

BELLCOMM, INC.

SUBJECT: LC 34 Pad Egress Provisions  
for Future Manned Flights -  
Case 330

DATE: March 8, 1967

FROM: L. G. Miller

ABSTRACT

This memorandum reports proposed hardware changes to the LC 34 egress system and related discussions from a recent meeting of the Emergency Egress Working Group of the ALOC. An extract from discussions of the Crew Safety Panel, which met on February 28, was used as a guide for determining what modifications were desirable.

The chairman of the Emergency Egress Working Group will recommend to the ALOC that a co-chairman be appointed to the working group from the KSC safety organization in order to facilitate coordination between operations and safety personnel. Also presented herein are additional thoughts on extending the scope of interest of the working group. It is strongly recommended that these changes be adopted.

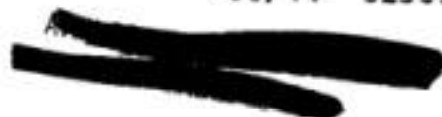
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| (ACCESSION NUMBER)  | (THRU)     |
| 5   | 218        |
| (PAGES)   | (CODE)     |
| CR-5386   | 11         |
| (NASA CR OR TMX OR AD NUMBER)                                   | (CATEGORY) |

(NASA-CR-153756) LC 34 PAD EGRESS  
PROVISIONS FOR FUTURE MANNED FLIGHTS  
(Bellcomm, Inc.) 5 p

N79-72049

Inclas

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MEMORANDUM FOR FILE

A meeting of the Emergency Egress Working Group of the Apollo Launch Operations Committee was held at the Kennedy Space Center on March 6, 1967, to discuss pad egress provisions for future Apollo manned flights. An extract from discussions of the Crew Safety Panel, which met on February 28, was used as a guide. Similar, though somewhat more detailed, information was also available in the form of minutes of an ad hoc group which met at KSC on February 28 to discuss possible design changes in the astronaut egress system.

It is important to note that the Crew Safety Panel has stated that pad abort will remain the most rapid means of escape from a pad emergency external to the Command Module and must be immediately available whenever safety of pad personnel permits its employment. The panel further recommended that new concepts be explored to improve egress time, but that this improvement must not be at the expense of pad abort capability. Barring radical changes to the LC 34 umbilical tower, it is difficult to visualize significant improvement to egress time without some impact on pad abort capability. In addition, pad emergencies external to the Command Module have always been considered to be the primary danger in the past. The proposed hardware changes reported below would contribute to a refinement of existing procedures and equipment and, in addition, recognize to some extent the possibility of contingencies internal to the spacecraft. They do not, by themselves, eliminate the possibility of personnel casualties in the event of an accident similar to the one which took place on January 27.

At the conclusion of the meeting, a lengthy discussion took place concerning the need for a comprehensive operations plan covering pad evacuation and hazardous egress starting with the time of flight crew arrival at the pad. It seems obvious that the time period of concern to the Emergency Egress Working Group should be extended to start upon flight-crew arrival at the pad. A logical continuation of this philosophy would require that the actions of all personnel on the umbilical tower during

the referenced time frame be controlled by a single planning group. Pad evacuation procedures for closeout personnel and others on the umbilical tower during spacecraft closeout should be included in one hazardous egress and pad evacuation procedures document.

In order to facilitate coordination between operations and safety personnel, the chairman of the Emergency Egress Working Group will recommend to the ALOC that a co-chairman be appointed to the working group from the KSC safety organization. He will further request guidance from the ALOC on extending the scope of interest of the working group as mentioned above. It is strongly recommended that these changes be adopted.

#### FIRE RESISTANCE OF ENVIRONMENTAL CHAMBER

The Crew Safety Panel agreed that fire-resistant construction is mandatory for the environmental chamber located at the end of the Command Module access arm. KSC design personnel are examining this problem. A nylon-base material for the bellows of the environmental chamber has been ordered which should provide fire resistance to the range of 500-600°F.

#### WATER SPRAY FOR ACCESS ARM AND ENVIRONMENTAL CHAMBER

It was decided that a spray would be more effective than a deluge system. Although the spray might make vision more difficult for rescue personnel and egressing astronauts, it is necessary if the strength of the aluminum access arm is to be maintained during a fire. A spray system in the environmental chamber will require some means for draining the water, possibly tied in with activation of the water-spray system. Some means of preventing slipping on the wet floor might also be required. At first glance, it appears that controls for initiating this water-spray system ought to exist in the LCC, near the elevator door on the 220-foot level of the umbilical tower, and in the environmental chamber.

#### EMERGENCY LIGHTING

KSC will investigate the emergency switchover capability of the present lighting system. The desirability of the additional, battery-powered lighting is also being examined.

#### DISPOSAL OF SMOKE IN ENVIRONMENTAL CHAMBER

KSC is investigating the possibility of installing a fan in the roof of the environmental chamber. PAA Fire Department personnel used the CM conditioned air supply hose

to aid in clearing smoke from the CM interior after the AS-204 accident. This procedure proved to be quite effective, but it was recommended that a quick-disconnect arrangement be installed so that the air hose can be rapidly deployed from the stowed position.

#### SWING ARM SPEED

A significant shortening of access arm extension and hook-up time does not appear to be likely with the present arm configuration. On LC 34, the arm could be parked in a position which would permit ground abort and yet gain, perhaps, 15 seconds over the normal extension and hook-up time. Also being studied is a proposal to provide a "break away" path between the environmental chamber in this parked position and the Command Module. These efforts are all aimed toward making an egress route available to the crew as soon as they can be ready to emerge from the CM. Considering the proposed 2-second hatch opening time, the "break away" path proposal seems to be the only means of achieving this end after CM closeout. It has yet to be demonstrated, however, that implementation of the idea is feasible and that use of such a path would not represent more of a hazard than staying in the Command Module. The answer is by no means obvious.

#### EGRESS PATH BETWEEN ENVIRONMENTAL CHAMBER AND UMBILICAL TOWER

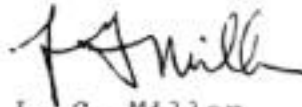
A number of comparatively minor improvements were cited. Some of these were to have been accomplished prior to AS-204. Others, such as replacing certain steps with ramps, are being evaluated.

#### UMBILICAL TOWER ELEVATOR

Once again, back-up schemes for the elevator are being considered. Helicopter pickup from the umbilical tower, jet backpacks, and a slide wire have all been mentioned; all these alternatives have been discarded at least once in the past. Even so, KSC will take another look at the slide-wire idea. The elevator situation is complicated by the number of personnel on the umbilical tower during spacecraft closeout. At present, an impasse exists between safety and operations personnel because more persons are scheduled to be on the umbilical tower during spacecraft closeout than can be brought to the ground in one elevator trip.

COMMAND MODULE ENGINEERING MOCKUP

A meeting has been scheduled at KSC on March 13 to discuss and document the case for obtaining an engineering mockup of the Command Module to be used for astronauts, pad egress team, and recovery personnel training as well as development and validation of egress procedures.



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2032-LGM-gmp

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