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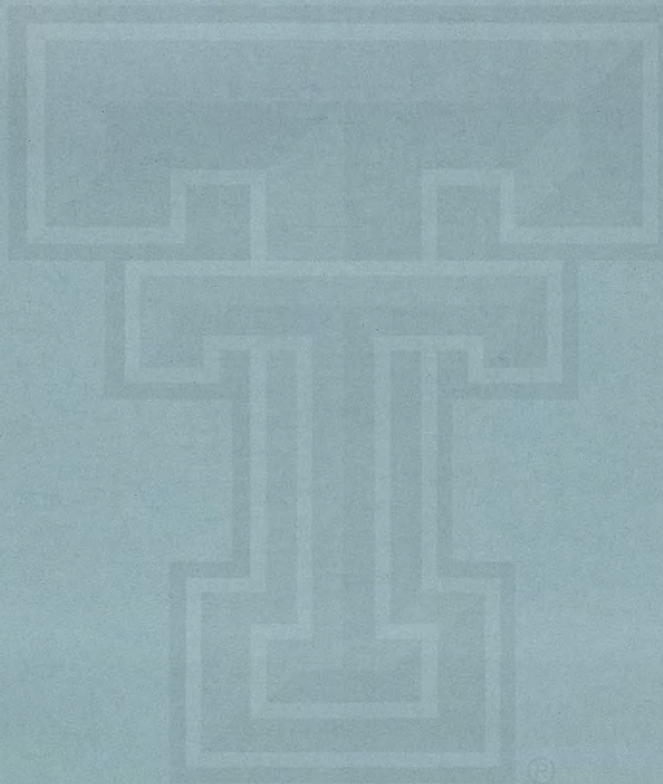
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1.1.1 Directive



9M 1.1.1 Mission Directive

1.1.1.0.0.0.0

3/18/63 Mission directive just received by OAM, MSC. Contains medical objectives.

1.1.2 Objectives



®

9M 1.1.2 Objectives

1.1.2.0.0.0.0

3/18/63 MA-9 objectives complete. They are included in mission plan and mission directive.

G 1.1.2 Mission Objectives

4/14/63 Total (non-medical) objectives are:

1. To check out prolonged exposure (two weeks) to space flight
2. Rendezvous technique and docking
3. Maneuvering after docking
4. Point landings on land (later)
5. May try recovery of spacecraft and re-use afterward
6. A vehicle for additional medical experiments

1.1.3 Flight Plan



®

9M 1.1.3 Flight Plan

1.1.3.0.0.0.0

3/18/63 MA-9 final flight plan complete. Three copies received by Medical Operations
3/11/63. We are on the mailing list.

G 1.1.3 Flight Plan

4/14/63

The time of first flight depends on the configuration to be used. If it is decided to deploy just the instrumented shell without systems, then this will be done on December 1, 1963, according to present plans. If a complete spacecraft is to be launched, it will be some time in April 1964.

The second shot will be a complete spacecraft, but unmanned.

The third shot will be manned, but when it occurs will depend upon previous successes. Its duration will be anywhere from three orbits to three days. It is presently more or less planned for July, 1964. Following this will be a three day flight, a rendezvous and docking flight calling for at least a three day life support system in the capsule.

Configuration of the capsule

Gemini has 50% more volume than Mercury. Generally, its systems are contained in the adapter outside the capsule. The systems are in packages which are completely replaceable. It has ejection seats which will be inclined ten degrees, for achievement of adequate seat altitude in event of ejection off the pad.

G 1.1.3 Flight Plan (continued)

4/14/63

We have 13 capsules and 15 boosters. We also have six test capsules. Adapter is composed of magnesium.

Retros fire in ripple normally--in salvo if emergency

Cannister holds reentry control system.

Center of gravity is offset to product a higher reentry attitude.

All attitude control fuels are stowed in the adapter. Attitude control is accomplished by eight 25 pound engines.

Engines allow not only attitude control but also threedimensional linear control (side to side, up and down, fore and aft).

Attitude control system fuel is monomethyl hydrazine with nitrogen tetroxide (N_2O_4) as oxidizer.

Agena will hold its proper orbital attitude for five days during which Gemini must be launched. If this is not done, orbital correction must be calculated. Gemini will be able to restart in orbit ten times.

Agena will be launched into a 160 mile circular orbit.

Gemini capsule will be launched into an 87 by 160 mile elliptical orbit.

G 1.1.3 Flight Plan (continued)

4/14/63

Gemini spacecraft will carry a computer very similar to the 707 digital.

It will take only one pound of oxygen to repressurize the cabin after decompression.

Agena is capable of reaching a 2,000 mile orbit.

Dimensions of adapter are 120 inches by 90 inches.

Landing

Will be by paraglider. Problems which have occurred in testing have been almost all on the basis of human error. (Chuck Berry)

At 60,000 feet a small chute will be deployed from the cannister.

At 50,000 feet a paraglider will begin inflation. With paraglider inflated the range of the capsule will be an area of approximately a 25 miles radius.

It should be possible for the spacecraft to be landed on a runway.

Paraglider control is obtained by a shortening and lengthening shroud line which will also provide the ability to bank and turn. (Half size models have been flown in 360 degree turns.) Some degree of dive and climb also possible by manipulation of shroud lines.

G 1.1.3 Flight Plan (continued)

4/14/63

The estimated impact velocity is 2 to 3 feet per second.

Cable reels work by air motors.

Three skids will be deployed prior to landing.

Spacecraft should be able to land on water as well as on land.

First Gemini flights will carry a backup chute which will be a ring chute of 84 feet diameter. This will be attached to a bridle extending the length of the capsule, from which the capsule will be suspended. The bridle is intended to eliminate the need for a landing bag.

After the first 8 or 10 flights, the paraglider will be used.

For the chute landings (first 8 or 10) recovery gear will be similar to that used on Mercury.

A 1.1.3 Flight Plan

4/14/63

General Comments

Three men, two weeks, shirt sleeve environment with either free movement or restrained, multiple missions, flexible schedule, crew control, reentry velocity of 36,000 feet per second, controlled flight path, Saturn 5 or Nova booster.

Four primary missions planned

1. Earth orbital
2. Circum-lunar
3. Lunar orbit
4. Lunar landing (primary earth landing area will be Texas, secondary will be Australia)

General Apollo information

Spacecraft will consist of manned module, service module, and adapter with total weight of 95,000 pounds.

Command module will weigh 8500 pounds.

Service module will contain gases, fuels, supplies, systems, etc.

Adapter will house the LEM.

A 1.1.3 Flight Plan (continued)

4/14/63

Spacecraft weight of 95,000 pounds will require a thrust of 290,000 pounds from Earth.

The total pressurized volume of the spacecraft will be 365 cubic feet with 220 cubic feet of free space.

Couches and movable equipment will occupy 30 cubic feet and fixed equipment 115 cubic feet.

The energy required to lift off the lunar surface is calculated to be $(\frac{1}{6})^2$ that of Earth.

LEM will weigh 25,000 pounds.

Navigation will be optical together with the computer which will be carried on board. The sextant used will be capable of obtaining three simultaneous fixes, Star, Spacecraft, and Land or Moon. Checks of this system have shown that an accuracy within two seconds of arc (in feet rather than miles) can be obtained. This means that a man can navigate in lunar orbit with a very high degree of accuracy.

Reentry

Reentry corridor must be just right. If too shallow the spacecraft will "skip out" and head back toward the Moon. If it is too steep too many G's will be

A 1.1.3 Flight Plan (continued)

4/14/63

encountered in reentry. If 90° spacecraft will have to take 300 G's. The design of the vehicle calls for a maximum G limit of 20 G.

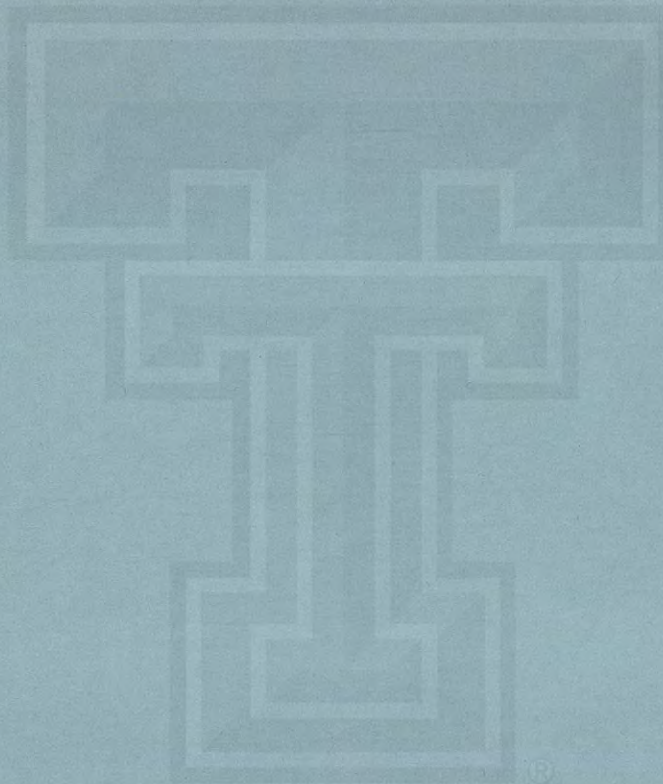
Reentry is planned for 400,000 feet.

