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To: F. H. Dietrich

17 July 1968

Subject: Neutral Buoyancy Integrated
Test Requirements

From: S. M. Tennant

Reference: Letter to S. Tennant from F. H. Dietrich dated 28 June 1968
Subject: Same as above

In accordance with your request, the requirements for underwater testing have been reviewed. It is our conclusion that there should be an underwater testing program in order to insure the adequacy of the design and verification of time lines and procedures. We conclude that only a minimum effort should be funded and that effort should be concentrated in those areas where downstream retrofit, either design or procedural, would have a significant cost and schedule impact. The details of this analysis are included in the enclosed package.

In line with this conclusion, the areas where integrated neutral buoyancy testing should prove effective are:

1. Locate the attach points for the lower leg restraints and temporary holding fixtures.
2. Assure that the equipment located in the lower portion of Bay 1 can be operated and maintained in conjunction with equipments stowed in the lower portion of Bay 5.
3. Verify the compatibility of the four components of the integrated restraint system with mission tasks at Bays 1, 2, and 8.
4. Determine the adequacy of DRC, both primary and secondary, stowage mechanisms, locations, and procedures.

Relative to the selection of an integrating contractor, it appears that DAC has more involvement in the required testing; however, either GE or DAC have adequate technical competence to do the work. It is recommended that whichever contractor is chosen, we place at least equal emphasis on the design development testing as on procedures development and verification, and that furthermore, this design development testing must proceed essentially in the next six months.

SMT:ov


Samuel M. Tennant

cc: D. R. Howard
W. C. Williams

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UNDERWATER WEIGHTLESSNESS SIMULATION BRIEFING

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UNDERWATER WEIGHTLESSNESS SIMULATION

o INTEGRATED TEST ALTERNATIVES

COMMENTS

/ 1-G MOCKUP SIMULATION

NASA EXPERIENCE PROVES RESULTS
CAN BE MISLEADING (TIME & EFFORT).

/ 0-G AIRCRAFT SIMULATION

20-25 SEC. MAXIMUM CONTINUOUS TIME.
CAN BE DANGEROUS WITH LARGE MASSES.

/ NEUTRAL BUOYANCY

NASA EXPERIENCE PROVES RESULTS
RELEVANT AND VALID.

o PRESENT COVERAGE

/ NO INTEGRATED CREW INTERFACE TESTING PROGRAMMED

/ INDEPENDENT 1-G SIMULATIONS - ALL CONTRACTORS

/ INDEPENDENT 0-G AIRCRAFT SIMULATIONS - LV CONTRACTOR

- GB CONTRACTOR

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UNDERWATER WEIGHTLESSNESS SIMULATION

o PURPOSE

/ INTEGRATE CREW INTERFACES

o RESTRAINTS AND LOCOMOTION AIDS

o MISSION TASKS

o DATA HANDLING

o CREW TRANSFER

/ VERIFY FLIGHT CREW PROCEDURE AND TIMELINE COMPATIBILITY WITH
MISSION TASKS AND HARDWARE CONFIGURATION.

/ PROVIDE BASIC FIXTURE, INCLUDING INTERIOR AND EXTERIOR CONFIGURATION
FOR USE IN FLIGHT CREW TRAINING.

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UNDERWATER WEIGHTLESSNESS SIMULATION

