



# ORIENTOR

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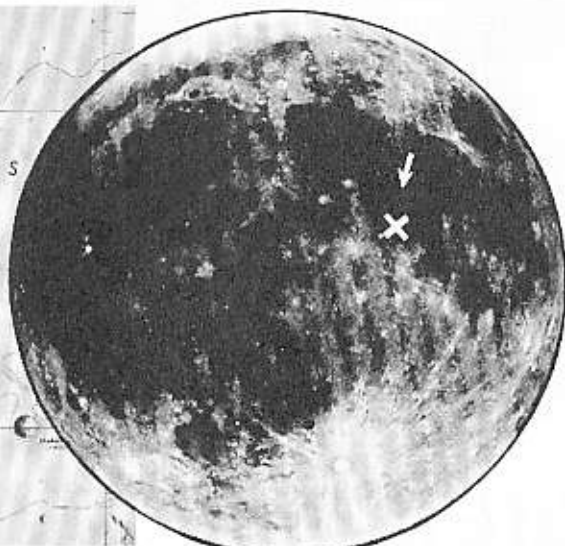
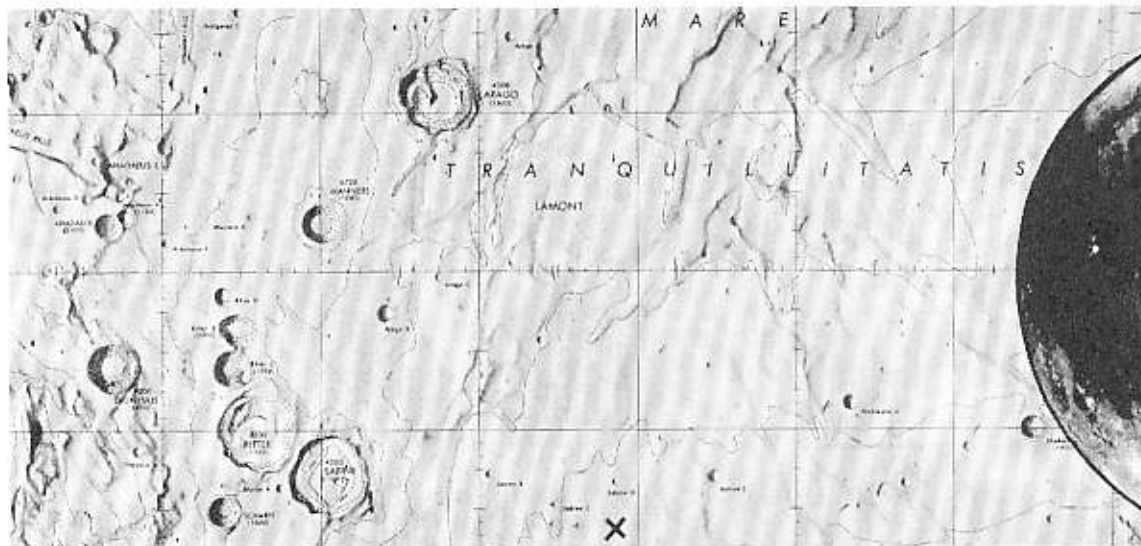
## ACIC Charts Will Help Astronauts Land on Moon

By Charles R. Miller

When the Apollo 11 astronauts roar off the pad at Cape Kennedy this month on their way to a moon landing, the three space pioneers will be carrying cartographic products specially produced here at the Air Force's Aeronautical Chart and Information Center. The flight items are another milestone in the decade of space support provided by the employees of ACIC.

In addition to the dozens of ACIC products required to support NASA's Project Apollo, two new series will make their training and operational debut during the Apollo 11 mission. These are the Lunar Module (LM) Descent Monitoring Chart series and the Lunar Surface Exploration Map Data Package.

