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FTD-TA-64-11

20 MARCH 1964

FOREIGN TECHNOLOGY DIVISION

AIR FORCE SYSTEMS COMMAND

WRIGHT-PATTERSON AIR FORCE BASE, OHIO

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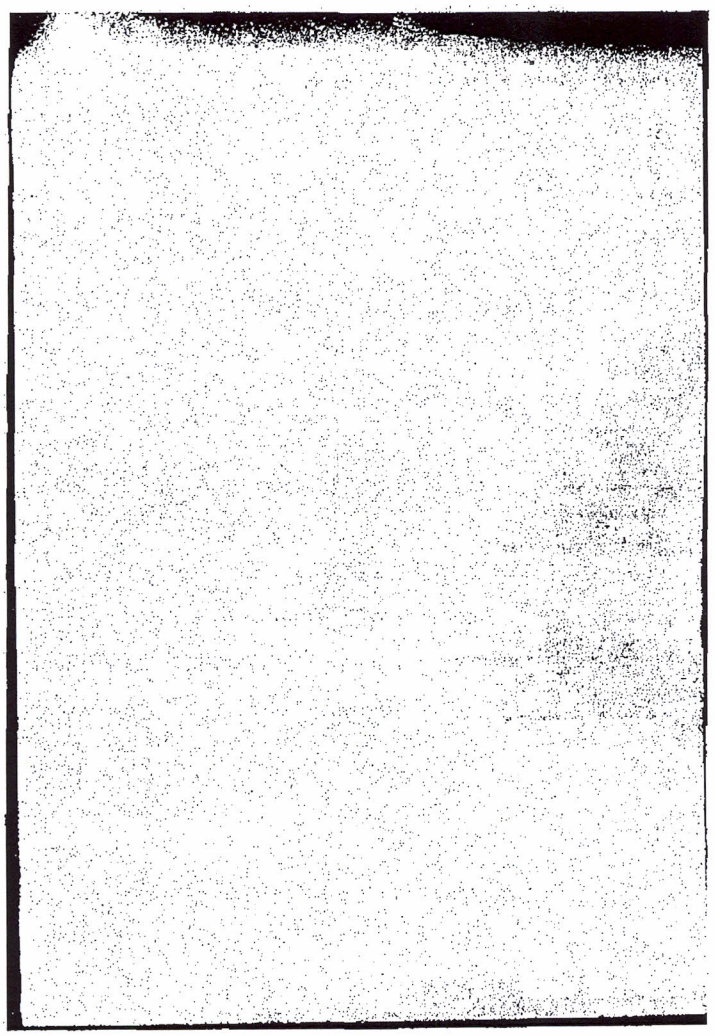

