FIELD DOCUMENT ROUTING AND ACTION RECORD

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FROM: Chief,

DOCUMENT SYMBOL AND NUMBER:

DOCUMENT DATE: 10 November 1960

ACTION SUSPENSE DATE:

TO	LOCATION	DATE FORWARDED	OFFICER INITIALS	COMMENTS
1.		14 Nov		
2.				
3.		15 Nov		
4.				
5. C/OS		17/11/60		V. C. - This may be of interest to you.
6. TSD/LEB	103 Headquarters			
7.	Rec'd SAB 16/20 Nov			
8.				
9.				file - Balloon, Jets, Hot air.
10.				
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FORM NO. 861
1 DEC 55

SECRET CONFIDENTIAL UNCLASSIFIED

(40)

STANDARD FORM NO. 64

Office Memorandum • UNITED STATES GOVERNMENT

TO : Chief of Station, [redacted]

DATE: 10 November 1960

FROM : Chief, [redacted]

SUBJECT: Report of Hot Air Personnel Balloon Flight Test

I. Sponsors of Test: TSD/EB

Contractor, Raven Industries, Sioux Falls, South Dakota

II. Purpose of Test:

To determine the feasibility and practicality of hot air for use as the lifting medium for personnel balloons by testing hot air generating equipment and a nylon-mylar material balloon.

III. Date, Time and Place of Test:

a. Date and Time - 22 October 1960, 0600 to 0930 hours.

b. Place Balloon Launched - In Nebraska approximately 250 miles south of Sioux Falls at an abandoned Air Force Base called Bruning State Airport.

IV. Material Tested:

A 40 ft. personnel balloon constructed of nylon-mylar cloth material equipped with a propane burner to provide continuous hot air during flight. Two propane bottles, containing a total of 83 lbs. of fuel, were utilized as fuel source during the flight.

V. Background:

TSD/EB awarded a contract to Raven Industries for the development of a hot air system for personnel balloons. Specifications called for development of a suitable balloon for use with hot air and generating equipment or burners to utilize kerosene or fuel oil (diesel).

The contractor has produced a satisfactory 40 ft. balloon frabricated of nylon-mylar material that will withstand heat and is extremely durable. A ten foot diameter opening has been incorporated into the top of the balloon for release of the gas for landing. The opening is tied off for flight and can be released by either a primary release squib system or alternate manual release system. This method of releasing the gas permits reuse of the balloon, versus the old method of ripping a panel used with the polyethelene balloons. The lower portion of the balloon (see photo #8 lower dark part of balloon) is made of nonflammable glass cloth to prevent ignition of the balloon from the flame of the burner.

To date the contractor has been unable to provide a satisfactory burner for utilization of low-grade petroleum such as fuel oil or kerosene. The difficulty being the residue deposit that forms over the burner and smothers the flame after 15 to 20 minutes of operation. A propane burner and propane fuel was used for the test.

VI. The Test Flight:

a. At 0600 on 22 October 1960 balloon launching preparations commenced. The balloon was launched at 0908, wind West about 3 mph, ground temperature 59°F. The flight terminated after a duration of 18 minutes, at 0926. No ballast was carried on the flight.

Free lift when the balloon was launched was sufficient to result in a rate of ascent of about 250 ft/min. With a burner output of about 3/4 maximum capacity the balloon achieved equilibrum at about 500 ft. altitude. After about 18 minutes of flight at 500 ft. the pilot by decreasing the hot air output of the burner commenced to descend for a practice landing. Due to a combination of the decrease of hot air input into the balloon and atmospheric cooling the balloon reached a rate of descent of about 400 ft/min. The pilot attempted to check the rapid rate of descent to a safe landing speed by opening the burner to fullblast to obtain the maximum hot air output.

Although the rate of descent was decreased somewhat, equilibrum could not be obtained due to the incapability of the burner to produce sufficient hot air rapidly. Because descent could not be checked before contacting the surface the pilot extinguished the burner at an altitude of 50 ft. to preclude

setting the rig on fire on landing. Prior to landing when several feet above the ground the pilot activated the squib release mechanism thereby opening the 10 ft. hole at the top of the balloon and releasing the hot air for landing.

The landing was made without difficulty even though the rate of descent was quite rapid.

b. A series of numbered photos of the layout, equipment, inflation, launching, flight, and post landing are included with this report.

Photos as follows:

1 shows the balloon laid out, two propane bottles, burner left center, and two Kollsman kerosene heaters.

2 and 3 show a close up of the propane burner and inflation duct. Lower part of balloon made of nonflammable glass cloth.

4 shows the balloon partially inflated using one of the heaters as the hot air source.

5 shows the lower portion of the balloon rigged with the propane burner and two propane bottles. At this stage the propane burner has been lit and the final inflation of the balloon was being completed. An auxiliary bottle was used for this so as not to use up the fuel from the bottles rigged for flight.

6 shows one of the helpers in the pilot's seat serving as ballast to help hold the balloon. Inflation almost completed.

7 shows the pilot in the seat, inflation completed and the auxiliary bottle being held and disconnected by one of the helpers. Instruments can be seen on each side of the pilot.

8 shows the balloon in flight.

9 and 10 show the rig as it landed after the flight of about 18 minutes. Note the pilots seat in the lower left of photo #9. No damage was incurred to any of the equipment as a result of the flight.

VII. Comments:

a. The Balloon: (a sample of the balloon material is attached to this report.)

This was the first and to-date the only balloon fabricated of nylon-myler material.

Due to its lightweight, (40 ft. balloon weight is 74 lbs.) durability and resistance to heat the material appears very suitable for personnel balloons. Results of this test indicated the material to be satisfactory.

b. The Burner:

The propane burner used proved to be unsatisfactory. Although sufficient continuous hot air could be generated at maximum output setting to compensate for loss of hot air due to atmospheric cooling and maintain equilibrum during flight, it was impossible to check descent and regain equilibrum once a descent was initiated. It is estimated that a burner having double the output capacity of the present burner would be required in order to provide the margin of control capability required for successful and safe operations.

VIII. Conclusions:

a. From the viewpoint of feasibility it can be concluded that hot air is satisfactory as the lifting gas for use with personnel balloon.

b. From the viewpoint of practicability for covert operations it can be concluded at least at this stage of development that the system is not suitable. Conditional on the development of a burner that utilizes a low-grade petroleum, or perhaps a solid fuel, I do not believe that this system holds much promise for covert operational use.

c. It is concluded that the nylon-mylar material is most satisfactory for personnel ballons.

IX. Recommendations:

It is recommended that consideration be given to the development of nylon-mylar material personnel balloons for use in the OTR personnel balloon training course. Involved in the development would be the incorporation of a 60 lbs. valve and a modification of the lower part of the present model to accommodate the gondola.

A substantial saving could be realized in the utilization of such a balloon because the same balloon could be used over and over indefinitely.

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Chief of Station, [redacted] 10 November 1960

Chief, [redacted]

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