CONFIDENTIAL

FACT SHEET

OCRD/Communications-Electronics Div
[redacted]
14 February 1962

25X1

SUBJECT: SD-5 Drone Characteristics and Capabilities

PURPOSE

The purpose of this fact sheet is to provide information on the SD-5 drone in connection with a briefing on 14 February 1962 for Dr. J. V. Charyk, the Under Secretary of the Air Force, and Dr. E. G. Fubini, Director of Research, ODDR&E.

FACTS

1. (U) Description: The SD-5 is an Unmanned Aerial System being developed for long range surveillance, target acquisition, aerial mapping photography, and delivery of chemical and biological warfare (CW/BW) agents. The complete system includes mobile ground support equipment for check out, launch, navigation and guidance, receipt of transmitted data, recovery, transport, and maintenance. The airframe can carry radar, infrared, or camera sensory devices and wing tanks for CW/BW agents. It is launched from a "zero-length" launcher and recovered by parachute. A jet engine, inertial navigation system, and terrain avoidance radar permit long distance flights at very low altitude and high subsonic speed.

2. (C) Drone Characteristics:

Length	-	36.7 ft
Weight - (Take-off)	-	8,500 lbs (including 4,000 lbs fuel)
Speed	-	Mach.75 (500 knots) at sea level
Endurance	-	$1\frac{1}{2}$ hours at sea level (allows 300 mile flight, 20 minute surveillance mission, and return)
Payload	-	Sensors - 450 lbs CW/BW - 1600 lbs with 278 mile radius 3200 lbs with 105 mile radius

CONFIDENTIAL

Downgraded at 3 year intervals
Declassified after 12 years

OCRD FILE COPY

CONFIDENTIAL

CRD/R
SUBJECT: SD-5 Drone Characteristics and Capabilities

3. (C) High Altitude long range capabilities:

a. Design, based on present engine, 250 # payload:

Range	-	3100 nautical miles, ship launch 3300 nautical miles, air launch at 40,000 ft
Altitude	-	Cruise-climb from 40,000 ft initial to 52,000 ft final
Speed	-	Average 500 knots

b. Refinement based on flight test data and incorporating 10% increase in engine thrust (available from Pratt & Whitney in 2 months):

Range	-	3400 nautical miles, ship launch 3500-3600 nautical miles, air launch
Altitude	-	40,000 ft to 57,000 ft
Speed	-	Average 500 knots

c. Provision for a 450 lbs payload would reduce above ranges by about 100 miles.

d. Deletion of recovery system and substitution of fuel would add 300 to 400 miles of range.

