in Elijah's chariot. The traveller, Israel Jobson, arrived just as the Lunarians, who were made of metal and fed on clay, were returning from battle. The wounded were being patched up by coppersmiths.

All through the 17th and 18th centuries

Britons took it for granted that Man would soon get to the Moon. In 1713 a newspaper article commented that "the humour so prevailed . . . that they were actually making parties to go to the Moon and were more put to it in their thoughts how to meet with accommodation by the way than how to get thither."

Of course, there could be no doubt that the Moon would be a British colony. Author Francis Harding proposed in 1692 to deport there all men who were a problem in Britain. The best of the colonists would be the Scots, a people who could subsist on little and so would wax fat in the airy atmosphere.

ALL the tales were scooped, however, by "The Great and Astronomical Discoveries lately made by Sir John Herschel, LL.D., F.R.S.," which were serialised in a New York newspaper in 1835.

Through a telescope weighing seven tons and having a 42,000-times magnifying power, Sir John (alias Richard Adams Locke) found the Moon to be a lovely country with rocks of marble and unicorns as graceful as antelopes.

But the inhabitants were vile creatures. Arrested somewhere in development between monkeys and men, many had great wings "similar in structure to those of bats."

Great excitement spread. In Britain a country curate asked his flock to buy Bibles for the lunar creatures, and the venerable New York Times declared in an editorial that Sir John's discoveries "are all plausible and have an air of verisimilitude."

Soon, however, the hoax was discovered, and by 1900 there was nobody to refute H. G. Wells when he peopled the Moon with insect-like creatures of superhuman intelligence.

Jules Verne, the greatest science-fiction writer of them all, proved to have singular foresight. In his "Voyage from the Earth to the Moon," the spaceship Columbiad carried three Americans towards a lunar landing.

But the three never got there. Diverted by a meteor, the spaceship just circled the Moon before finally plunging into the Pacific.

MIRRORSCOPE MOON SPECIAL

MIRRORSCOPE MOON SPECIAL



R

AFTER a series of trial-and-error attempts, the Ranger programme matured when Ranger 6 crashed on the Moon on February 2, 1964, 20 miles wide of bullseye. Its TV cameras switched on, but no pictures emerged. Ranger 7 crashed in the Sea of Clouds, sent back 4,316 photographs, the last taken 1,000 feet above the surface before crashing. Ranger 8 made it to the Moon on February 20, 1965, its cameras working for 23 minutes from 1,100 miles above the Moon, and yielding 7,140 pictures. Ranger 9 (March 24, 1965) landed in the Crater Alphonsus, where a Russian astronomer had reported signs of possible volcanic activity. Ranger 9's pictures ruled out the possibility.

L

THE Russian Luna programme started in January, 1959, when Luna 1 went within 4,000 miles of the Moon. Luna 2, an 86lb. steel ball crashed on the Moon on September 13, 1959 (at 7,500 m.p.h.) carrying a shockproof Soviet pennant. Luna 5 (May, 1965) crashed in the Moon's Sea of Showers. Luna 6 missed the target altogether. Luna 8 (December, 1965) crashed in the Ocean of Storms. Luna 9, a major success, landed safely in the Ocean of Storms on February 3, 1966, "talked" to Earth, relayed first TV pictures from the surface. Luna 13 made a landing on Christmas Eve, 1966, and prodded the Moon surface with a mechanical arm to test surface strength.

Moon Map copyright Hallwag, Bern, Switzerland. Additional graphics by Roy Foster and Roy Wright.