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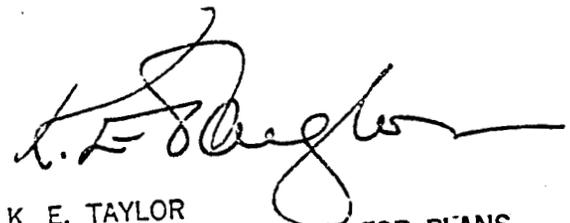
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THIRD ENDORSEMENT on NAMC, Phila, spdltr XG-4:EH:pao 7307 (4050) of
28 Aug 1962

From: Chief of Naval Personnel
To: Secretary of the Navy

Subj: Experimental studies of a medical nature involving persons in
the Naval Establishment

1. Forwarded, recommending approval.



K. E. TAYLOR
ACTING ASSISTANT CHIEF FOR PLANS

Copy to:
NASA Hdqtrs., Wash. D.C.
NASA (MSC), Houston, Tex.
NAVAIRMATCEN (ACEL), PHILA
Chief, BuWeps
Chief, BuMed

2 Sept 1962
Paul B. Stang
Secretary of the Navy

RETURNED TO ORIGINATOR FOR
REVISION THIS DATE 9-10
GCP

4
SERIAL:
3941

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BUMED-711:mkf
31 Aug 1962

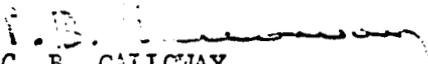
SECOND ENDORSEMENT on NAMC, Phil. spdltr XG-4:EH:pao 7307 (4050)
of 28 Aug 1962

From: Chief, Bureau of Medicine and Surgery
To: Secretary of the Navy
Via: Chief of Naval Personnel

Subj: Experimental studies of a medical nature involving persons in
the Naval Establishment

Ref: (a) MANMEDDEPT, Chapter I, Section II, Article 1-11,
"Experimentation of Personnel"

1. Forwarded, in accordance with reference (a), recommending approval.
2. The proposed study using human subjects will provide information not otherwise obtainable to validate specifications for the construction of manned space capsules. Test personnel will be subjected to increasingly high rates of negative G of very brief duration, until discomfort levels are reached. The conditions of the experiment will be changed gradually, and test personnel will at all times be under the careful observation of trained Medical Department personnel. No injury to test personnel is expected to occur.


C. B. GALLOWAY
Assistant Chief for Research and
Military Medical Specialties

Copy to:
NASA Hdqtrs., Wash. D.C.
NASA (MSC), Houston, Tex.
NAVAIRMATCEN (ACEL), PHILA
Chief, BuWeps

4 1485

NAVAL SPEEDLETTTER

13432

FIRST ENDORSEMENT on SecNav sndltr XG-L:EH:nao 7307 (4050) of 28 Aug 1962

From: Chief, Bureau of Naval Weapons
 To: Secretary of the Navy
 Department of the Navy
 Washington 25, D. C.
 Via: (1) Chief, Bureau of Medicine and Surgery
 (2) Chief of Naval Personnel

Subj: Experimental studies of a medical nature involving persons in the
 Naval Establishment

Forwarded, strongly recommending approval. A BuWeeps-BuMed-ACEL conference held 28 August evaluated the hazards and reviewed the procedures with the conclusion the work could and should be performed with no serious risk.

This data is necessary for future Navy systems involving negative g. If approved, this work will be performed as BuWeeps Problem Assignment No. 005-AEL3-16.



R. L. GIBSON
 Assistant Chief for Research,
 Development, Test and Evaluation

Copy to:
 NASA Hdqtrs., Wash. D. C.
 NASA (MSC), Houston, Tex.
 NAVAIRMATCEN (ACEL), PHILA

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CLASSIFICATION

UNCLASSIFIED - URGENT

IN REPLY REFER TO

MG-4:EH:pao
7807
(4050)

DATE

28 AUG 1962

TO: Secretary of the Navy
Department of the Navy
Washington 25, D. C.

LVia: (1) Chief, Bureau of Naval Weapons
(2) Chief, Bureau of Medicine and Surgery
(3) Chief of Naval Personnel

NAVAL SPEEDLETTER—

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May be sent (1) with enclosures, (2) in a window envelope (size 2 3/4" x 3 3/4"), if contents are not classified as confidential or higher, (3) to both naval and nonnaval activities.

Is packaged 500 sheets of white or of one color: yellow, pink, or green.

(Fold)

Subj: Experimental studies of a medical nature involving persons in the Naval Establishment

This communication is a follow-up to NMIC Special Delivery, Unclassified-URGENT Spdtr MG-4:EH:alc 7807 (4039) of 16 August 1962, which contained the same request as the present correspondence, but which is understood not to have been received by the Chief, Bureau of Naval Weapons.

Approval is requested to conduct the enclosed experimental study "Determination of the Effects of Impact, Negative Acceleration on Human Subjects" using volunteer personnel of the Naval Establishment as subjects. The enclosed study was formulated from the National Aeronautics and Space Administration (NASA) AFCLLO Impact Conference held on 8 August 1962 and will provide information urgently required by NASA for the AFCLLO program.

In view of the urgency expressed by NASA for the information to be obtained from this study, it is requested that approval be expedited.

Richard A. Smith
RICHARD A. SMITH
By direction

Encl: (1) Determination of the Effects of Impact, Negative Acceleration on Human Subjects

COPY TO

NASA Hdqtrs., Wash., D. C.
NASA (MSC), Houston, Tex.