Astronauts will be able to maneuver spacecraft to a range of 5,000 miles with a width of 1500 miles---called the maneuvering footprint. This is done by means of an offset center of gravity providing a surf board effect of the flat bottom of the vehicle. The astronaut aims the center of gravity, i.e. if up, he goes further; if down, he travels a shorter distance; if right, he goes right; if left, he goes left.

There will be no earth orbit before reentry and no retro rockets. He will reenter at 9° from the horizon (vehicle will be at 7° and seat back will be at 2° from line of vehicle, making a total of 9°).

Strakes (small wings) will be on the capsule for reentry attitude control. These will burn off on reentry, but they are provided in case the capsule attitude is wrong on reentry. They will have the effect of flipping the capsule over.

1.1.4 Rules

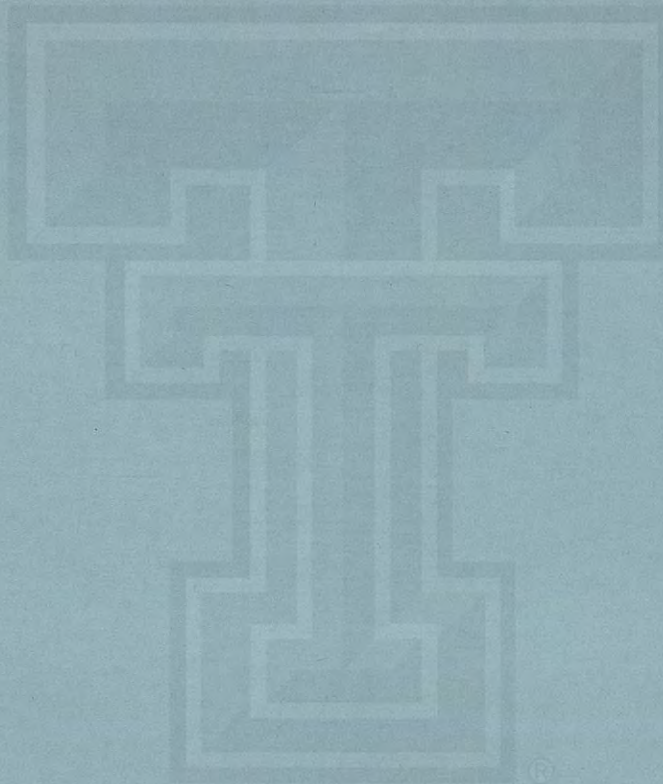


9M 1.1.4 Rules

1.1.4.0.0.0.0

3/18/63 Semi-final rules complete and in possession of OAM. Classified as Center Confidential. Final rules may not be fixed until night before the flight.

1.1.5 Contingencies



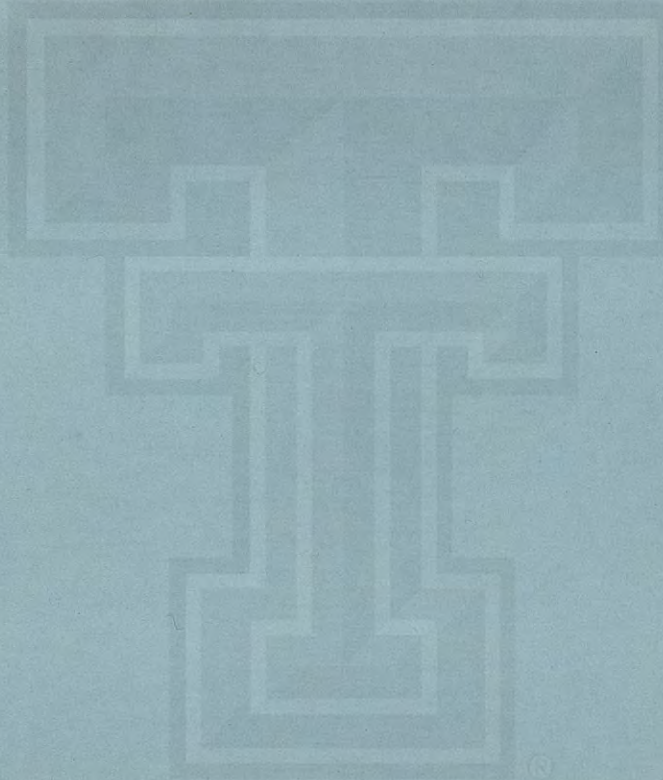
9M 1.1.5 Contingencies

1.1.5.0.0.0.0

3/18/63 Not list except as pertains to recovery. This is included in the recovery document. The final recovery document should be completed in April. OAM requirements are complete and have been discussed with Col. Yerg.

4/14/63 As of this date the final recovery document is still not complete. OAM has received a recovery document from Col. Yerg but is not in full agreement with it. A reply is in process of being written and will be forwarded back to Colonel Yerg so that a satisfactory document can be written by DOD. One point of contingency is the presence of an orthopedist at forward med area. OAM feels this is unnecessary after consultation with Dr. Michael De Bake of Baylor and several other prominent surgeons and orthopedists. Col. Yerg has agreed not to place an orthopedist at the Cape but will supply one at Patrick on his own. Point of contention is that Yerg feels that NASA should provide surgical equipment for this orthopedist whereas NASA feels that since this is a DOD preference and prerogative DOD should also supply his equipment. Certainly agree with OAM on this one.

1.2.1.1 Diet



9M 1.2.1.1 Diet

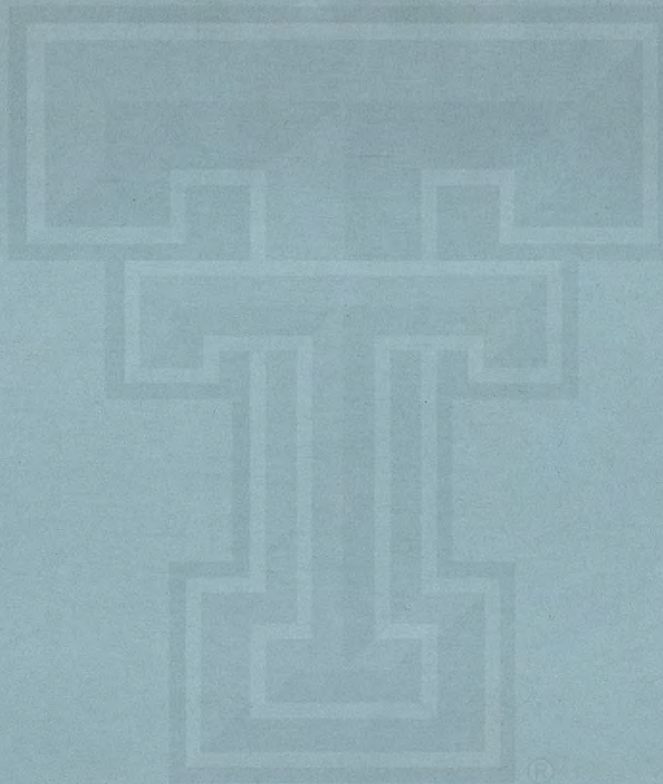
1.2.1.1.0.0.0

3/18/63 Low residue diet three days before flight. Menus are now complete--by Nance in CSD--using Bea Finkelstein's old menus.

Meals will be prepared by mess sargent at Patrick. Dining facility is NASA house trailer where he prepares the food which he buys at the Patrick commissary with NASA funds.

Before the three day period the astronaut eats anywhere.

1.2.1.2 Phys. Fit.



9M 1.2.1.2 Physical Fitness

1.2.1.2.0.0.0

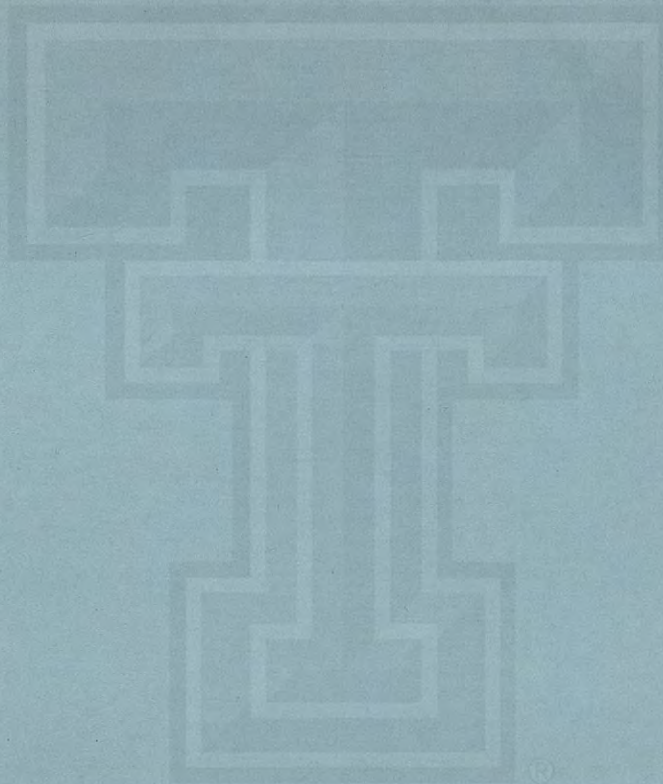
3/18/63 No formal program. There is some supervision over rest periods. OAM has veto over astronaut's activities (meetings etc.) if considered excessive or dangerous.

OAM encourages some physical exercise program of astronaut's choice, daily.

OAM has limited activities in the past, i.e. Schirra's water skiing curtailed, considered dangerous by Williams.

There is no physical therapist on the premises.

