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MEMORANDUM

Lyndon B. Johnson Space Center NASA

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TO: MF/W. W. Lofland, Jr.		CC CA/R. L. Crippen CB/J. W. Young CB/P. J. Weitz EC/W. W. Guy MA/R. A. Colonna
FROM: CB/W. E. Thornton, M.D.		SIGNATURE W. Thornton W. E. Thornton, M.D.

SUBJ: Improved Waste Collection System Status

A conceptual demonstrator of a piston-compactor Improved Waste Collection System (IWCS) has been successfully completed, tested and demonstrated. To transform this into a potential waste collection system for flight, a number of systems must be designed, built, tested and combined into an actual WCS system which in turn must be tested.

It was agreed to build such a system, called a 1-g prototype, as quickly as possible. In order to have a unit for flight test as soon as possible, the essential features of a WCS were to be decided upon and incorporated from the 1-g prototype as they became available. This unit is called the DTO prototype. If this is successful, then a full-up flight prototype must be constructed for test.

The following is a listing of the major features to be incorporated in the 1-g prototype. The order is the anticipated order of fabrication.

Items:

1. Pad transport/cutter mechanism - This requires advancing a new section from a supply roll, correctly positioning and holding it, and cutting it from the roll. The operation will have to be driven in synchronism with the piston but may be manual to expedite the DTO prototype.

2. An air circulation/filtration system which provides a positive inflow of air through the inlet and collection chamber and then is exhausted through an odor filter is required. This is complicated by the need to occlude the inlet holes as the piston transports waste past this. A filter for particulates will be included. A high pressure jet system just under the seat is to be investigated, but this may be delayed.

3. A compaction/drive system which includes an initial pad pickup motion, a sweeping drive, a variable stroke with force sensing and constant force maintenance for compaction and retraction. This drive will ultimately control and probably drive other systems, including the inlet slide valve, pad advance/cutting mechanism and vent inlet occluder.

4. A seat inlet assembly must be designed and tested and will include a gate "valve" which is closed when the unit is not in use. Directed air including positive pressure jets to prevent migration out of the unit must be included here.

5. An electric system and various other accessories such as mounting points and enclosures, fairings and operating controls, will be required. Most of this, however, will be reserved for the DTO proto.

6. A vent to vacuum with sufficient flow to remove gases and odors when the air circulation is off must be included. Extensive human testing will be required here.

The importance of testing each subsystem and complete systems cannot be overemphasized.

Current Status: A general plan of action is in place and proceeding. Each of the major subsystems (items 1-6) is to be constructed and tested to satisfaction. As soon as it is possible to safely extrapolate the work to the DTO prototype, a minimal design will be agreed upon and work will proceed in parallel.

All 1-g prototype systems have been designed, and the following work is underway: The basic collection tanks, which also serve as a chassis for other systems, have been fabricated for both 1-g and DTO prototypes.

Item 1 - A pad transport system has been constructed and demonstrated and a cutter is currently being assembled at this writing and should be tested for function before the day is over. Still to be done is a pad release, synchronization, and supply storage. A pad manufacturer is supplying short bulk material and has promised to supply rolls or at least long sections for rolling, but there is no firm date for this. In my opinion (based on previous projects and 20+ years of mutual work with Whitmore) another week will be required to complete and test this item.

Item 2 - Air Circulation: Components are being fabricated for the inlet plenum and inlet occluders. A 60 Hz. blower assembly is in hand, and a 400 Hz. motor has been identified (i.e., available or quickly available) as a possible replacement for the 60 Hz. unit. Also, two complete 400 Hz. units, fan and blower, have been identified for possible use. Filter material and odor filter have also been identified. My estimate for completion of this is 3 weeks from time of starting.