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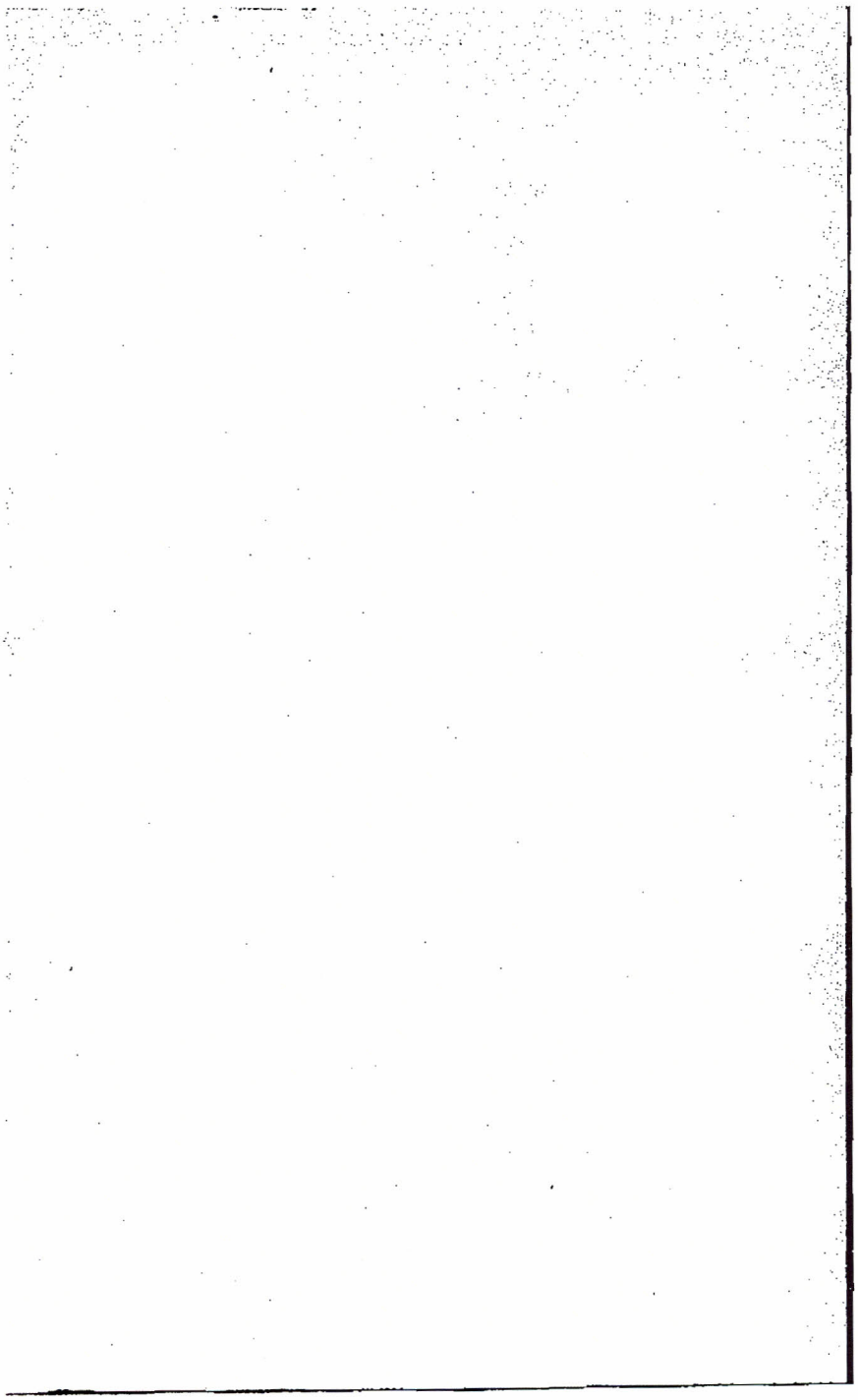

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1	~~(C)~~ Probable Soviet Titanium Space Capsule Disclosed Mr. R. J. Jackson This item reveals the basic structure of a probable Soviet space capsule, heretofore unidentified. Although its mission cannot be defined as yet, the open-literature article on which this item is based yields several significant points which indicate its probable application: (1) it is pressure-tight, (2) structural materials are titanium and titanium alloys, similar to the US Mercury capsule, which was developed for aerospace structural application, (3) past work and associations of the author and his colleagues firmly associate them with the Soviet aerospace effort. ~~(S)~~ (U)	1
2	(U) Electronic Complement of BADGER A and B Aircraft Mr. F. A. Stelzer Continued research and development of new airborne electronic equipment requires the updating of the electronic complement of the Soviet BADGER A and B aircraft. This item provides a listing of Communications, Navigational Aids, Radar Equipment and ECM gear carried by these aircraft. ~~(S)~~ (U)	2
3	(U) Electronic Equipment for "Export" Version of BADGER A and B Mr. F. A. Stelzer The electronic complement of BADGER A (Tu-16) and BADGER B (Tu-16KS) aircraft which have been exported from the Soviet Union has been determined. It is apparent that the Soviets have exported aircraft which are equipped with relatively old equipment, and they are believed to have refrained from including any ECM complement. ~~(S)~~ (U)	4

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4	(U) Analysis of Unknown Balloon Capt J. E. Wanamaker	6