1.2.1.3 Med. Equip.



9M 1.2.1.3 Flight medical equipment

1.2.1.3.0.0.0

3/18/63 No single plan. McDonnell plus operations engineers under G. Merritt Preston maintains spacecraft and all contents until launch.

Food is under direct control of Dave Morris (refrigeration, etc.)

Water was provided by Tech Services personnel under Preston. Distilled water maintained in survival equipment trailer. Two samples of water were taken the night before the flight to Patrick Lab for bacterial count. This is also done 24 hours before flight. They are now changing this, setting standards by OAM. We don't know now who is responsible and how it will be done.

*** Suits are maintained by CSD suit technicians. OAM feels this should be changed. Maintenance is at suit room in HANGAR S. A log is kept of the number of hours each suit has been inflated and how many times it has been put on and taken off. Suits in the past have been checked so often they were just about worn out at the time of flight.

*** Survival kit--CSD is in charge but Whittaker acts autonomously in maintenance This is a point of discussion by OAM.

Medical kit-- Dave Morris is in charge of maintenance. There are two kits, one in the suit and one in the survival pack. Morris is in charge of maintenance of both.

1.2.1.4 Sim., Train.



9M 1.2.1.4 Simulations and training exercises

1.2.1.4.0.0.0

3/18/63 MA-9. Refresher at the end of March at Johnsville for Cooper and Shepard. Flight operations engineers will accompany. Minners will monitor voice, ECG, Respiration Blood pressure. They will fly the Atlas profile.

This will probably not be considered baseline data.

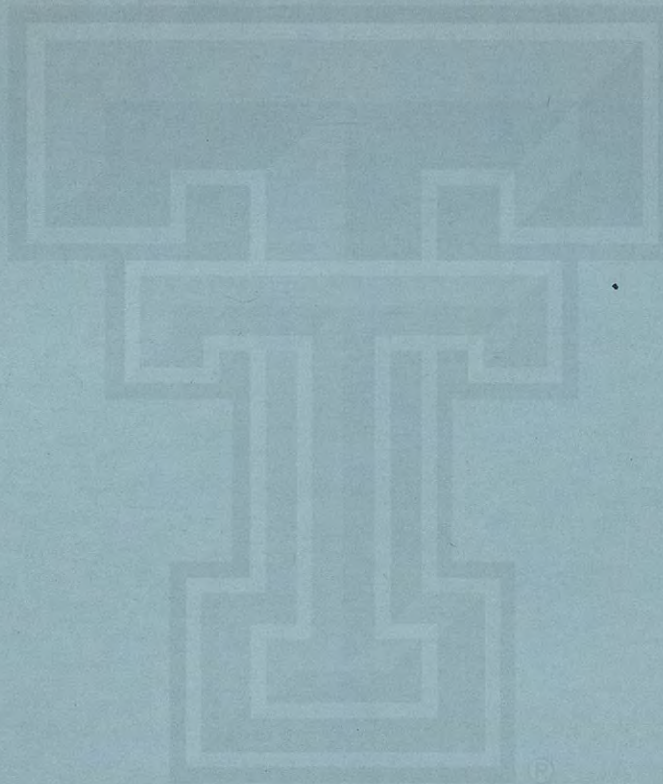
Preflight chamber runs at the Cape.

SEDR 77 is primarily an ECS checkout. Due to start two days ago, will go tomorrow or next day. Monitoring in full harness when suited. Astronauts will only be suited part of the time (lasts three to four days). Also includes baseline data, tilt table and Flack tests.

SEDR 83 is primarily a capsule checkout. Done one month ago, unmanned.

Pilots take turns in each SEDR. This is also true of launch abort simulations in spacecraft at Cape.

1.2.1.5 Med. Brief.



9M 1.2.1.5 Medical briefing

1.2.1.5.0.0.0

3/18/63 MA-9. There is no formal briefing. It is done during conferences--go over flight plan with astronauts--brief on data requirements. The astronaut knows the flight plan best. Compromises are made by OAM.

Any one of the three--Catterson, Pollard or Berry--do the briefing.

Some briefing is done during the physical examinations in the form of questions and answers.

1.2.1.6 Med. Exam.



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9M 1.2.1.6 Medical examinations

1.2.1.6.0.0.0

3/18/63 MA-9. (Patterns are set but no plan is written down for all of these examinations)

Preflight medical examinations

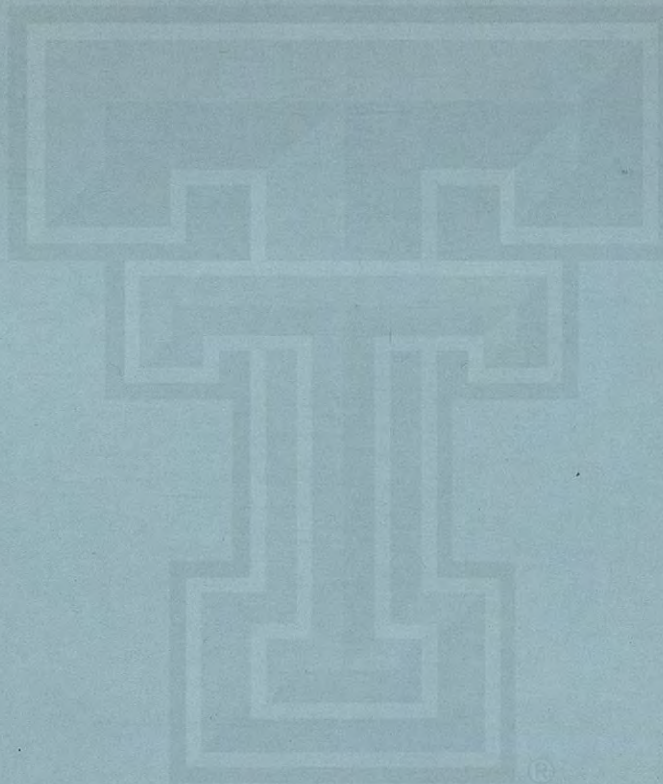
10 day--General cursory examination, auscultation, inspection, percussion, palpation, General state of mind okay. Examination is done by the flight surgeon. Walt Williams wants a report at this time.

3 day--very cursory. Telemetry baseline data obtained at simulated launch by flight surgeon

2 day--very thorough physical (Caloric and Rail tests not done last time and will not be done this time.) This examination is done at Patrick by a team of specialists.

Flight morning examination--fairly cursory, state of health check, general physical, done by astronauts flight surgeon.

1.2.1.7 Preflt. Fac.

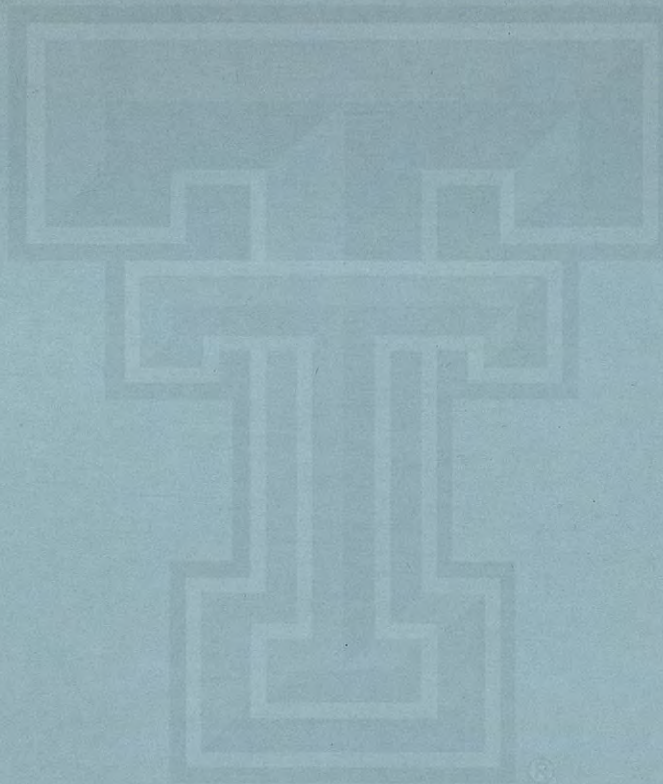


9M 1.2.1.7 Preflight facilities

1.2.1.7.0.0.0

3/18/63 Includes all those already mentioned. No dietician present at LOC. No physical therapist employed. Same equipment and transfer van will be used for MA-9 as on MA-8. Dining facility consists of trailer behind Hangar S. Apartments are in Hangar S. There is no gymnasium.

1.2.1.8 Fin. Flt. Prep.



9M 1.2.1.8 Final flight preparation

1.2.1.8.0.0.0

3/18/63 There is a written flow plan which is a checklist for the medical countdown. Minners has a dry run rehearsal one week before flight. Flow plan will be drawn up when the Operations group gets down to the Cape.

4/14/63 Flow plan document is called the Aeromed Countdown. This is now printed up and copy has been obtained.

1.2.2.1.1 Atmosphere



9M 1.2.2.1.1 Atmosphere

4/14/63 Mercury atmosphere of 100% O₂ at 5.4 psi (actually ECS provides 5.1 psi) was selected very early in the Mercury program. OAM is not entirely satisfied with selection of this atmosphere but chiefly because of lack of satisfactory experimental information. Chief worry is fire, also worried about atelectasis; not very worried about oxygen toxicity except in terms of oxygen as a pulmonary irritant which could cause pulmonary edema. Office of Flight Safety and Reliability has worked out emergency fire procedure which is included in the flight rules, namely, immediate decompression (takes 5-6 seconds)

OAM finds atmospheric validation satisfactory except for carbon dioxide partial pressure sensors. However, they feel this is probably simply the state of the art. Our carbon dioxide sensor which will be flown in MA-9 has failed many times in validation tests.

