



OVER 100 RECOGNIZED—

## MSC Employees Receive Awards

More than 100 employees of the NASA Manned Spacecraft Center were recognized in an award ceremony, Monday December 14 for their contributions to the Apollo 13 mission and the safe return of the astronauts following the explosion and loss of oxygen and electrical supplies aboard the spacecraft.

Apollo 13 astronauts Fred W. Haise, Jr., and John L. Swigert, Jr. received the NASA Distinguished Service Medals awarded them and Apollo 13 Commander James A. Lovell, Jr. at NASA Awards Ceremonies in Washington last month.

Ten persons received awards for contributions to last year's successful Apollo 12 mission.

MSC Associate Director Frank A. Bogart was master of ceremonies and Deputy Director Christopher C. Kraft, Jr. made the presentations to MSC employees of 47 Certificates of Commendation, and 73 Certificates of Superior Achievement. Ten Certificates of Appreciation were awarded to officials of contractor firms. One Group Achievement Award was made.

The awards ceremony was held in the MSC Auditorium, (Continued on page 4)

## NAR Shuttle Study Modifications Include Structural Test Programs

The NASA Manned Spacecraft Center has modified its space shuttle study contract with Space Division, North American Rockwell, Downey, Calif. to include a structural test program.

Estimated value of the fixed price modification is \$2 million. Total value of the contract is estimated at \$10.8 million. This includes \$8 million for definition and preliminary design studies; a \$500 thousand add-on to study

use of expendable second stages, and a \$300 thousand increment of Department of Defense funds to study requirements for the U. S. Air Force.

The contractor has been requested to establish a test program on cryogenic tank structure and insulation; high-temperature fasteners; static and dynamic seals; bulk insulation packaging and attachment; thermal protection; wing structure and fuselage structure. Work will be done at plants in Downey and Seal Beach, Calif. and at a subcontractor facility in San Diego.

North American Rockwell is one of two aerospace firms making detailed studies of the space (Continued on Page 2)

### —EDITOR'S NOTE—

The ROUNDUP will not be published during the Christmas Holidays. The next issue will appear on January 15, 1971. Deadline for ads will be January 7 and deadline for copy will be January 8.



**ONE-IN-A-MILLION**—Sometime last month the one-millionth visitor this year to the Manned Spacecraft Center toured our facilities during the daily visitor program. This young fellow taking a workout with the perennial duck population at the Center could have been that visitor putting the open house program over the million mark. The Center is open daily to visitors from 10 a.m. to 4 p.m., Saturdays and Sundays included except for Federal Holidays.

### A MESSAGE FROM MSC DIRECTOR DR. ROBERT R. GILRUTH

*We have come to the close of a difficult year. Hopefully, we emerge surer of our abilities and more certain of our proper course in the years ahead.*

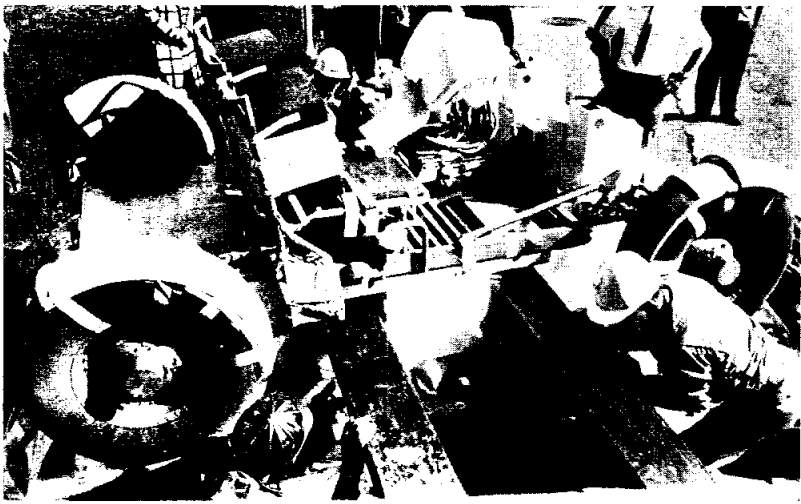
*After the dizzying triumph of two faultless lunar landings in 1969, we were sorely tested in 1970. For you men and women of the Manned Spacecraft Center, Apollo 13 must have seemed your most trying hours. I believe it was also your finest hour. The crisis of Apollo 13 was followed by the most painful experience, felt by MSC contractor and federal employees alike, of having to adjust to lowered priorities and shrinking resources. There are signs that this downward trend is leveling off. I hope so. But one thing is certain. This country's future was bound irrevocably to space exploration in the 1960s and as long as this is true the Manned Spacecraft Center and its people will have a vital role to play.*