The LM Descent Monitoring Chart Series, prepared from Orbiter IV and Apollo Mission 10 photography, is produced to cover each of the three potential Apollo 11 landing sites. These graphics, 3 or more per landing site, are designed to cover the landing site area, approach and departure corridors to provide the LM flight crew with visual descent and ascent monitoring capability. The series will provide coverage for approximately 1100 nautical miles east and 200 nautical miles west of each site for descent and ascent



The Apollo 11 astronauts are scheduled to touchdown in the southwestern corner of the Sea of Tranquility, as shown on the ACIC chart above. The area pictured is roughly 43,000 square miles or about equal to 60 percent of the area of the State of Missouri. In the tele-

scopic photograph of the near side of the moon at right, the X indicates the general area shown on the map. The black area extending north and east of the X is the Sea of Tranquility.

## U.S. Air Force Pioneered Modern Lunar Mapping

In 1959, when the Air Force first authorized ACIC to begin its project to systematically chart the lunar surface, the undertaking was

virtually unprecedented. There was no coordinated series of maps depicting portions of the moon in existence at that time, while pos-

sibly the most accurate moon map had been designed by the German astronomer, Julius Schmidt, in 1874.

ACIC's initial objective was simply to study and collect data that would be useful in charting the moon. But two years later, the National Aeronautics and Space Administration asked ACIC to con-

scientific illustrators to Lowell Observatory in Flagstaff, Ariz. Using high-powered telescopes, members of the team recorded lunar features in the fleeting moments when they were least obscured by the earth's atmosphere.

The illustrators were able to improve upon the accuracy of lunar photographs because their eyes

### Lunar Chief Recalls History Of ACIC Space Programs

By Robert W. Carder

On this eve of man's greatest space adventure - a manned lunar landing - I recall with a bit of nostalgia that time period 10 years ago when ACIC turned its cartographic attention toward the moon and space. It was in the summer of 1959 that Robert Kingsley, ACIC's Technical Director at that time, stopped me in the corridor early one morning and asked, "Bob, do you have any ideas on how we can publish a Lunar Atlas" -- and that was the beginning of our moon program.

Our first action was to assemble a small space team in the P & D Plant, headed by Howard Holmes and assisted by Al Burkhardt, Bill Cannell, Ken Walters, Pat Bridges, Walt Lueber, Jim Perry, Jake Nelson, Ed Roth, Harry Jenkins, and Alex Jablonski. Those were hectic days, almost like the blind leading the blind for all we knew about the moon; but with help and assistance from Dr. Gerard Kuiper, Director of Yerkes Observatory, we managed to unvell our first lunar items in March 1960 at the ASP-ACSM national meeting in Washington.



Mr. Robert Carder  
Chief, NASA Project Office

It wasn't too long before Dr. Kuiper convinced us that we needed a large telescope if we were to map the moon. Why not use the Naval Telescope at Flagstaff, Arizona, someone suggested. This seemed like a good idea, so after some high level negotiating with the Naval Observatory in Washington, we dispatched Bill Cannell with his suitcase packed for Flagstaff. Bill's reception at the Naval Station was "lukewarm" to say the least; for the director Dr. Hoag, a Stellar astronomer with no particular love for the moon, wasn't too happy about being pushed off his telescope by a cartographer with a priority from Washington.

The following day, Dr. Hoag tactfully suggested to Bill that while in Flagstaff he might like to observe the moon through the 24-inch refractor at Lowell. This was soon arranged with Dr. Hall, the director at Lowell, and so commenced our Lunar Mapping Program at Lowell which was to last for nine years. However, this was not the end of our association with the Naval Station. Bill Cannell and Dr. Hoag subsequently became close friends and when the Navy installed their new 61-inch telescope, Dr. Hoag agreed to take some long exposure full moon plates for ACIC which played a major role in our Selenodetic Program.