Maintenance of this atmosphere equipment not entirely satisfactory in that with involvement of McDonnell, G. Merritt Preston, and CSD, problems are extremely difficult to trace down. Responsibility too diverse. * * *

MA-9 equipment: gaseous oxygen carried in three round tanks, slightly smaller than volleyball in size, each carrying four pounds of oxygen at 7500 psi. This amount should be adequate for about 51 hours of flight. (25 hours/4 HO₂ at normal flow rate and 1 hour/4 HO₂ at emergency flow rate used routinely during insertion and reentry) Cabin leak rate is 600 cc's per minute at ground level.

9M-1.2.2.1.1 Atmosphere (continued)

4/14/63

For carbon dioxide removal, MA-9 will carry four cannisters of lithium hydroxide totaling 5.4 pounds all contained in one container, stowed deep in life support system equipment (under astronaut's legs). (Three hours would be required to get at LiOH cannister in event of problem). 5.4 pounds of LiOH is good for 43 hours. When astronaut on pad before launch he will use small LiOH cannisters in suit outlet, each good for six hours. At launch he will switch to 5.4 pounds LiOH cannister.

For deodorizing, 0.2 lbs charcoal cannister inserted in life support system.

Freon is used as coolant for suit before launch. After launch, water will be used as coolant, since water evaporation at altitude makes excellent coolant, but poor on ground level.

See General--Flight Controller Handbook, SEDR 104, Descriptive Synopsis of Project Mercury

G 1.2.2.1.1 Atmosphere

4/14/63

Gemini will use 100% oxygen at 5.1 psi. It will store the oxygen in a super critical cryogenic liquid state--a total of 10^4 pounds. The secondary oxygen system will consist of a dual gaseous supply of 7 pounds each which will be used for reentry. Water will be removed by wick absorption at the heat exchanger. The ECS system will be carried outside the spacecraft in the adapter section.

Gemini ECS criteria:

1. Oxygen consumption 2 pounds per man per day
2. CO_2 production 2.5 pounds per man per day
3. Heat production 500 BTU per man per hour
4. Nominal cabin pressure of 5.1 psi

A 1.2.2.1.1 Atmosphere

4/14/63 It appears at the present time that Apollo will also go with 100% oxygen at 5.4 psi. However, this is not firm.

Apollo atmosphere to be provided is as follows:

Oxygen (shirtsleeves)--100% at 5.1 psi

Oxygen (suit)--100% at 3.5 psi

CO₂ partial pressure--7.6 mm of Mercury

Temperature in degrees fahrenheit--75 plus or minus 5

Relative humidity (percent)--40%

General aims of Apollo ECS

1. Provide conditioned oxygen atmosphere for crew
 - a. Shirt sleeve in cabin
 - b. Pressure suit mode
2. Provide regulated pressure for cabin and suit
 - a. Special requirement for meteoroid puncture
3. Provide thermal control of spacecraft equipment
4. Provide means of charging back pack
5. Provide atmospheric monitoring.

A 1.2.2.1.1 Atmosphere (continued)

4/14/63

ECS Subsystems

1. Pressure suit circuit
2. Water--glycol circuit (temperature control)
3. Command module pressure and temperature control
4. Oxygen supply
5. Water supply
6. Inflight instrumentation for monitoring systems.

Pressure circuit removes water vapor, odors, trace contaminants and CO_2 (at the rate of 2 to 3 pounds per man per day)

Lithium hydroxide will be used to remove CO_2

Trace contaminants and odors will be removed by activated charcoal and not by catalytic burner.

A gas analyzer will be available for selected flights--(R & D at present).

Water-glycol circuit absorbs heat generated by spacecraft equipment and transfers the excess heat to the space radiator.

A supplemental radiator called a Keflic will also be included for heat rejection.

A 1.2.2.1.1 Atmosphere (continued)

4/14/63

Arguments concerning atmosphere selection:

1. Disadvantage of mixed atmosphere
 - a. Complexity
 - b. Decompression hazard
 1. Safety
 2. Operational restraints
2. Disadvantages of pure oxygen
 - a. Fire hazards
 - b. Possible atelectasis
3. Conclusions
 - a. Decompression problems have been experimentally demonstrated
 - b. Atelectasis was not experimentally demonstrated. However, this issue is not yet closed.

Nitrogen can still be batched in if needed. It has been found that the nitrogen level holds in the capsule pretty well because of its inertness. An adequate nitrogen level can be maintained by the astronaut by opening a new pressure bottle of nitrogen no more than every eight or ten hours.

1.2.2.1.2 Food



9M 1.2.2.1.2 Food

4/14/63 MA-9 food will be of two types, bite sized and freeze dried. Both are supplied by the Army Quartermaster Corps, believe Whirlpool has the contract. OAM approves of selection and validation of foods. Meal times are established and are in the flight plan, by OAM. Both types of food were received at the Cape about one week ago in an amount two and a half times that which will be flown. A total of 2376 calories of food will be flown on MA-9.

The food is being maintained by Dave Morris to whose office it was delivered. The bite sized food is kept refrigerated, but the freeze dried food is kept in a locked cupboard since it needs no refrigeration. No bacteriological studies will be done at the Cape, but food samples are kept for analysis in the event the astronaut becomes ill or any question of the purity of the food arises. Food maintenance is satisfactory as far as OAM is concerned.

The food is placed aboard the spacecraft just before launch. This is programmed in the countdown.

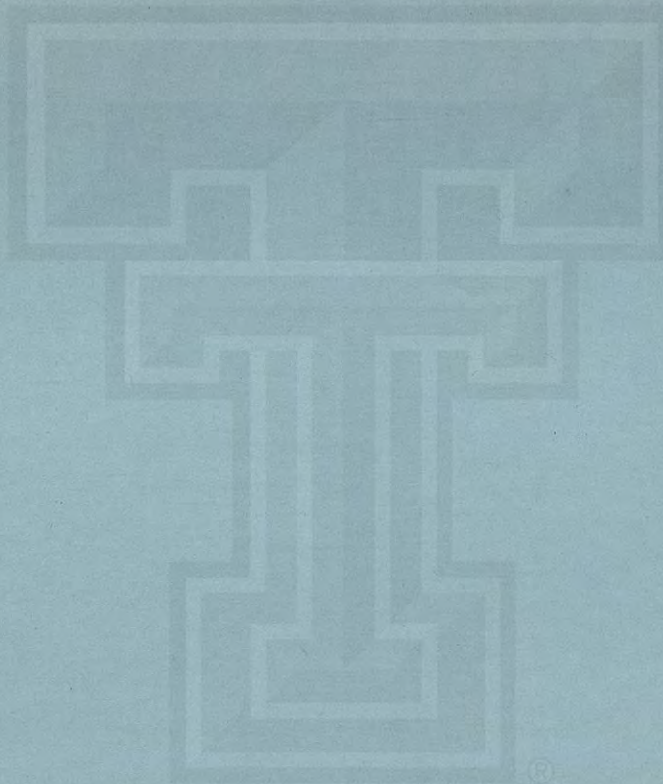
Aboard the spacecraft, the bite sized food will be kept in a drawer in the little folding desk. The freeze dried food will be kept in the astronaut's ditty bag.

A 1.2.2.1.2 Food

4/14/63

Apollo food will be the freeze dried variety which will be stored at room temperature. Meals can be prepared in either hot or cold and will consist of a variety of flavors and textures similar to normal Earth types.

1.2.2.1.3.1 Fluid in.



®

9M 1.2.2.1.3.1 Water balance, fluid intake

4/14/63 Have used distilled water in the past. Ten days ago the project office got out a twx indicating the new standards for water which were the result of recommendations from OAM.

1. The water must be deionized (run through an electrostatic precipitator
2. It must be filtered through a molecular sieve (filters out bacteria as well as foreign matter). The water will be prepared no earlier than 48 hours before the flight (where water processed is unknown by OAM at present). Once the water is processed it will be kept by Whittaker (the survival man at the Cape) sealed in three gallon jugs under "aseptic" conditions. It is not refrigerated.

Cultures of the water will be taken 24 hours before flight and also on the morning of the flight. The bacteriology will be done at Patrick.

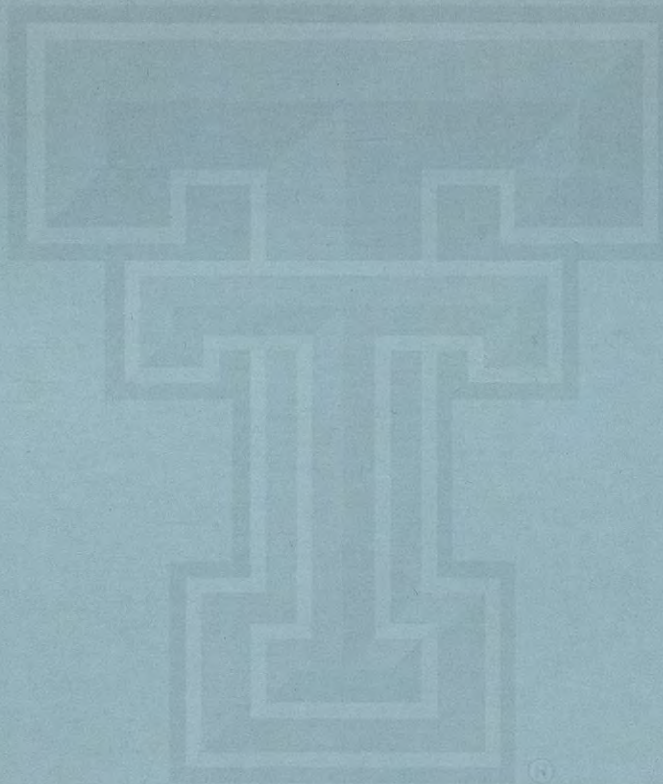
The water will be installed into the spacecraft just before flight; this is included in the pre-countdown, as is the installation of food. The total quantity of drinking water carried on the spacecraft will be about 10 pounds. There will be a six pound bag near the astronaut's head and a four pound bag carried in his survival gear, but this is subject to almost constant revision.