*There are reasons to feel encouraged. In 1971 we will go to the moon two more times. With each succeeding lunar voyage the scientific payoff of the Apollo Program becomes greater and more apparent. Other exciting missions for the Manned Spacecraft Center are gaining momentum and direction. The launch of Skylab is now just two years away. We are embarked on an earth resources program which holds great potential for direct benefit to man.*

*But perhaps the most far-reaching event of the year just passed may be the clear emergence of the space shuttle as the keystone of virtually all future efforts in space. I like to think that a versatile, economical shuttle may make the "manned versus unmanned" arguments of the '60s seem as irrelevant in the '70s as competition of passengers versus freight.*

*But in any event, the Manned Spacecraft Center will be busy and needed. So may I wish you and your families a very Merry Christmas and a challenging New Year.*

Sincerely,



LRV ARRIVES AT MSC — The one-g Lunar Roving Vehicle trainer for the Apollo 15 mission arrived at the Manned Spacecraft Center December 16 via truck. The LRV was shipped from the GM Delco Electronics Defense Research Center, Goleta, California on Monday. Technical Service Division personnel are shown uncrating the vehicle near Building 5 at the Center.

### Area Teenager's Christmas Ball Set

The first annual Christmas Ball for teenagers with KILT's Michael presenting "The Best On Record" will be held Wednesday, December 23 beginning at 8 p.m. The Christmas Ball will be held in the Grand Ballroom of the Nassau Bay Resort Motor Hotel under the sponsorship of the Catholic Youth Organization of St. Paul's Church. For additional information call 474-4734.



TEST VERSION OF SKYLAB WORKSHOP — Transporter carrying full-scale non-flight version of Skylab orbital workshop is maneuvered into position for loading aboard USS Point Barrow at Seal Beach, Calif. Ship is scheduled to have arrived at National Aeronautics and Space Administration's Michoud Assembly Facility in New Orleans yesterday. There the vehicle, called the Dynamic Test Article, will be loaded aboard a NASA barge for shipment to Manned Spacecraft Center (MSC) in Houston, arriving here January 6. McDonnell Douglas Astronautics Company, Huntington Beach, Calif. converted a Saturn S-IVB stage into the structural simulation of actual Saturn Workshop in which crews of astronauts will live and work for periods of up to 56 days in earth orbit. Acoustic and vibration testing will be done at MSC and stage then will be shipped to NASA's Marshall Space Flight Center for static structural testing. Test vehicle is 50 feet long, 21.7 feet in diameter and weighs 27½ tons on transporter. Skylab is scheduled for 1972 launch as nation's first space station.

### Shuttle Study

(Continued from Page 1)

shuttle transportation system. A similar study by McDonnell-Douglas Corporation, St. Louis, Mo. is monitored by the Marshall Space Flight Center.

OVER THE HOLIDAYS  
DRIVE CAREFULLY  
AND BE COUNTED IN '71

Merry Christmas

IF MCC COULD NOT SUPPORT APOLLO 14—

## Emergency Control Center Prepared To Take Over Flight

Many precautions are taken in the Mission Control Center for preserving the integrity of the facility in support of spaceflight in Earth orbit and beyond.

But, what if for some unknown reason a massive failure occurs that is unavoidable and the Houston control center is unable to continue its support?

This is when the EMCC (Emergency Mission Control Center) would come into the picture with a preselected team of flight controllers to initially take over control of the flight.

The EMCC is contained within an enclosure approximately 30 by 45 feet located above and overlooking (through a glass window) the Manned Space Flight Network operation center at the Goddard Space Flight Center, Greenbelt, Maryland.

This enclosure is partitioned off into four rooms. The larger is the Mission Control Room (MCR) and it contains ten (10) consoles for flight controllers to conduct the mission. Other rooms are the Management Observation Room (MOR), Launch Support Room (LSR), and a document room with tables, desks and file cabinets.

Computer support will be supplied by the Goddard Real Time System (GRTS). Two IBM 360-75s in the GRTS will be utilized. One will interface with the GSFC computer processors (CPs) to process the trajectory data for orbit determination (OD), and the other will be used for maneuver computation. The latter will use the Manned Spacecraft Centers' EMCC program.