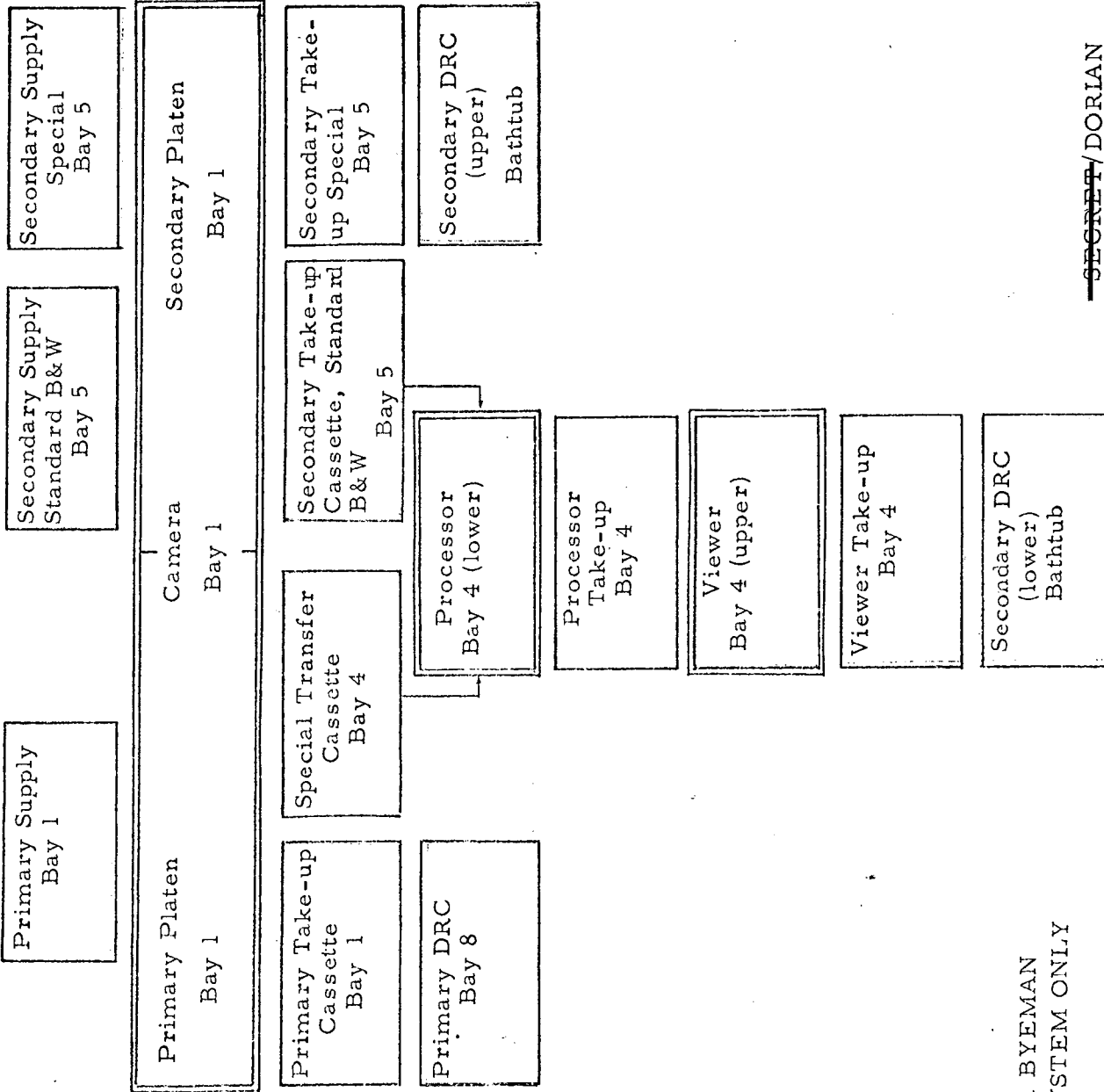
<u>INTEGRATED TESTING TASKS</u>	<u>PARTICIPANTS</u>					
	<u>HSD</u>	<u>DAC</u>	<u>GE</u>	<u>EK</u>	<u>MCASTRO</u>	<u>SO/FLIGHT CREW</u>
o EVALUATE CREW RESTRAINT ADEQUACY FOR OPERATIONS AT BAY'S 1, 2, 4 AND 8		X	X			X
o EVALUATE CREW RESTRAINT ADEQUACY FOR REQUIRED REACH ENVELOPES AND ACCESSABILITY		X	X	X		X
o EVALUATE CREW RESTRAINT LOCOMOTION AIDS & TEMPORARY HOLDING FIXTURE ADEQUACY FOR DATA HANDLING		X		X		X
o CREW TRANSFER		X			X	X
o UTILIZATION OF GFP PRESSURE SUIT IN TASKS LISTED ABOVE	X	X	X	X	X	X
o PROCEDURES DEVELOPMENT AND VERIFICATION						

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FILM FLOW



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UNDERWATER WEIGHTLESSNESS SIMULATION

- o ALLOCATION OF RESPONSIBILITIES
- / INTEGRATING CONTRACTOR
 - o BASIC UNDERWATER FACILITY
 - o BASIC LV FIXTURE
 - o SAFETY
 - o INTEGRATED TEST PROCEDURES COORDINATION
 - o TEST CONDUCT AND PARTICIPATION
 - o DATA RECORDING AND DISSEMINATION
 - / ASSOCIATE CONTRACTOR
 - o ASSOCIATE CONTRACTOR HARDWARE MOCKUPS
 - o PARTICIPATE IN TEST PROCEDURE PREPARATION
 - o TEST PARTICIPATION
 - o IN-HOUSE DISSEMINATION OF TEST RESULTS
 - / SO
 - o PROGRAM MANAGEMENT AND FLIGHT CREW PARTICIPATING
IN PROCEDURES PREPARATION AND TESTS

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UNDERWATER WEIGHTLESSNESS SIMULATION

o ESSENTIAL TESTING REQUIREMENTS

- / ATTACH POINTS FOR LOWER LEG RESTRAINTS AND TEMPORARY HOLDING FIXTURES
 - / COMPATIBILITY OF EQUIPMENT IN BAY 1 WITH STOWAGE IN BAY 5
 - / COMPATIBILITY OF INTEGRATED CREW RESTRAINTS WITH BAYS 1, 2 AND 8 OPERATIONS
 - / DRC STOWAGE MECHANISMS, LOCATIONS AND PROCEDURES
- o MOCK-UP FIDELITY
- / MINIMUM TO ACCOMPLISH ESSENTIAL TESTING

NOTE: WOULD REQUIRE UPDATING MOCK-UP FOR TRAINING

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UNDERWATER WEIGHTLESSNESS SIMULATION

o RECOMMENDATIONS

- / SELECT INTEGRATING CONTRACTOR AND REQUEST ECP FOR
ESSENTIAL TESTING ONLY
- / REQUEST ECP'S FROM AFFECTED ASSOCIATES FOR SUPPORT
OF INTEGRATED UNDERWATER TESTS
- / SCRUB RESULTING ECP'S - TECHNICAL AND COST
- / AUTHORIZE INTEGRATED UNDERWATER WEIGHTLESSNESS TEST
PROGRAM FOR ESSENTIAL TESTING ONLY
- / INCLUDE UNDERWATER WEIGHTLESSNESS FACILITY IN TRAINING
PLANING

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UNDERWATER WEIGHTLESSNESS SIMULATION

- o MINIMUM REQUIREMENTS FOR ESSENTIAL TESTING
 - / SEGMENTED BIRDCAGE FRAMEWORK
 - / FORWARD AND AFT END DOMES
 - / MAJOR PROTUBERANCES, ATTACH POINTS AND THF'S
 - / SELECTED CLOSURES AND PANELS
 - / CREW RESTRAINTS - FOOT, LOWER LEG, PELVIC, FOREARM,
HEAD
 - / DRC'S, PRIME AND SECONDARY
 - / DATA HANDLING DEVICES

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