A 1.2.2.1.3.1 Water balance, fluid intake

4/14/63

Water will be carried in the fuel cell and will be produced by it so that the initial amount of water provided and the amount remaining post landing should be the same. (Not certain this is absolutely correct) * * *

1.2.2.1.3.2 Fluid out.



9M 1.2.2.1.3.2 Fluid output

4/14/63 The urine equipment consists of the urine collecting device (UCD), the syringe (same as exchange transfusion syringe--originally developed from a veterinary cat feeder) for the emptying of the UCD by the astronaut and the urine bags into which the urine will be pumped from the urine collecting device. The validation of everything but the syringe is considered satisfactory by OAM. The astronauts have not demonstrated to the satisfaction of OAM that they handle the syringe satisfactorily. (During SEDR 83 using water instead of urine one of the astronauts sprayed the whole cabin inadvertently while attempting to use the syringe. The astronauts were highly amused but OAM views more soberly).

The very latest decision (as of a few days ago) on the urine bags is that there will be four carried. One will be a six pound bag for use while the astronaut is on the pad. The remaining three will be two pounds bags, each of which will hold a single voiding. All four bags will be stowed under the couch. After the flight, the urine still in the bags will be frozen and shipped to CSD for measurement and analysis. It has already been determined that freezing exerts no adverse effects on bioassays.

A 1.2.2.1.3.2 Water balance, fluid output

4/14/63

Urine will not be recycled. Will probably be dumped into space according to present plans.

1.2.2.1.4 Waste



9M 1.2.2.1.4 Waste

4/14/63 There will be no waste on MA-9. Astronaut will be fed a low residue diet for three days prior to the mission and therefore no defecation problem is anticipated. However, there will be a diaper-like crotch pad worn inside the underwear in the event that it may be needed.

A 1.2.2.1.4 Waste

4/14/63

Sanitation considerations include the following:

1. Human waste
 - a. Solid and liquid
 - b. Will be stored on board
 - c. Urine will not be recycled, will probably be dumped into space.
2. Perianal hygiene
3. Non-human waste
4. Control of infectious organisms.

1.2.2.1.5 Suits



9M 1.2.2.1.5 Suits

4/14/63 The suit configuration consists of the following changes over MA-8.

1. Gemini shoulder
2. Integrated boot
3. Mechanical face plate seal
4. Improved suit outlet known as the pig-tail which comes off the right side of the helmet
5. Oral temperature thermistor attached by velcro patch to right ear muff.
6. Water tight oxygen inlet valve on left lower chest.
7. Medical injection cartridges worn on inside of right lower thigh
8. Double cuff seal at wrist.

Additional information about suit: bioinstrumentation plug on anterior right thigh; urine receptical diaphragm opening on anterior left thigh; rams horn life preserver in pocket over anterior left tibia; medical kit (tablets) in pocket over right tibia; "plantronics" microphones.

There will be no windshield wipers. These made windshield fog worse by spreading film of oily residue from suit humidity, probably consisting of oil from astronaut's skin.

Suits now tested and are flight ready. There are two suits per man on the Cape at the present time. Joe Schmidt will go down to the Cape to be on hand prior to the mission. Suit maintenance accomplished by Al Rochford and is satisfactory as far as OAM is concerned except for the fact that OAM feels that Al Rochford should be on their staff.

G 1.2.2.1.5 Suits

4/14/63

Suit pressure will be 3.5 psi, 3 inches of water below cabin normal. Suit ventilation rate will be 10 cubic feet per minute. The two suits will be connected in parallel in a single closed loop circulatory system.

Extravehicular suit and equipment will contain communications and life support equipment (ECS). The man will be attached to the vehicle by means of a 15 foot lanyard. The limiting factor in extravehicular activity will be heat protection. The present limit is 25 minutes as now planned but this can be increased to 95 minutes in an emergency.

A 1.2.2.1.5 Suits

4/14/63

Apollo space suits will be provided by Goodrich. They will not be worn during normal space flight.

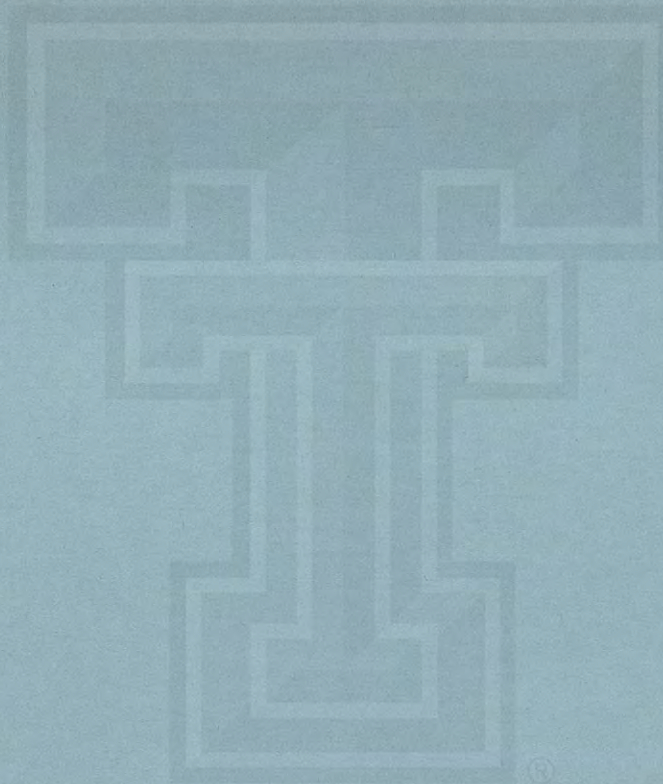
The same suit will be used for emergency decompression as for extravehicular operations.

Space suit assembly will consist of following:

1. Pressure garment assembly
2. Constant wear garment or undergarment
3. Coverall or overgarment
4. Portable life support system.

Emergency suit operation will not govern systems design and will not benefit the reliability/safety calculations.

1.2.2.1.6 Gen. hygiene



®

9M 1.2.2.1.6 General hygiene

4/14/63 There is no provision on MA-9 for dental, beard, skin, skin bacteria, nails, or hair care aboard MA-9. Plans for MA-10 are unknown at the present time.

1.2.2.1.7 Sys. Check.



9M 1.2.2.1.7 Systems and equipment checkout

4/14/63 This is done in two SEDR's at the Cape, i.e. final checkouts. SEDR 83 is an altitude chamber run and SEDR 77 consists of a simulated flight in the white room at the Hangar S. SEDR 83 is primarily an ECS checkout and it lasts for about three or four days. During this SEDR the astronauts are suited part of the time. Tilt table and flack tests are done during SEDR 83 and baseline data is accumulated. Both SEDR 83 and SEDR 77 have been completed satisfactorily for MA-9.

1.2.2.1.8 Needs Flt.Cr.



9M 1.2.2.1.8 Functional needs of flight crew

4/14/63 For MA-9 rest time has been scheduled for the period from the ninth to the fifteenth orbits during which the astronaut will sleep. Provision has been made for cooperation from the ground crew to allow him to sleep undisturbed. There are no recreational provisions specifically programmed other than taking picture if he wishes or doing whatever he desires to do during his rest time.

1.2.2.1.9 Life Sup.



G 1.2.2.1.9 Mission specific life support

4/14/63

Extra vehicular suit and equipment will contain communications and life support equipment (ECS). The man will be attached to the vehicle by means of a 15 foot lanyard. The limiting factor in extravehicular activity will be heat protection. The present limit is 25 minutes as now planned but this can be increased to 95 minutes in an emergency.

A 1.2.2.1.9 Mission specific flight support

4/14/63

There will be no command receivers on Apollo, all command being accomplished on board. Factors to be considered in on-board command are flight crew selection, crew participation, crew mobility, automatic systems, and abort initiation--all manual.

1.2.2.2.1.1 Res. Esc.



®

9M 1.2.2.2.1.1 Restraints and escape

4/14/63 Couch will be the old couch without the leg troughs. Instead there will be foot plates which cup the heels, and a bar which comes under the legs just inferior to the popliteal space but which does not touch the legs unless abnormal circumstances prevail. The net couch will not be used in MA-9. The restraint harness will be the same as that worn by Schirra in MA-8. The thigh straps worn on the Glenn flight will not be worn on MA-9.

Aluminum honeycomb will be same as MA-8.
Escape tower same as MA-8.