Nine of the consoles in the MCR are identical, having a single key set and TV tube with 15 TV channels available for presentation to the controllers computer print-out data on the mission. The tenth console has two keysets and controls for three overhead TV monitors. In addition there is a console in the computer room that

is available for use by the flight controllers and can be patched to the MCR.

Adjoining the Mission Control Room is the Management Observation Room (MOR) which has TV plus loop monitor capability. The Flight Operations Director, Apollo Spacecraft Program Office and Department of Defense personnel will occupy this room.

In back of the MOR is the support area (LSR) with two keysets on two tables. Also available if needed will be three consoles in

the Manned Space Flight Network Operation Control area. These latter consoles would be open for systems support people and others.

Consoles in the MCR will be provided for Flight Director (FD), Spacecraft Communicator (CAPCOM), Retrofire Officer (RFO), Network Controller, Lunar Module (LM), Command and Service Module (CSM), Assistant Flight Director/Flight Activities Officer (AFD/FAO), Operation and Procedures/Instrumentation & Communications Officer (O & P /

INCO) Flight Dynamics Officer (FIDO), and Guidance Officer (GUIDO).

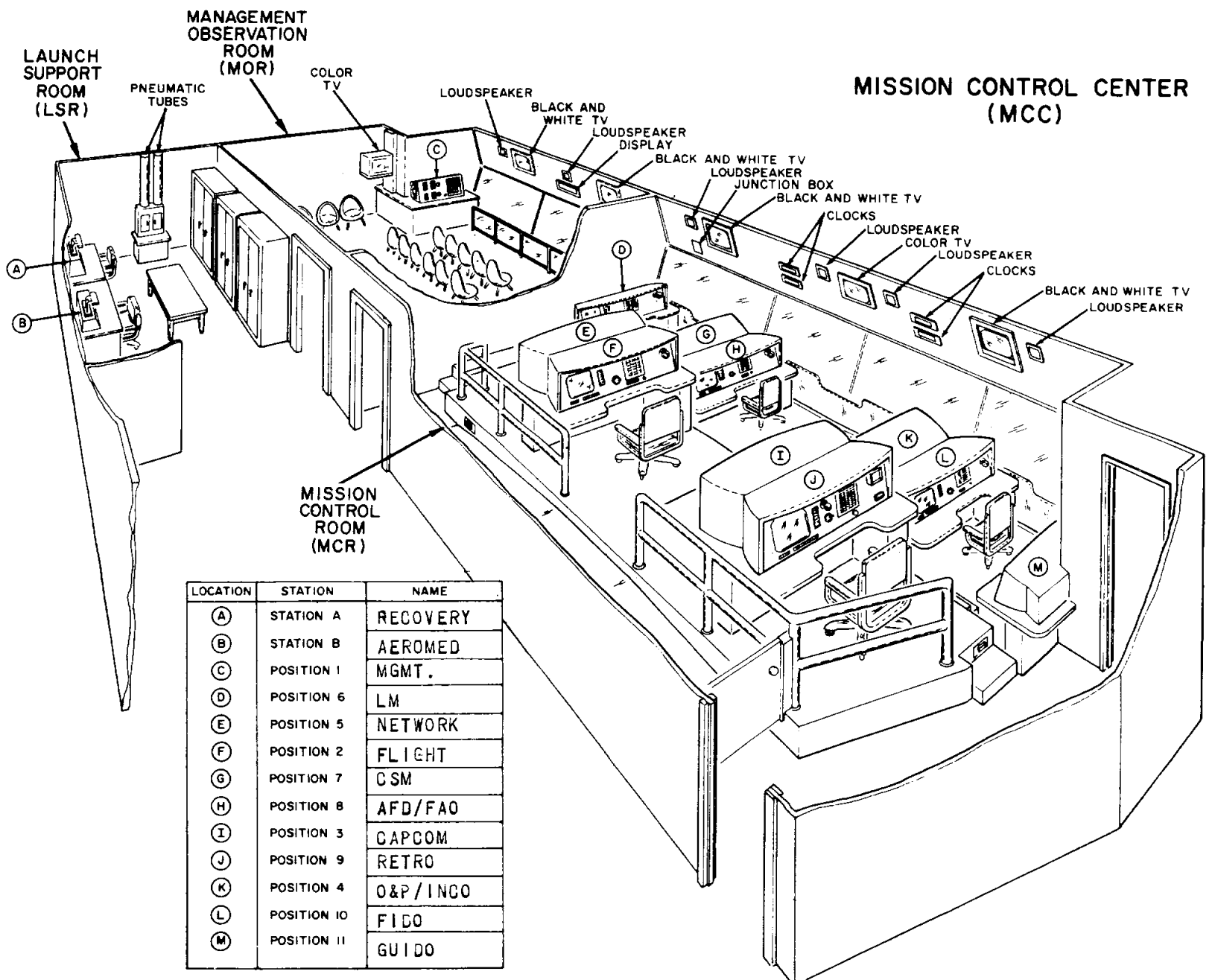
The Landing and Recovery Division personnel and aeromed will be located in the LSR.