Analysis of a balloon recovered by the Swedish Air Force reveals that it is of non-reflective material, not likely to be an object tracked by Swedish radar, and is not identical with any other type previously analyzed by FTD. (S)

1. (C) PROBABLE SOVIET TITANIUM SPACE CAPSULE DISCLOSED
Mr. R. J. Jackson (TDEWP)

(U) Since 1958, Soviet literature has continuously reflected the development of titanium alloys for aerospace applications, but little evidence existed suggesting serious Soviet interest in a titanium space capsule. Recent information, however, suggests that not only have they been interested in such a design, but they fabricated a number of such capsules in the 1958-1960 time period. This information was covered in an article authored by Ye. G. Antonov in a Soviet periodical. A line drawing of one of the Soviet structures is shown in Figure 1. Definite dimensions cannot be ascertained. The structure shown was fabricated by spot,

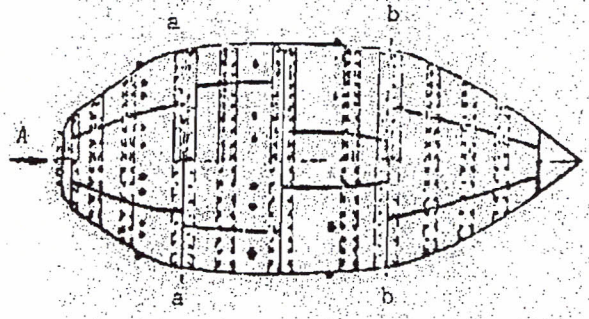

Fig. 1. Design of Structure

seam, and argon-arc welding of unalloyed sheet titanium, BT1; a low strength titanium sheet alloy, OT4; and a forged titanium alloy, BT6. Thicknesses ranged between 1 and 1.5 mm (0.040 and 0.060 inches). Internal hat-shaped stiffeners of BT1 reinforce the structure, circumferentially. Along sections "a" and "b", the structure is joined by bolts which effect a pressure-tight seal. Thus, the structure was assembled from three separate sections — a truncated conical section, a center cylindrical section, and a full conical section. The BT6 forging with inlets, nipples and tubing is joined to the extreme end of the truncated section; the OT4 sheet alloy is joined to the extreme end of the other section.

(U) With respect to materials and fabrication techniques, this structure differs little from the internal structure of the Mercury or the command module of the

Gemini; however, the shape illustrated differs radically from the US vehicles, which are structured to effect ballistic re-entry.

(U) Although radically different from the Apollo command module in materials used (stainless steel and aluminum alloy) and in fabrication technique used (brazing and adhesives), the Soviet structure shares one feature with these US vehicles — the three-section breakdown.

(U) In 1958, Ye. G. Antonov co-authored, with prominent Soviet aerospace people in an unavailable issue of "Aviatsionnaya Promyshlennost", an article on weld planishing thin-sheet structures. This work was indicative of liquid-propellant tankage fabrication. In 1963, Antonov again co-authored with aerospace people, this time publishing on the welding of low-alloy, high strength steel pressure vessels. This effort is indicative of solid-propellant missile casing fabrication. Finally, Antonov in a footnote to the current article, credits three individuals (Matveyev, Frolov, and Iglenkov) with having originally directed the fabrication of the structure shown in Figure 1. Two of these names, Matveyev (A. P.) and Frolov (V. F.) were associated with liquid-propellant missile activity at a Kuybyshev plant in the 1956-1958 time period. ~~(The overall classification of this item is SECRET.) (Gp 3 Normal - Downgraded at 12 year intervals; not automatically declassified.) (NO FOREIGN DISSEM, except UK, Can, Aus, NZ and NATO.)~~

2. (U) ELECTRONIC COMPLEMENT OF BADGER A AND B AIRCRAFT
Mr. F. A. Stelzer (TDEEO)

(U) Information received from a variety of sources has provided a better understanding of the electronic complement carried by the Soviet BADGER A and B aircraft.