G 1.2.2.2.1.1 Restraints and escape

4/14/63

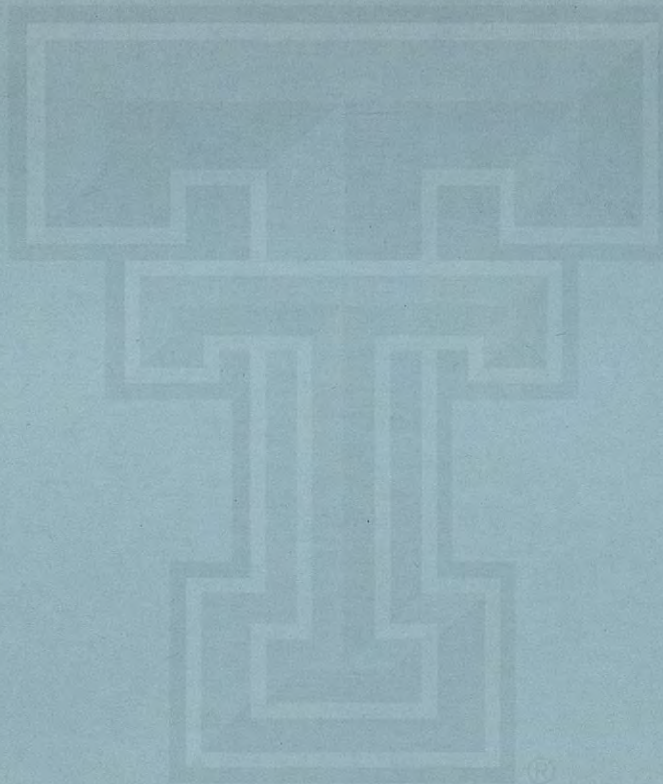
The following escape provisions are made:

1. 0 to 70,000 feet--rocket powered ejection seats which will fire simultaneously.
2. 70,000 to 529,000 feet retro fire
3. Above 529,000 feet--the capsule maneuvering system

The ejections seats are canted to 10 degrees and will eject the astronauts to an altitude of 750 feet off the pad. The escape rocket fuel is monomethyl hydrazine. Ejection seats were chosen over the escape tower in an effort to save weight. Tower weights 1,000 pounds. The ejection seats G levels will reach only half of the military escape seats.

Between 70,000 and 529,000 feet abort will be accomplished by retrofire. This will occur in ripple under normal circumstances but can be fired in salvo in emergency.

1.2.2.2.1.2 Ace1.Wt.



9M 1.2.2.2.1.2 Acceleration and weightlessness

4/14/63 The cardiovascular experiment to be done in flight is the only new consideration in this realm. For details, see under inflight medical experiments.

A 1.2.2.2.1.2 Acceleration and weightlessness

4/14/63

The approximate acceleration peaks anticipated for Apollo are as follows:

Launch--several peaks of 6 G

Abort

Pad--15 G short duration

Max Q--Plus 10 G - Minus 10 G (short term)

High altitude--15 G (short term) 20 G (long reentry)

Space Flight--less than 2 G

Lunar operations--less than 2 G

Reentry--less than 10 G (normal) up to 20 G (emergency limit)

Landing--variety of impact accelerations

Rendezvous of LEM with spacecraft

Command Module--1 G

LEM--3 to 4 G

A 1.2.2.2.1.2 Acceleration and weightlessness (continued)

4/14/63

Impact tolerance limits with which working at present time

20 G Normal	)	Eyeballs In.
40 G Emergency	)	

10-15 G---Eyeballs Up	)	Normal
20 G---Eyeballs Down	)	
10G---Eyeballs Lateral	)	
15 G---Eyeballs Out	)	

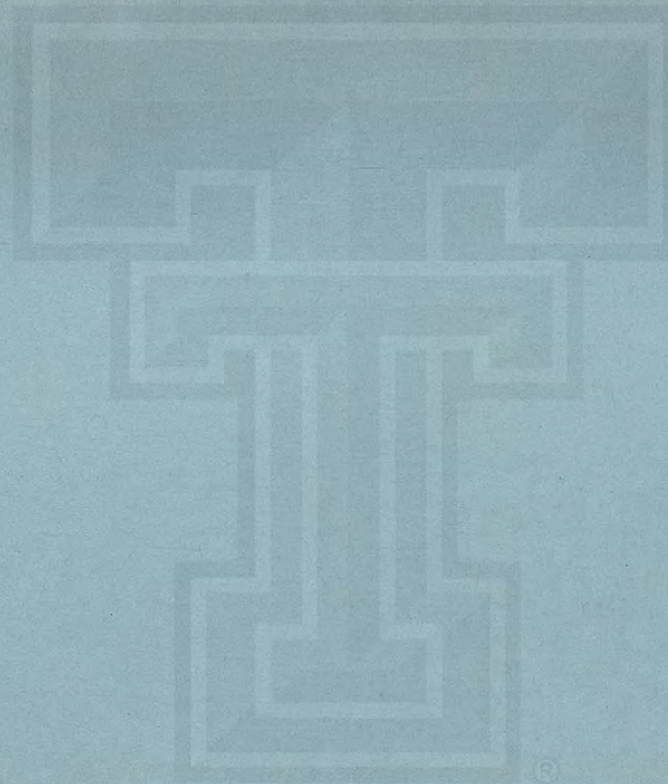
1.2.2.2.1.3 Vibration



9M 1.2.2.2.1.3 Vibration

4/14/63 No new provision or expectation since Ma-8.

1.2.2.2.1.4 Noise



9M 1.2.2.2.1.4 Noise

4/14/63 No new considerations since MA-8.

1.2.2.2.2 Radiation



9M 1.2.2.2.2 Radiation

4/14/63 No new problem over MA-8. No radiation effect is expected. However, new measurements will be taken consisting of:

1. Geiger Muller counter in retropack; results to be recorded on tape.
2. Ion chamber counter placed inside of hatch. Measurements to be taken periodically by astronaut
3. Four film badges to be worn by astronauts inside his suit, three worn in underwear (right leg, and right and left chest) and one inside of helmet in the liner.

A 1.2.2.2.2 Radiation

4/14/63

Environment consists of trapped radiation (Van Allen belts) solar flares, and cosmic rays. Apollo project office now thinks that the spacecraft will protect adequately against even the biggest solar flare known. They also estimate that less than 10% of the radiation will result from interaction of this radiation with the spacecraft and spacecraft shielding. Apollo Project Office is now using the following dose limits:

Normal

Eyes---27 RAD
Blood forming organs--54 RAD
Skin--233 RAD
Extremities--559 RAD

Emergency

Eyes--100 RAD
Blood forming organs--200 RAD
Skin--500 RAD
Extremities--700 RAD

Personal radiation dosimeters will be worn by each crew member at all times. The exact type is not yet specified.

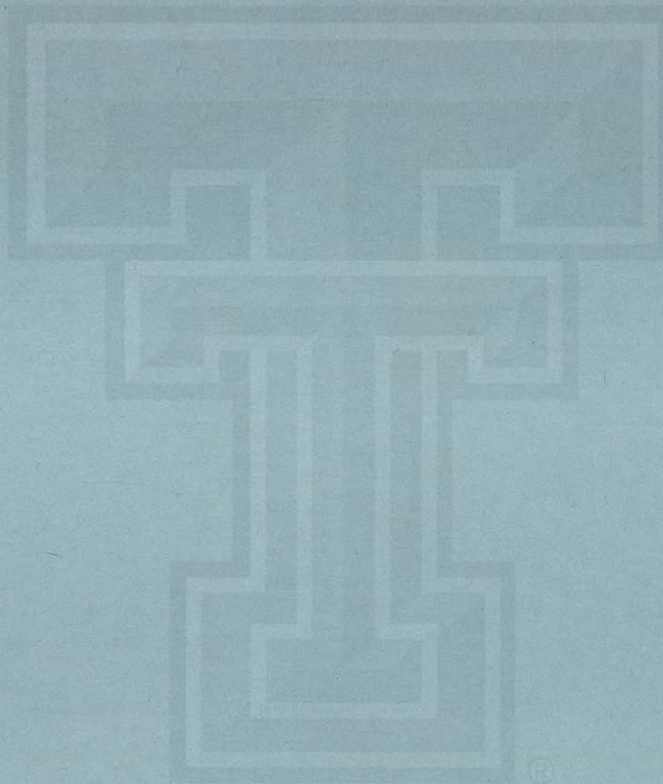
1.2.2.2.3 Meteorites



9M 1.2.2.2.3 Meteorites

4/14/63 No special protection. Special shingle on outside of capsule will detect the number of micrometeorite hits. Shingle is highly polished.

1.2.2.2.4 Fire



9M 1.2.2.2.4 Fire

4/14/63 MA-9 protection against fire is procedural. Astronauts flight rules call for immediate decompression which will be complete in ~~five or six~~^{six to seven} seconds after he pushes the appropriate button.

1.2.2.2.5 Toxic prod.



9M 1.2.2.2.5 Toxic products

4/14/63 No special protection or measurement except procedural. For protection astronaut will close face plate and pressurize suit and remain on 100% oxygen. He may also decompress and then recompress if he desires. Suit pressure on inflation ranges between 4.1 and 4.6 psi.

Carbon dioxide sensor carried in ECS at suit inlet. Reliability only fair. No other measurement devices, except a comparison of total cabin pressure with cabin oxygen partial pressure to determine presence of contaminant. If these are not equal, a contaminant of some sort must be present.