With this setup at GSFC the flight control team would be able to provide return trajectory maneuvers direct or circumlunar return, transearth injection (TEI), midcourse corrections and retrofire in Earth orbit.

Should the need arise to place the EMCC in operation, a team

of flight controllers will be prepared to board an aircraft in Houston and be on their way to Greenbelt, Maryland to take over control of the flight from there. Within a matter of hours the EMCC could be operational and providing data to the crew of the spaceflight.

During a recent checkout of the facility at GSFC by flight controllers from MSC it was determined that the EMCC program was adequate and ready to support a manned spaceflight if needed.





TO ELIMINATE 'POGO' EFFECT—

## Apollo 14 Launch Vehicle Modified

An "accumulator" device designed to suppress oscillation buildup during flight has been installed on the second stage of the Apollo 14 launch vehicle at the National Aeronautics and Space Administration's Kennedy Space Center, Fla.

Technicians have placed the accumulator in the liquid oxygen line of the center engine of the Saturn V's second (S-II-9) stage. The Saturn V launch vehicle program is directed by NASA's Marshall Space Flight Center, Huntsville, Ala.

Space agency officials made the decision to modify the liquid oxygen system after unusually high oscillations—sometimes called the "Pogo" effect—were recorded during the Apollo 13 flight on April 11.

While the oscillations resulted in an early shutdown of the stage's center J-2 engine, the

launch vehicle performed satisfactorily and met all mandatory and desirable flight objectives.

Apollo 13 flight evaluation indicated oscillations in the S-II liquid oxygen feed system caused the pressure in the "plumbing" of the center engine at one instant to drop below the minimum required, resulting in liquid oxygen pump cavitation. Cavitation, the creation of gas-filled spaces or bubbles in the liquid oxygen, reduced pump efficiency, and, in turn, engine thrust. When the center engine's thrust dropped off, it was automatically shut down.

Oscillations recorded on the S-II stage during the Apollo 13 flight were localized and were not passed on to the manned Apollo command module.

The accumulator installed in the Apollo 14 vehicle is a compartment or cavity located in the liquid oxygen line feeding the center engine. The compartment is filled with helium gas which acts as a cushion to the pressures of the fluid flowing through the line.

This dampening effect will cause that column of fluid to oscillate at a frequency different from that of the thrust structure and engines, and will in effect "de-couple" the propulsion system from the structural system, thus preventing the three respective systems from oscillating in rhythm. It is such rhythm oscillation, or "coupling," that causes the unacceptable buildup that occurred in Apollo 13. The accumulator, engineers say, "de-tunes" the several oscillations which have a natural and unwanted tendency to fall into the same rhythm.

In addition to the installation of an accumulator in the liquid oxygen line feeding the S-II center engine, three acceleration-actuated modules will be installed on the center cross beam structure. These modules will act as a backup to initiate cutoff of the

center engine should excessive oscillation of the center beam structure start to occur.

For the Apollo 14 mission, another change has been made in the S-II stage—a redesign in the J-2 engine propellant utilization valve. Five J-2 engines power the S-II stage.

The valve controls the propellant mixture ration to the engine to provide high thrust when it is needed during the early burn period with higher stage weight, and lower thrust for more efficient operation during the later burn period.

The redesigned, pneumatically-actuated valve replaces a motor driven valve and by-passes considerable onboard stage electronic circuitry. Its actuation command now comes directly from the vehicle instrument unit.

## MSC Awards

(Continued from Page 1)  
Building 1, at 3 P.M. Monday.