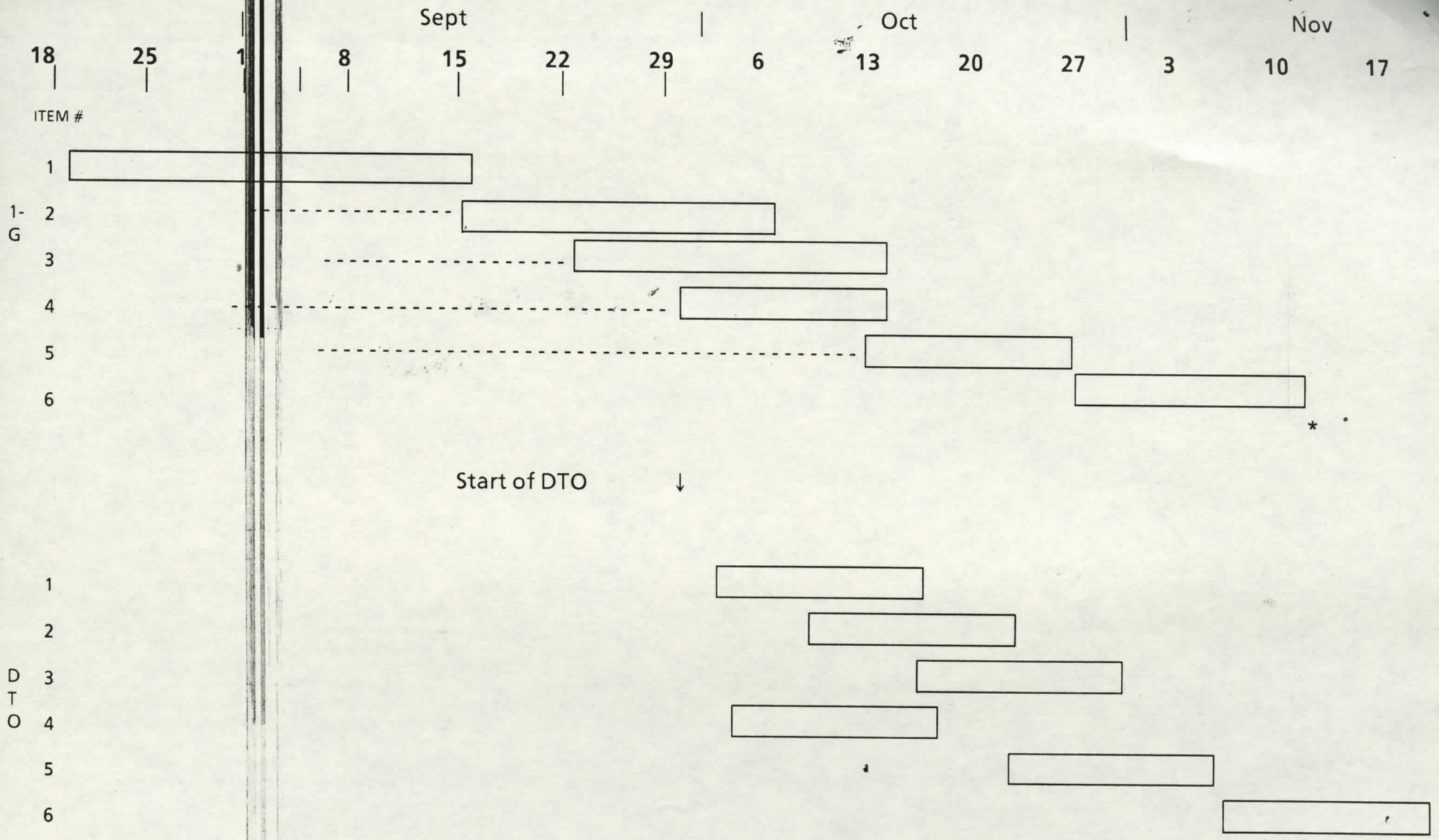
Item 3 - Compaction device and drive - A scissors device has been designed and parts are being fabricated. A screw mechanism has been promised in 2 weeks. My estimate for this is also 3 weeks, but some parallel effort with item 2 may be possible here.

Item 4 - Seat assembly - A Skylab seat has been provided such that a copy is being fabricated. The work with air control elements and slide valve cannot be started until item 2 is well in hand and a minimum of 2, but more likely 3 weeks will be required here.

Item 5 - Electric & Auxiliary Systems: An electric system has been agreed upon, and I am laying it out at this time such that flight qualified components can be identified and any safety issues can be addressed. This circuit with general component specs should be available in 2-3 days. Ground support 28 V.D.C. and 115 V. 400 Hz. 3 ∅ have been identified. Fabrication can be expected to take a minimum of 2 weeks and probably more.

Item 6 - Vacuum vent: This should require a relatively small amount of hardware but a large amount of other efforts including decisions on the amount of gas available, division of this venting between the WCS, wet trash, etc., and actual testing with feces to confirm adequacy. The unit must be complete for this. A study of possible locations for the DTO tests was made in the 1-g trainer and the mockup, and it appears that an area in the present WCS area can be used. A great deal of ancillary support has and is being given under the direction of Bill Lofland and won't be described.

In summary, there are no obvious design fabrication difficulties at this time, only the irreducible minimums required for such development which cannot be precisely forecast. My estimates are enclosed on a calendar sheet. Based on this, a DTO flight test would be practical by December. While earlier dates are possible, a series of small miracles will be required.



----------Preliminary parts fabrication, acquisition

* This test could be omitted and done on the DTO prototype