1.2.2.2.6 Med. kit



9M 1.2.2.2.6 Illness (medical kit)

1.2.2.2.6.0.0

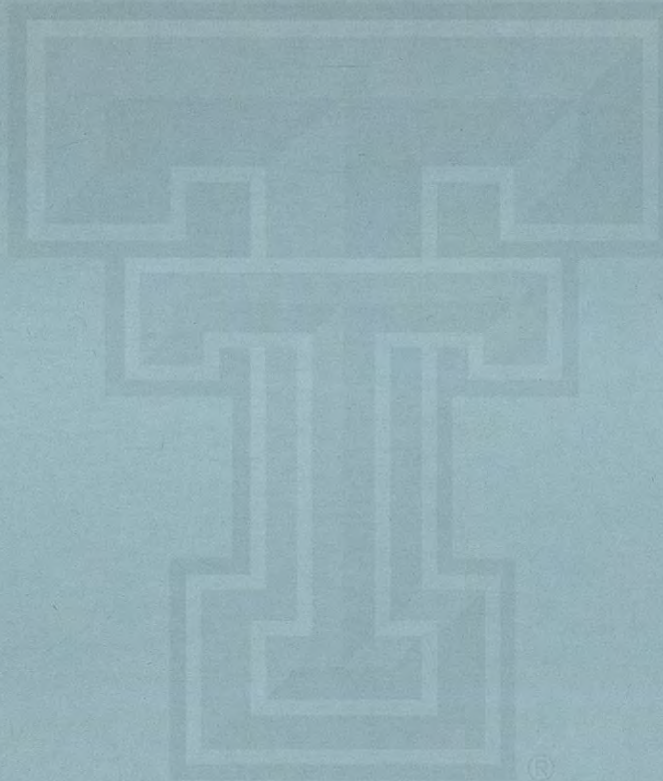
3/18/63 MA-9. Medical kit ready, contains morphine and Tigan. Maintained by suit department at Cape by A. Rochford under Dave Morris.

4/14/63 Astronaut Cooper will carry Demerol. 90 miligrams injectable and demerol tablets, 50 miligrams each in place of morphine. This is because a trial injection of morphine caused severe abdominal colic thought to be due to spasm of sphincter of Odi. History of Cholecystectomy in 1960.

Medications carried will be:

1. Demerol
2. Tigan
3. Chlortrimeton
4. ASA (in survival gear)
5. First aid kit (in survival gear)

1.2.3.1 Surv. equip.



®

9M-1.2.3.1 Survival equipment

4/14/63

The survival equipment will be essentially the same as that used on MA-8 and will also include the following medications.

1. Tablets--Tigan, Chlortrimeton, Dexadrine, and APC's
2. Injectors--Tigan 180 mgm (Two syringes), Demerol 90 mgm (Two syringes)

Survival equipment will include the following: sea dye marker, survival flashlight, shark chaster, food container, survival knife, sun glasses, pocket waterproof matches, signal whistle, jack knife, signal mirror, zinc oxide, soap, medical injectors, first aid kit, SARAH beacon, nylon lanyard, life raft, four pound water container. Personnel cover on the life raft will be detachable in MA-9 for use as weather cape on land if needed.

For recovery tracking MA-9 will not use radar chaff and will be equipped with only one SOFAR bomb.

Fishing equipment will also be included in the survival kit as well as a sea water still.

A 1.2.3.1 Survival equipment

4/14/63

Presently planned survival gear for Apollo will include the following:

- Rafts (three one manned)
- Lighter
- Compass
- Nylon cord
- Fishing kit
- Whistle
- Sunglasses
- Food
- Knife
- Medical Kit
- Water containers
- Signal mirror
- Dye marker
- Desalter
- Flashing light and battery
- Radio beacon and battery

1.2.3.2 Recovery



9M 1.2.3.2 Recovery

4/14/63 Formal recovery document not completed yet. However, plans and procedures are already underway.

Planned recovery areas, preferred contingency areas, and contingency areas are all plotted and covered by the DOD.

Recovery operation involves 15,000 people, 50 airplanes and 25 ships. The 23 orbits will all be confined to a zone ranging from $32\frac{1}{2}^{\circ}$ North to $32\frac{1}{2}^{\circ}$ south latitudes.

1.2.3.3 Med. Assess.Cr.



9M 1.2.3.3 Medical assessment and care of crew

4/14/63

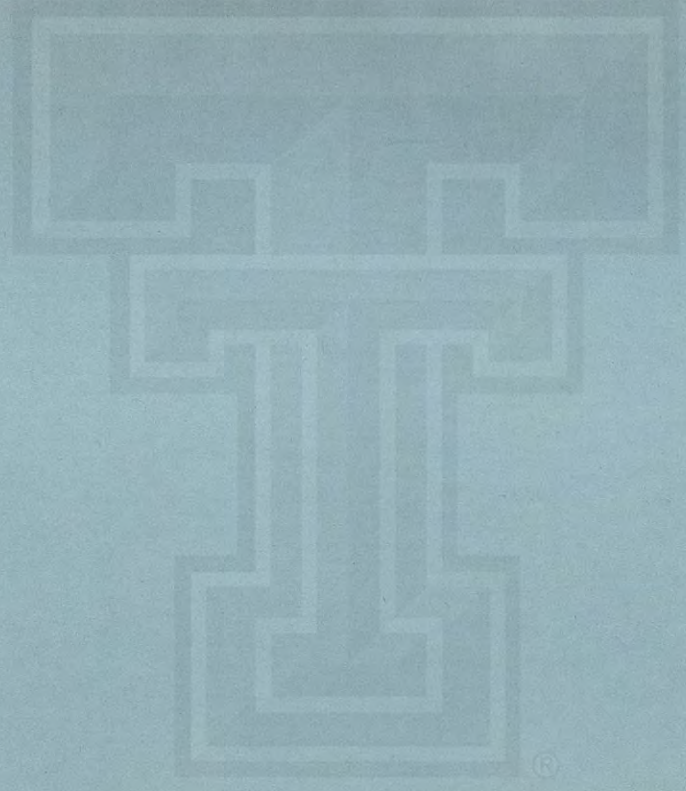
Recovery team and postflight medical evaluation groups briefed and selected on May 8 and 9, 1963 at Houston. Postflight medical evaluation plan has been prepared but we do not have a copy. Tilt table and Flack procedure written up and disseminated to recovery team and medical monitors. (See File)

Blood pressure will be taken through the suit by means of special tubing to be attached to suit immediately after egress from capsule.

Specialty medical teams will be on station and on call if needed post-flight. These are two in number and will be stationed at Portsmouth and at Triplar (Hawaii.) The teams will consist of a General Surgeon, Anesthetist, Neurosurgeon, Orthopedist, Internist, Pathologist, Urologist, Plastic Surgeon, and Medical Technicians.

Contingency recovery hospitals will be located at Patrick Lajes (Canary Islands), Kindley, Subic Bay, Yakuska, Clark, Tripler, and Ryukyu. In addition the burn team at Brooks, and the kidney team at Portsmouth will be on call.

1.3.1.1 Med. Exper.



9M 1.3.1.1 Medical experiments

4/14/63 These consist of the freeze dried foods, the exercise-cardiovascular experiment, accurate fluid intake and output measurements, and a observation of the sleep rest cycle. In addition, of medical interest, but not truly a medical experiment, will be the measurement of radiation exposure.

Cooper will carry meat and gravy (96 calories per 23 gram package) and spaghetti and meat sauce (34 calories per 13 gram package). Total food supply including bite sized and freeze dried foods will be 2376 calories carried on board. (See under food)

Water supply, approximately 10 pounds will be carried. Fluid intake and output measurements will be conducted for 24 hours before the flight throughout the flight, and for 72 hours after the flight. Urine collection device consists of urine collecting device worn by the astronaut, a syringe, and tubing. The intake tubing ends in a needle which is inserted through a diaphragm in the left anterior thigh of the suit into the urine collection device and the output is directed by the astronaut into one of four plastic bags. These bags will consist of 1 six pound and 3 two pound bags. The six pound bag is for use while the astronaut is on the pad. The two pounds bags are for the deposition of each voided specimen during the flight. Should a fifth specimen or more occur during the flight these will be collected in the urinary collection device and remain there throughout the flight. (See fluid intake and output).

9M 1.3.1.1 Medical experiments (Continued)

4/14/63 An exercise test will consist of the astronaut stretching the bonge cord, which will be inserted between his legs in the capsule, to its twelve inch limit once per second for 30 seconds producing a specific number of foot pounds of work (exact number is unknown to me). This exercise will be done twice during the flight, once at 2 hours and 25 minutes elapsed time, and again at 7 hours and 40 minutes elapsed time. Blood pressure, respiration, and ECG will be carefully observed during and after this test. Also part of this experiment is the tilt table study to be done post recovery, baseline data for which has already been obtained at the Cape. This data and directions for performing the tilt table and Flack test has been distributed to monitors and members of the recovery teams for their use in obtaining data. (See tilt table studies under 1.2.3.3, medical assessment and care of crew)

Observation of the sleep rest cycle will consist merely of telemetered observations and voice communications before and after, together with a review of the entire flight.

Radiation measurements will consist of the four film badges, three of which will be worn in the astronaut's underwear (right leg and right and left anterior chest) and one in the helmet. An ion chamber will be stowed inside the hatch of the capsule and read by the astronaut at designated intervals. In addition, a Geiger Muller counter will be carried in the retropack, the data from which will be taped.