EMPLOYEES NOMINATED  
FOR AWARDS

NASA Distinguished Service  
Medal (Apollo 13):

Fred W. Haise, Jr., John L. Swigert, Jr.;

MSC Certificate of Commendation  
(Apollo 12):

Maj. Charles J. Tringali (presently assigned to USAF Space & Missiles Systems Organization, Los Angeles, Calif.);

Mission Planning and Analysis  
Division, Emil R. Schiesser;

Flight Support Division, James  
C. Stokes, Jr.;

Lunar Missions Office, John G.  
Zarcaro;

MSC Certificate of Commendation  
(Apollo 13):

Public Affairs Office, Brian M.  
Duff;

Flight Control Division, Arnold  
D. Aldrich, Melvin F. Brooks,  
Gerald D. Griffin, James E. Han-  
nigan, Eugene F. Kranz, Glynn S.  
Lunney, Jones W. Roach, Milton  
L. Windler;

Mission Planning & Analysis  
Division, Ronald L. Berry, Carl R.  
Huss;

Astronaut Office, Vance D.  
Brand, Maj. Charles M. Duke, Jr.,  
Lt. Comdr. Joseph P. Kerwin,  
Maj. Jack R. Lousma, Lt. Comdr.

Thomas K. Mattingly, Comdr.  
John W. Young, Col. Thomas P.  
Stafford;

Flight Crew Support Division,  
Stanley Faber, Tommy W. Hol-  
loway, Riley R. McCafferty, John  
W. O'Neill;

Apollo Spacecraft Program Of-  
fice, Aaron Cohen, Ronald W.  
Kubicki, James A. McDivitt,  
Scott H. Simpkinson, Owen G.  
Morris;

Engineering & Development Di-  
rectorate, Robert P. Burt, Philip  
M. Deans, John B. Lee;

Systems Engineering Division,  
John R. Sevier, Jr.;

Information Systems Division,  
Arturo B. Campos;

Test Division, Sidney C. Jones,  
Jr., Donald D. Arabian;

Crew Systems Division, Robert  
E. Smylie;

Guidance and Control Division,  
John F. Hanaway;

Propulsion & Power Division,  
Richard B. Ferguson;

Flight Operations Directorate,  
Sigurd A. Sjoberg, Howard W.  
Tindall, Jr.;

Goddard Space Flight Center,  
Richard J. Augenstein, Dale W.  
Call, George A. Cassels, William  
A. Pfeiffer, Robert H. Plaumann,  
Robert L. Owen, Robert E. Spear-  
ing, Robert C. Taylor;

MSC Superior Achievement  
Award (Apollo 12):

LM Project Engineering Divi-  
sion, William C. Fischer, Daniel T.  
Lockard;

CSM Project Engineering Di-  
vision, Jerry S. Lowe, Gary G.  
Metz;

MSC Superior Achievement  
(Apollo 13):

Astronaut Office, Capt. Eugene  
A. Ceran, Dr. Anthony W. Eng-  
land, Lt. Col. Joe H. Engle,  
Comdr. Ronald E. Evans, Comdr.  
Edgar D. Mitchell, Lt. Col. Wil-  
liam R. Pogue, Maj. Stuart A.  
Roosa, Dr. Harrison H. Schmitt,  
Col. David R. Scott;

Flight Control Division, John  
W. Aaron, William C. Burton,  
Charles F. Deiterich, Harold M.  
Draughon, Charles L. Dumis, Ed-  
ward I. Fendell, William E. Fen-  
ner, Neil B. Hutchinson, Robert  
H. Heselmeyer, Larry W. Keyser,  
Jack Knight, Jr., Seymour A.  
Liebergot, Harold A. Loden, W.  
Merlin Merritt, Jr., William L.  
Peters, Donald R. Puddy, H.  
David Reed, Kenneth W. Russell,  
William M. Stoval, Jr., Larry W.  
Strimple, Richard A. Thorson,

John A. Wegener, Briggs N. Wil-  
loughby;

Information Systems Division,  
Gary W. Johnson;

Crew Systems Division, James  
V. Corrae, Edward L. Hays, El-  
ton M. Tucker;

Guidance and Control Division,  
Cline W. Frasier;

Propulsion & Power Division,  
Bobby J. Bragg, William R. Ham-  
mock, Jr.;

Structures & Mechanics Divi-  
sion, James A. Smith, Jr.;

Landing and Recovery Division,  
Sheridan J. Berthiaume, Richard  
W. Blakley, Edward C. Bullock,  
Charles C. Filley, John E. Hoover;

Mission Planning & Analysis  
Division, Martin L. Alexander,  
Troy J. Blucker, Robert S. Davis,  
Charles A. Denham, Rocky D.  
Duncan, Quentin A. Holmes,  
Martin D. Jenness, Alfred N.  
Lunde, Robert E. McAdams,  
Charles W. Pace, Vernon S.  
Ritchey, Robert T. Savely, Walter  
Scott, Jr., Richard M. Swalin,  
Kenneth T. Zeiler;

