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SUBJECT: Recovery Requirements

TO: Commander
Air Research and Development Command
United States Air Force
Andrews Air Force Base
Washington 25, D. C.

1. Reference your letter (Confidential), RDZAB, above subject, dated 12 December 1958, the following information is provided on recovery support requirements of the Air Force Ballistic Missile Division weapon system operations within the foreseeable future:

a. The WS315-A and WS107A-1 copper re-entry vehicle development programs require recovery of data capsules; the WS107A-1, WS107A-2 and Minuteman ablation re-entry vehicle programs require recovery of re-entry vehicles and data cassettes.

b. Geographical areas involved: Atlantic Missile Range for all four (4) weapon systems; probably also the Pacific Missile Range for WS107A-2 and/or Minuteman.

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c. Recovery capability is required now in the Atlantic Missile Range and will continue to be required there for an indefinite period. No requirements have been definitized as yet for the Pacific Missile Range.

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d. Present and visualized requirements involve such recovery operations as the following:

(1) Data capsules. These are presently being recovered in the Atlantic Missile Range; they weigh about one hundred (100) pounds each and are spheres about eighteen (18) inches in diameter.

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Ablation type re-entry vehicles. Both scaled and operational, these will be sphere-cone-cylinder-flare shapes ranging in size and weight from about 61 x 27 inches and seven hundred (700) pounds (for Able Phase II experimental vehicles) to about 145 x 64 inches and three thousand pounds (3000 lbs), (for prototype Atlas re-entry vehicles).

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Recovery of still heavier and larger re-entry vehicles may ultimately be required in support of missile and/or space programs.

Data Cassettes. These are presently visualized as cylindrical objects about thirty-six (36) inches long with a diameter of eighteen (18) inches and a weight of one hundred (100) pounds.

(2) Recovery will take place from water in all instances.

(3) Recovered items will have to be returned to launch sites from distances of at least fifty-five hundred (5500) nautical miles.

(4) Time will be extremely important in return of recovered items since establishment of design validity, the need for additional flights, product improvement, space system development and rapid advancement of the state-of-the-art will depend upon the earliest possible evaluation of the data stored in the recovered items and/or laboratory examination of the item itself.

(5) These recovery requirements have necessitated the development of specialized recovery "packages" which include deceleration parachutes, flotation balloons and such locator aids as radio beacons, flashing lights, solar bombs and sea marker dye. Recovery operations may conceivably be improved by the use of special electromagnetic locator and diving equipment (and perhaps handicapped by fragility of the re-entered item, due to ablation losses.) The development of an all weather recovery capability would, of course, also be helpful. We do not anticipate that any disarming operations will be required.

3. We visualize somewhat different requirements for recovery in support of space systems development:

a. WS 117L.

b. Recovery will be required Southwest of Hawaii.

c. The recovery capability is required in January 1959.

d. Nature of recovery requirement:

(1) Bio-medical capsules weighing one hundred twenty pounds (120 lbs) and sixty pounds (60 lbs).

(2) Air recovery is planned for these capsules.

(3) They will be returned about thirty-five hundred (3500) miles to the delivery point.

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(4) The nature of experiments involving bio-subjects demands that they be returned to the delivery point for analysis as soon as possible.

(5) The bio-subject is relatively fragile and care must be taken to avoid excessively rough treatment.

c. Recovery requirements for this weapon system extend through FY 1960. Seventeen (17) recovery attempts will be made during this time period. The 6593d Test Squadron (Special) now stationed at Hickam Air Force Base has been assigned responsibility for aerial recovery of test capsules.

3. a. Man-in-space Program.

b. Recovery will be required in the ocean area adjacent to the United States, near the Air Force Missile Test Center, and possibly in the central land area of the United States.

c. The recovery capability is required in the last half of Calendar Year 1960.

d. Nature of recovery requirement:

(1) Four (4) unmanned and two (2) manned test vehicles each weighing approximately twenty-three hundred (2300) pounds, about six (6) feet wide at the large diameter and seven (7) feet long.

(2) Primarily water recovery, with a possible desire for one land recovery.

(3) The recovered objects must be returned about two hundred (200) miles to the delivery point.

(4) For unmanned vehicles, about twenty-four (24) hours is satisfactory. For manned vehicles, the return to delivery point must obviously be as soon as possible, and not to exceed twelve (12) hours.

(5) Special considerations are obviously needed to avoid exceeding environmental tolerances of the man in the vehicle.

4. a. Recoverable mapping satellite.

b. Recovery will be in the central land area of the United States.

c. The capability for recovery is required in the second quarter of Calendar Year 1960.

d. Nature of recovery requirement:

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(1) Four (4) vehicles, each weighing approximately fifteen hundred (1500) pounds, with dimensions of six (6) feet in diameter and eight (8) feet in length.

(2) Land recovery is planned, with possible water recovery.

(3) Return distance of three hundred (300) to four hundred (400) nautical miles for the payload and about eighteen hundred (1800) miles for the re-entry vehicle itself.

(4) Return within about twenty-four (24) hours will be desired.

(5) No special considerations.

5. The above "payload recovery" projects should generate steadily increasing requirements for size of the recovered object, and for frequency of recovery as more types of manned missions are undertaken. However, one major advance is needed to make sustained space operations economically feasible; this is the recovery, eventually for routine re-use, of the first-stage boosters. Progress towards this goal may be expected to include three steps:

a. Unmanned parachute recovery of "small" (up to ICBM-size) first stages, to develop recovery techniques and investigate re-use potentials. The primary recovery area would be in the South Atlantic, with return of the entire stage to the U.S. for analysis. Return should be reasonably expeditious, consistent with the system development schedule adopted (fifty (50) feet long, ten thousand (10,000) pounds.)

b. Unmanned parachute recovery of "large" (million-pound thrust and over; thirty to fifty thousand (30-50,000) pounds, sixty to eighty (60-80) feet long) first stages, to develop recovery system and validate re-use capabilities as designed. Recovery area would be in the South Atlantic, with return of the entire stage to the U.S. for analysis and possible partial refuse. Return should be reasonably expeditious, depending upon the development schedule.

d. Manned, maneuverable recovery of large space boosters to develop recovery techniques and systems leading towards booster re-use for sustained space operations (satellite stations, staged inter-planetary explorations, ion or nuclear propulsion testing.) Land recovery (conventional landing or parachute) in a selected area contiguous to the South Atlantic. Emergency recovery of the pilot would be required along the planned trajectory. The recovered space booster would be returned to the U.S. for analysis, IRAN, and re-use.

6. The time schedule for these requirements depends upon national decisions as to the proper emphasis to place on space achievements.

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Early dates are estimated at 1961-1963 for the "small" parachute recoveries; 1963-1966 for the "large" parachute recoveries, and 1966-1969 for the maneuverable recoveries.

7. As space programs advance, it is expected that additional requirements for recovery will be generated. These recoveries will be of the same general nature as those described above, with increasing emphasis on manned re-entry vehicles. The extent of the recovery areas will be increased, but they should still be centered in the same general locations (i.e., the Atlantic Missile Test Range, central United States, and the Pacific Ocean area from California to southwest of Hawaii.) The weight of space re-entry vehicles which will require recovery can be expected to increase to approximately ten thousand (10,000) pounds, with a corresponding increase in dimensions.

RICHARD D. CURTIN
Colonel, USAF
Deputy Commander
Military Space Systems

for B. A. SCHRIEVER
Major General, USAF
Commander

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