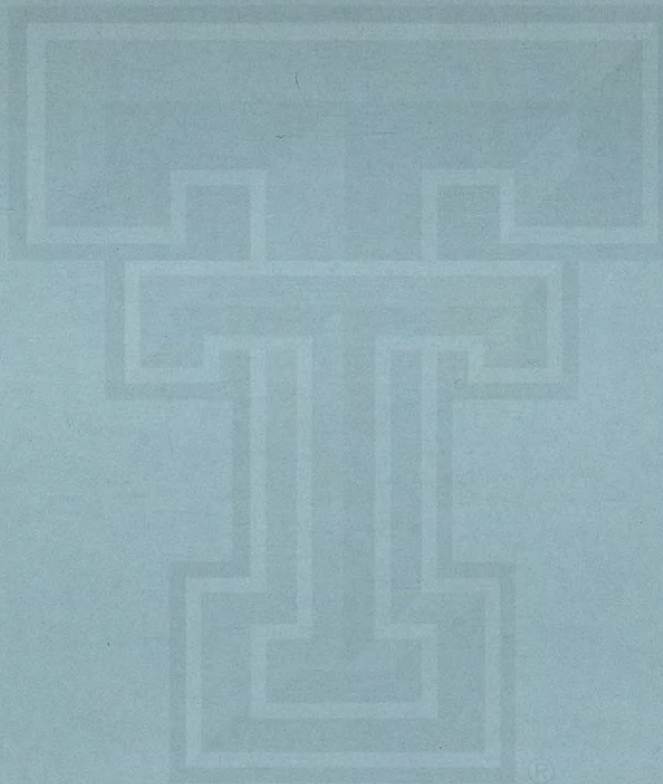
1.3.1.2 Non-Med. Exper.



9M 1.3.1.2 Non-medical experiments

4/14/63 All experiments have been reviewed and approved and time for them has been provided in the flight plan

1.3.2.1 Bioinstr.



9M 1.3.2.1 Bioinstrumentation

4/14/63 Bioinstrumentation will include ECG (same two channels as previously) oral temperature--helmet temperature (for the first time on MA-9), respiration by electrical impedance, blood pressure (same as MA-8--semi-automatic) TV (for the first time), and voice communications.

Temperature taking is programmed in the flight plan. Must be held in mouth for five minutes before accurate temperature recording is taken. This is because it takes this long for the mouth to achieve a uniform temperature and not because of the few seconds it takes for the thermistor to achieve the temperature to which it is exposed.

The ECG readout monitoring stations will now be equipped with a cardio-tachometer, which is a counter running on the ECG. This will show the average rate of R waves over 20 to 30 second periods and not the rate as determined by the distance between each two R waves. It does not involve any change in capsule instrumentation or in astronaut instrumentation.

Blood pressure cuff takes 30 seconds or so to inflate. It does so automatically on the push of a button. As before, the Korotkov sounds are picked up by a microphone which is placed in a small pocket in the blood pressure cuff. Systolic pressure is marked by the beginning of the Korotkov sound and diastolic by the end of the Korotkov sounds.

All instrumentation has been flight tested and approved. It is now on station.

9M 1.3.2.1 Bioinstrumentation (continued)

4/14/63 The ECG electrodes are worn in the same position as MA-8 but the electrical impedance pneumograph electrodes will be placed slightly lower on MA-9 to eliminate the muscle noise interference on MA-8. The electrode paste will be on the same as MA-8.

The most important addition to MA-9 monitoring will be television. This will be seen as a slow scan picture (scanning horizontally from top down at rate of 2-5 seconds) at Cape Canaveral only. However, the picture will be taped, although not seen at the Canary Island Station. Strangely enough on visiting the Mercury Control Center at the Cape on Friday, April 19, 1963, I found that there is as yet no TV receiver incorporated in the pannel.* * *

A 1.3.2.1 Bioinstrumentation

4/14/63

All flights will be self monitoring and will have provision for only one bioinstrumentation telemetry channel, a thirty cycle channel which can be plugged in as desired.

On orbital flights, supplementary systems will be available consisting of several channels with additional provision for special experiments.

Extravehicular space suit operations will be equipped with duplex voice, one channel of bioinstrumentation, and six channels of systems telemetry which will include pressures, temperatures, and other quantities.

1.3.2.2 Facilities



9M 1.3.2.2 Facilities

4/14/63 The monitor sites will be just the same as for MA-8 except that Woomera will no longer be used. The monitoring panels are with few exceptions essentially the same as before. One of these exceptions is the inclusion of the cariotachometer (see Bioinstrumentation 1.3.2.1). The other exceptions have to do with improved communications. All sites have been inspected and standards have been satisfactorily met.

See 1.1.3 Mission Control Center

1.3.2.3 Equipment



9M 1.3.2.3 Equipment

4/44/63 Medical equipment is on station, and in addition, some medications are being hand carried by the senior medical monitors to their stations.

1.3.2.4 Theat. clear.



9M 1.3.2.4 Theater clearances

4/14/63 Current politics have been appraised and civilian monitors are required only at Zanzibar. Immunization has been provided by OAM for all controllers although the medical monitors by and large have taken care of their own. Passports have been cared for by MSC Travel for MSC personnel. Military personnel and medical personnel have by and large taken care of their own except where MSC help was required in the interest of speed. This occurred in only one instance that I know of.

1.3.2.5 Brief. mon.



9M 1.3.2.5 Briefing of monitors

4/14/63 Medical monitors were all briefed along with all other monitors and controllers on the 16th and 17th of April, 1963 at MSC. Training of a pool of new monitors was accomplished in a program which ran from April 10, 1963 to April 19, 1963. The program was very intensive and on the whole, well run.

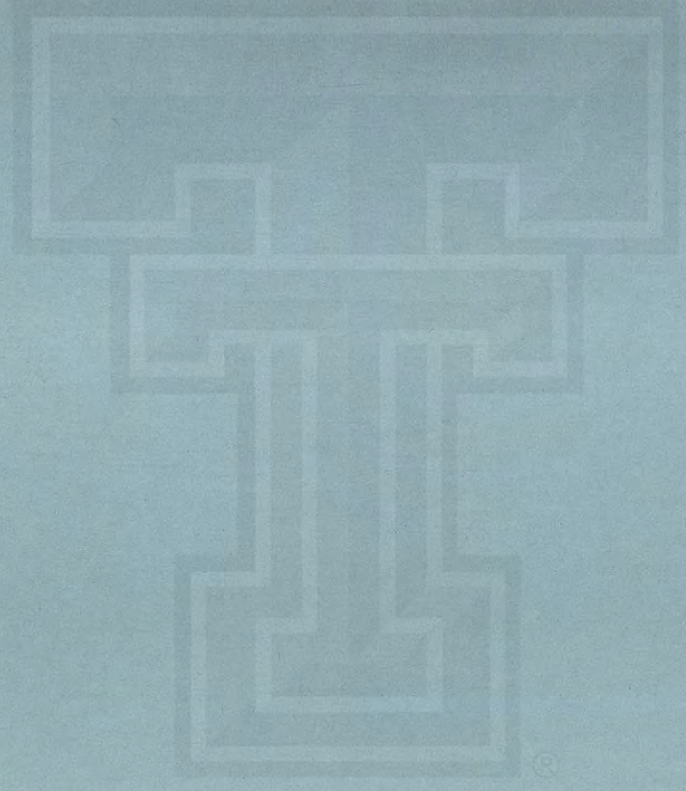
1.3.2.6 Deploy. mon.



9M 1.3.2.6 Deployment of monitors

4/14/63 Selection of medical monitors for MA-9 took place during the training and briefing period. Since the monitor training program there is now a pool of monitors from which backup monitors can be chosen in the event of the necessity for sudden changes. Travel arrangements are made by the monitors themselves, rather than by MSC. The decision as to when the monitors must be on station is made by Walt Williams since he determines the actual date of the flight. This information is transmitted by OAM to all of the monitors by long distance telephone as soon as it is known. A joint FAC test is done 14 days before the flight when the capsule is jointed to the booster. At this time a simulated launch and abort is performed which is the last major test before the flight. If this goes well, the monitors are then deployed, but if it does not, they are not.

1.5.2.1 Sim. train.



9M 1.3.2.7 Simulations (training)

1.3.2.7.0.0.0

3/18/63 MA-9 Monitoring training simulations consist of taped simulations. After each simulation a critique is given by Berry and Catterson from MCC.

4/14/63 Simulation plans have been completed and the tapes are now prepared and ready for use for training the monitors on station. Performance standards are evaluated during the simulations and corrective measures are taken at that time also. The simulation runs are about as follows:

1. Four to five short station runs (T-15 to T + 10) starting on X-9.
2. The following day a network simulation of the full countdown starting at T-360.
3. This is followed by two days of network simulations utilizing a short count.
4. This is followed by a full simulation (three orbits).
5. At X-5 or 6 the stations are torn apart and put back together again, a process which takes about two days. All systems are then very closely checked.
6. At X-2 a full countdown simulation starting at T-360 and lasting through three orbits is again run. After that comes the launch itself.

1.3.2.8 Debrief. mon.



9M 1.3.2.8 Debriefing of monitors

4/14/63 Debriefing will be held at Houston, 7 to ten days after the shot is completed. The exact date and time will be given over the network by Chuck Berry at the completion of the flight. All of the arrangements, travel orders, etc. will be arranged in the same way that the monitor training program was arranged. Everyone will stay at the Houston Airport Inn and orders and travel to and from the debriefing will be provided by the monitors home station.