(U) Available evidence indicates Soviet aircraft of the same type and model are not necessarily equipped identically. This is especially true for older aircraft which are still in an operational status. As newer electronic systems become available, and retrofits take place, a "standard configuration" becomes more difficult to define. This item provides the most probable electronic complement of Soviet BADGER A and B aircraft for this time period. This listing includes some new equipments which augment or replace the original aircraft fit.

BADGER A

(U) Communications

VHF	RSIU-4 or RSIU-5 (2 sets)
HF liaison	RSB-70 transmitter, and RPS receiver
HF command	RSB-70M transmitter and US-9D receiver
Intercom	SPU-10
Emergency survival radio (MF)	AVRA-45

(U) Navigational Aids

Radio compass	ARK-5 (2 sets)
Radio altimeter (low altitude)	RV-2
Radio altimeter (high altitude)	RV-17M
*DME	SD-1
*Marker beacon receiver	MRP-48P
*ILS - Course receiver	KRP-F
- Glide path receiver	GRP-2
SVOD navigation and landing aid	Limited fit; alternate to SP-50
Directional gyro	GPK-52
Gyromagnetic compass	DGMK-7
Dead reckoning computer	NI-50B
Sun compass	DAK DB5
Hyperbolic nav aid (MOON)	SPI-3M (limited fit)

(U) *Combination of DME, marker beacon receiver and ILS is referred to as the SP-50 Instrument Landing System

(U) Radar Equipment

IFF	SRO-2 (SRO-1 may be additional in some aircraft)
BEE HIND tail radar	PRS-1
Bomb/nav radar	RPB-4 (MUSHROOM) in some aircraft, others may carry an improved radar with K-band channel (possibly SHORT HORN)
Passive tail warner	SIRENA-2
Rendezvous beacon	

(U) Electronic Countermeasures

Chaff (2000 lb)	60-mc through X-band
Warning and set-on receivers	VHF/UHF, L, S and X-bands
CW and swept noise jammers	VHF/UHF, L, S, and X-bands
IR flares	
HF through X-band ferret receivers	

(U) Miscellaneous

Autopilot	AP-52M

(U) The total weight of electronic equipment (less ECM) is 3000 pounds. Weight of ECM (including 2000 lb chaff) is 4050 pounds.

(U) The electronic fit for BADGER B is essentially the same as that of the BADGER A except that an additional radar station is used to control the AS-1 (KENNEL A) 55 NM ASM. Total weight of electronic components for the BADGER B (less ECM) is approximately 3650 pounds.

(U) The comprehensive electronic complement of these aircraft clearly implies that the Soviets realize the important role of electronics in modern warfare. The quality and sophistication of this equipment does not necessarily represent the ultimate in their state-of-the-art, for they are continously striving to improve known systems and to develop new ones. With the development of new equipments, the component listing for these aircraft probably will continue to change. ~~(The overall classification of this item is SECRET.) (Gp 3 Normal - Downgraded at 12 year intervals; not automatically declassified.) (NO FOREIGN DISSEM, except UK, Can, Aus, NZ and NATO.)~~

3. (U) ELECTRONIC EQUIPMENT FOR "EXPORT" VERSION OF BADGER A AND B

Mr. F. A. Stelzer (TDEEO) E.O. 13526, section 3.3(b)(1), 50X1 has provided information concerning the electronic fit of BADGER A and B aircraft which have been released to countries outside the USSR. (U) This item presents an initial listing of the electronic complement of these aircraft.

(U) Communications

VHF	One set of RSIU-3M (set consists of 1 transmitter and 2 receivers) or one set RSIU-4P
HF liaison	One RSB-70 transmitter and US-9 receiver

(U) Communications

HF command	One RSB-70M transmitter and US-9D receiver
Intercom	SPU-10
Emergency survival radio (MF)	AVRA-45 (500 kc/s)

(U) Navigation Aids

Radio compass	ARK-5 (2 sets)
Radio altimeter (low altitude)	RV-2
Radio altimeter (high altitude)	RV-17M
*DME	SD-1
*Marker beacon receiver	MRP-48P
*ILS - Course receiver	KRP-F
- Glide path receiver	GRP-2
Directional gyro	GPK-52
Gyromagnetic compass	DGMK-7