Systems Engineering Division,  
Richard H. Kohrs;

LM Project Engineering Divi-  
sion, Donald M. Corcoran; John  
G. Presnell, Jr., John Vincze;

Flight Support Division, James  
E. Mager;

CMS Project Engineering Divi-  
sion, Robert E. Bobola, Jerry S.  
Lowe, Daniel A. Nebrig, William  
H. Taylor, Jr.;

MSC Certificate of Appreciation  
(Apollo 12):

Robert E. Breeding, Hamilton  
Standard, Leonard F. Shepard,  
International Latex Corporation;

MSC Certificate of Appreciation  
(Apollo 13):

William R. Bischoff, Grumman  
Aerospace Corporation, Joseph G.  
Gavin, Jr., Grumman Aerospace  
Corporation, George W. Jeffs,  
North American Rockwell Corpora-  
tion Donald J. Markarian,  
Grumman Aerospace Corporation,  
George B. Merrick, North Amer-  
ican Rockwell Corporation, Gary  
E. Smith, Grumman Aerospace  
Corporation, Ralph H. Tripp,  
Grumman Aerospace Corporation;

MSC Certificate of Appreciation  
(Awarded 11/70):

North American Rockwell Cor-  
poration, Tulsa Division, Carl A.  
Hawthorne;

MSC Group Achievement Award  
(Apollo 13):

Public Affairs Office.

## MSC Stamp Club

### To Issue 3 Covers

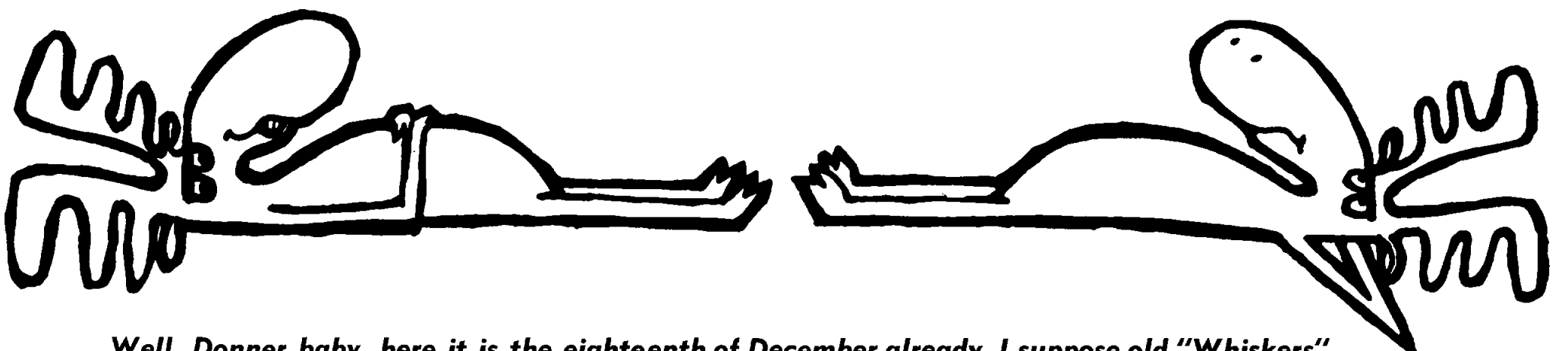
The MSC Stamp Club has an-  
nounced plans for issuing a set  
of spaceflight covers commemora-  
ting Apollo 14 mission scheduled  
for launch on January 31, 1971.

The set of 3 covers, for presen-  
tation to the club's worldwide  
membership, will be postmarked  
on dates of launch, lunar landing,  
and splashdown, at Houston,  
Texas.

Each cover will bear the official  
inscription of the NASA Manned  
Spacecraft Center Stamp Club,  
and a four-color reproduction of  
the official mission insigna.

Non-members desiring to ac-  
quire this historic philatelic  
memento may write to MSC  
Stamp Club, Box 58328, Hous-  
ton, Texas 77058, enclosing \$1.00  
for each set of 3. A stamped  
self-addressed envelope must be  
furnished, and the request should  
be marked "Apollo 14 covers."

The Roundup is an official publication of the National Aeronautics and Space Administration Manned Spacecraft Center, Houston, Texas, and is published every other Friday by the Public Affairs Office for MSC employees.



Well, Donner baby, here it is the eighteenth of December already, I suppose old "Whiskers" will be around again soon with that nutty hypnotist routine . . . "You can fly! You can fly! Look deep into my eye!"

(filched from Republic Aviation News)

Seizant