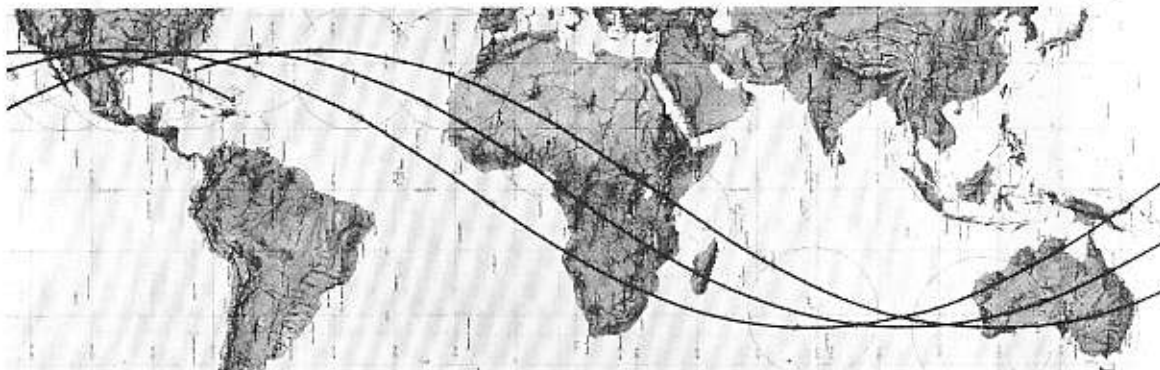
#### Thinking "Way Out"

While one group was working on the moon, another ACIC group was formed which turned its attention toward designing an earth orbit chart for the Mercury Program. John Dornbach (now with NASA) was selected to spearhead this effort, later to be taken over by Joe McKinney for Gemini and currently managed by Charlie Miller for Apollo. Our thinking had to be "way out" when it came to designing an earth chart to be

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with the added objective of providing lunar charts for Project Apollo.

To collect data for its first series of maps, ACIC sent a team of



This Mercury Orbit Chart was produced by ACIC in December 1961 for use as an on-board flight item and for the DoD recovery forces in America's first manned orbital flight by Col. John H. Glenn Jr. It is now an "antique," in the words of Robert W. Carder, chief of ACIC's NASA Project Office, but the basic format is still being used in the earth orbital charts produced for Apollo 11.

## ACIC Has Aided Space Men For 10 Years

When astronauts Armstrong and Aldrin set foot on the moon this month, the act will culminate 10 years of cartographic support for the manned space program by ACIC.

Over the past 10 years ACIC has provided each of 20 manned space missions with literally hundreds of cartographic products, ranging from the small-scale earth orbit charts now familiar to ACIC employees to simulation filmstrips for astronaut training, flight crew navigational charts and capsule recovery graphics.

This program started in 1959 when the National Aeronautics and Space Administration requested the Department of Defense to provide cartographic support for the DoD forces that were to be utilized in recovery operations for Project Mercury.

At that time ACIC was identified as the agency most capable of providing this support because of experience gained in satisfying similar requirements for aircraft

snatches of lunar detail that camera exposures could not.

On the basis of the telescopic observations made at Lowell and

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tion, graphics prepared from oblique photography are produced for the primary and alternate sites.

To achieve the broad scientific

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operations.

For the one-man Mercury missions, ACIC provided a series of Mercury Orbit Charts that combined in one map, terrestrial ground track and orbit data covering the entire circumference of the earth.

Ground track data included the location and facilities of airfields and radar stations, while the orbit data established the path of the space vehicle in relation to the earth, marked at each 10-minute interval from time of launch.

This basic format was later used in providing earth orbit charts for the Gemini and Apollo missions. A separate spacecraft recovery chart was also provided for Project Mercury.

As a result of ACIC's responsiveness to Mercury requirements, both in terms of product and meeting schedules, NASA requested and 11q. USAF authorized continued ACIC support for Project Gemini.

Cartographic support for the Gemini missions consisted both of modified Mercury products and new products to satisfy requirements unique to the Gemini programs. Included among these new products were earth simulation filmstrips for astronaut training, Gemini Flight Charts for training and spacecraft navigation and a Spacecraft Weather Briefing Chart for use by Mission Control.

From an original two series of charts used to support Project Mercury, the list of ACIC support items for Project Apollo has grown to well over 30. These include several series of new charts and graphics designed to support lunar mission operations, including lunar orbit, landing and surface exploration phases.

*(This article is based largely on a report prepared by Charles R. Miller, ACIC Apollo Project Officer, NASA Project Office.)*