ADDRESS: Commanding Officer
Naval Air Material Center
Philadelphia 12, Pennsylvania

← SENDER'S MAILING ADDRESS

Address reply as shown at left; or reply hereon and return in window envelope (size 2 3/4" x 3 3/4"), if not classified as confidential or higher.

CLASSIFICATION

Unclassified - URGENT

NAVY-NAVY, PHILA., PA.

7-1700

NAVAL AIR MATERIAL CENTER
AIR CREW EQUIPMENT LABORATORY
PHILADELPHIA 12, PA.

Enclosure to NAVAL SPEEDLETTER NG-4:EH:mck 7307 (4050) dated 27 Aug 1962

DETERMINATION OF THE EFFECTS OF IMPACT, NEGATIVE
ACCELERATION ON HUMAN SUBJECTS

Supine volunteer subjects dressed in coveralls shall be exposed to abrupt impact accelerations directed through the long axis of their bodies, from head to feet (negative acceleration). The Air Crew Equipment Laboratory (ACEEL) Horizontal Accelerator shall be used to apply controlled acceleration-time patterns to the subject supporting structure. The latter shall consist of a rigid couch to which the subject shall be attached by a composite restraint harness with tie-downs located around each thigh, around the pelvis, around the chest and over the shoulders. The back of the couch shall be tilted to form an angle of 5 degrees between the seat back and the horizontal surface of the accelerator sled, so that the head portion of the couch shall be raised with respect to the hip portion. The couch shall be constructed so that an open angle of 107 degrees shall be maintained between the subject's thighs and torso and between his thighs and lower legs. A sufficient number of acceleration exposures shall be made using an anthropomorphic dummy to assure the adequacy of the support and restraint system before any human exposures are undertaken.

Accelerations shall be measured on the rigid structure of the couch supporting the subject. Present data on the performance of the ACEEL Horizontal Accelerator indicates the following relationships:

<u>Acceleration Level (G)</u>	<u>Velocity Change (ft/sec)</u>	<u>Onset Rate (G/sec)</u>
2	7.1	270
3.5	10.0	600
4	10.7	800
5	11.8	1000
6	13.4	1250
7	14.5	1500
8	15.1	1800
9	17.4	2000
10	18.8	over 2000
15	25.6	over 2000
20	32.4	over 2000

It should be noted that the above data were obtained from measurements made on the Accelerator Sled; considerable attenuation of the rate of acceleration onset can be anticipated with regard to what the subject may experience.

In no case will any subject be exposed more often than once in 24 hours to any acceleration level. It is planned to expose each of five subjects in succession to the following G levels on the dates indicated:

<u>G Level</u>	<u>Date (1962)</u>
2	6 September
3.5	7 September
5.2	8 September

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G LevelDate 1962

6.5	10 September
8.5	12 September
10.0	14 September
11.5	17 September
13.0	19 September
15.0	21 September
16.5	24 September
18.0	27 September
20.0	2 October

The G levels selected are arbitrary and will be modified in accordance with findings, as required. It is planned to prepare a summary of the data and findings by 5 October 1962.

A review of the literature on impact negative acceleration effects on humans showed only a limited amount of data to be available. From these data, properly restrained subjects have been shown to tolerate, without untoward effects, acceleration patterns having the following characteristics: less than 10 G level, less than 100 G/sec onset rate, and less than 30 ft/sec velocity change. Reference is made to Air Force Pamphlet AFP 160-10-4 entitled "Physiology of Flight" of 1 January 1961 which indicates a tolerance level for downward ejection of 16 G at 200 G/sec, although the original source of this information is not given. Exposure of chimpanzees to impact transverse accelerations (both forward and rearward facing) indicates survival without injuries to patterns having 2 to 3 times the peak G and onset rates of those tolerated by humans. Chimpanzees tolerated impact negative acceleration patterns of 28 to 51 peak G, 700 to 1000 G/sec onset rates and durations of 0.13 to 0.20 sec. Applying the same factor of 2 to 3 to peak G and onset rate, it would appear that the tolerance limits for humans described above are validated by comparable animal experiments. No systematic investigations have been reported with respect to negative impact accelerations applied to living organisms which would indicate the combined effect of various combinations of onset rates, G levels and velocity changes.

Exposure of subjects using the method and equipment described above shall be done with the utmost care and caution. An attending flight surgeon shall personally monitor the condition of the subjects throughout the study, and shall determine when and if a given subject shall be exposed at any particular time to impact acceleration. The full diagnostic and clinical facilities of the Philadelphia Naval Hospital are available and shall be utilized as deemed necessary. Sufficient information shall be obtained prior to the study on the normal physical condition of the subjects (including X-rays of the spine and skull, and electroencephalograms) so that changes which may occur can be detected before they lead to serious or irreversible sequelae. In no case will a subject be exposed to the test conditions when he is unwilling or expresses appreciable discomfort. Continuous electrocardiograms, before, during and after each exposure, shall be obtained, and such other procedures shall be followed to gain information regarding the subject's condition as are considered appropriate by the attending flight surgeon. Approach to more severe exposure conditions will be made cautiously, with close medical monitoring and repeated assessments of the safety and well-being of the subjects. Procedures outlined in Article 1-11, Manual of the Medical Department, 1962, shall be fully complied with.