(U) *Combination of DME, marker beacon receiver and ILS is referred to as the SP-50 Instrument Landing System

(U) Radar Equipment

IFF	SRO
BEE HIND tail radar	PRS-1
MUSHROOM bomb/nav radar	RPB-4
Passive tail warner	SIRENA-2

(U) Camera Equipment (some aircraft)

Daylight vertical & oblique	AFA-33/100M, AFA-33/75M, AFA-33/50M
Nighttime survey	NAFA-35/50
Radar scope photography	FA-RL-1

(U) Miscellaneous

Autopilot	AP-52M

(U) The total weight of electronic equipment (less camera) is 2650 pounds. Total weight of cameras and mounts is 900 pounds.

(U) The electronic fit in the export version of BADGER B (Tu-16KS) is essentially the same as that of the BADGER A, except for the addition of the K-2M missile guidance radar station used to control the AS-1 (KENNEL A) 55 NM ASM. Total electronic weight for the export BADGER B is approximately 3200 pounds.

(U) No references were made to installation of any ECM equipment, including chaff, and it is doubtful that the export BADGERs are ECM-equippped.

(U) The electronic fit of these aircraft cannot be compared to that of similar US aircraft. In fact, it is probably a considerably inferior complement when compared to the same type of aircraft which is flown by the Soviet Air Force. The Soviets tend toward exporting older equipment and retaining newer hardware for themselves. ~~(The overall classification of this item is SECRET.) (Gp 1 - Excluded from automatic downgrading and declassification.) (NO FOREIGN DISSEM)~~

4. (U) ANALYSIS OF UNKNOWN BALLOON
Capt J. E. Wanamaker (TDEEO)

FTD recently received a balloon of unknown origin which was found by the Swedish Air Force. Indications are that a number of these have been found in southern Sweden; on occasion unidentified tracks have been picked up on radar in the general area where these were found. However, interceptors were unable to locate any targets.

The balloon deflated is approximately 15 feet long and 6.5 feet across. It is rectangular, the open end is gathered and it terminates in a cardboard cylinder of 4 inches diameter and 7 inches long. The cylinder is wrapped in cord which also is used to secure a small rectangular bag (14 x 10 inches) to the balloon. The entire device is of simple functional construction normally considered expendable. It has no unusual protuberances or attachments to show that it might have lifted anything other than the possible contents of the attached bag.

Radar reflectivity tests at S and X-bands indicate that both the balloon and bag are essentially nonreflective. Reflectivity is so low as to cast doubt on the possibility of its being tracked by radar.

Infrared spectrophotometric analysis of both balloon and bag revealed that the material was a common uncoated polyethylene plastic giving no clue as to the manufacturer.

It is concluded that the balloon was a simple device of inexpensive material that was not intended to be recovered by the launchers. It was not an experimental entity in its own right, but was merely a vehicle used to lift another device, probably scientific instruments contained in the attached bag.

which was subsequently jettisoned and recovered. It is doubtful if the objects tracked by the Swedish Air Force radar were balloons of this type. No definite determination of the country of origin is possible.

In August 1963, another radiosonde balloon released in Sweden was recovered in Alaska. The two balloons are definitely not the same type.

The balloon recovered in Alaska was about 100 feet long including reflectors, parachute and instrument packages: the balloon itself was approximately 65 feet long and had a diameter of 25 to 35 feet.

The balloon and instrument packages recovered in Alaska were constructed so that when the instrument packages separated and parachuted free, the corner reflectors remained with the balloon. Apparently, no corner reflectors were provided for this unknown balloon; at least, none was recovered.

The unknown balloon had a plastic bag attached for the payload package, while the balloon recovered in Alaska did not. (The overall classification of this item is ~~SECRET.~~) ~~(Gp 3 Normal - Downgraded at 12 year intervals; not automatically declassified.)~~ ~~(NO FOREIGN DISSEM)~~

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