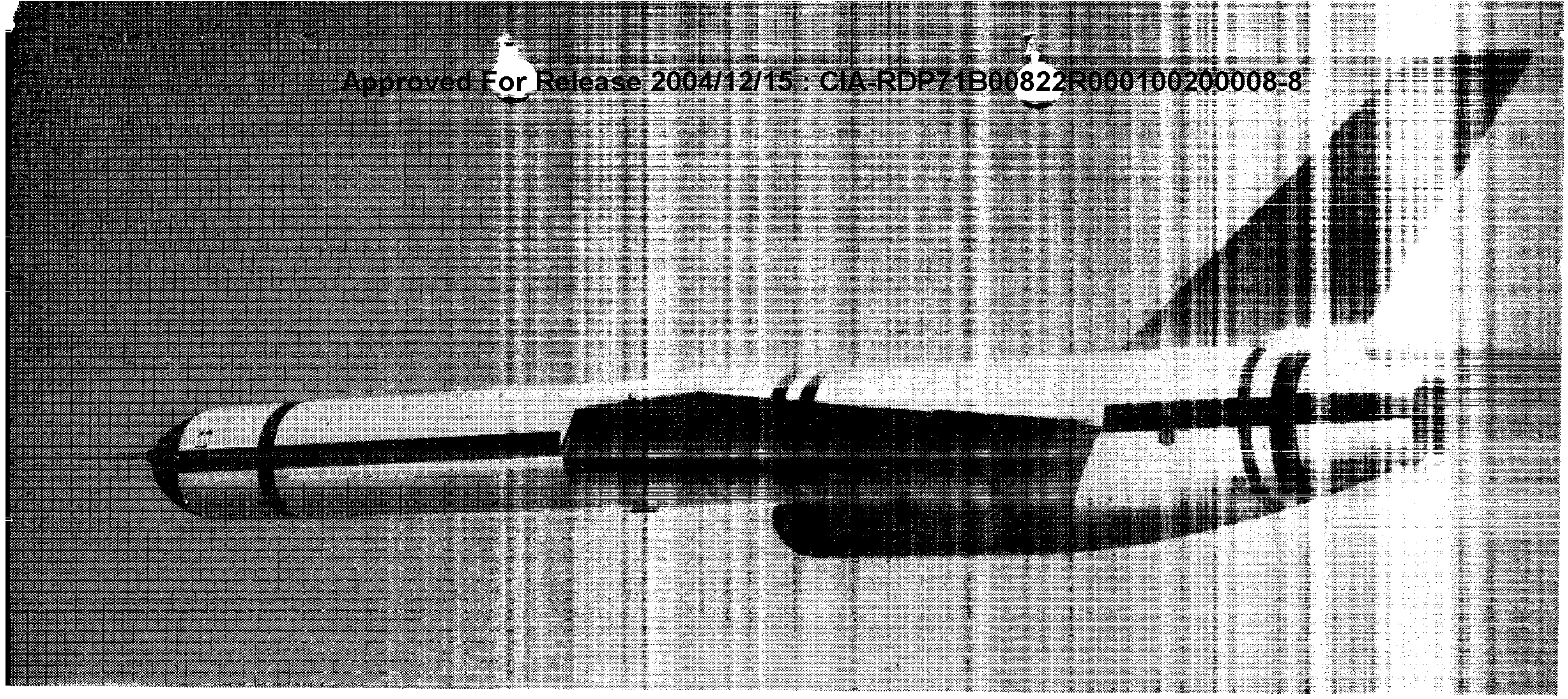
SIGNED

F. F. QUIST
Colonel, GS
Chief, Communications-Electronics

INITIALS	
Action Officer	-----
Branch Chief	-----
Div Chief	-----
Director	-----

CONFIDENTIAL

Declassified after 12 years
DOD Dir 5200.10



SD-5 returns to predetermined area after mission and dumps remaining fuel before recovery.

$75-million outlay . . .

SD-5 May Decide Fate of Drones

Fairchild's sophisticated bird could have many uses; support needs simplifying

by Charles D. LaFond

YUMA TEST RANGE, ARIZ.—The future of long-range high-performance military drones may rest with the *AN/USD-5* Surveillance Drone now in final development.

After nearly 5 years' effort and over $75 million investment by the Army, even the staunchest drone advocates believe that engineering model tests over the next few months must show a success. Otherwise, they see the end of a requirement for such a vehicle for at least the next 5-10 years.

The *SD-5* program got a boost last week when the drone successfully completed a high-altitude, long-range R&D flight under control of its Inertial Navigation System. Another recent attempt to test the INS system had been scrubbed just before launch due to guidance troubles. Earlier short-duration INS flights were completely successful, according to Walt Schafer, Fairchild Director of Engineering.

Prime contractor for the program is Fairchild Stratos Corp. Command and control electronic subsystems are being developed by the company's Electronic Systems Division, at Wyandanch, L.I., N.Y.; airframe, launcher, other ground support, and systems integration is being carried out by the Aircraft-Missiles Division at Hagerstown, Md.

The Signal Corps contract is being performed under the supervision of the Army Combat Surveillance Agency with technical direction by the Signal Research and Development Lab at Fort Monmouth, N.J.

Scheduled now to be operational in late 1963, the turbojet-powered unmanned aircraft is designed for the primary mission of supporting tactical *Pershing*-class missile systems.

Reportedly capable of flying distances exceeding 2000 miles at altitudes of from a few hundred feet to over 35,000 ft., the highly sophisticated drone obviously could perform many other military or even non-military functions.

Under flight-testing since mid-1960, the *SD-5* so far has had 13 successful flights, 2 partials and 4 failures.

Success of current test flights will go a long way in proving the polygamic marriage of the guidance and control system, terrain avoidance radar and the electronic recovery subsystems.

Success also may add impetus to a program that has slipped at least six months behind schedule.

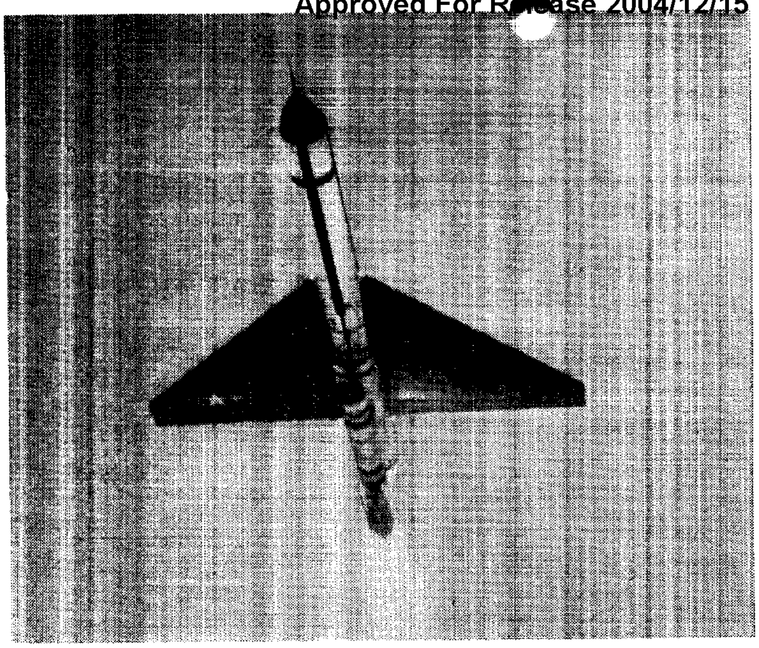
• **Multi-sensor package**—One-third of the *SD-5's* 36-ft. length is designed to carry surveillance equipment. The nose of the airframe carries the TARA, or Terrain Avoidance Radar, built by Texas Instruments, Inc.

Also included in the forward section is a KA-30 or T-11 reconnaissance camera, an infrared sensor system (AN/AUS-5) and SLAR, side-looking radar. Both SLAR and the IR equipment were also developed by Texas Instruments. Other subsystems which might be carried include radiological detection and measuring devices, chaff dispensers, meteorological instruments, and in-flight film processing equipment.

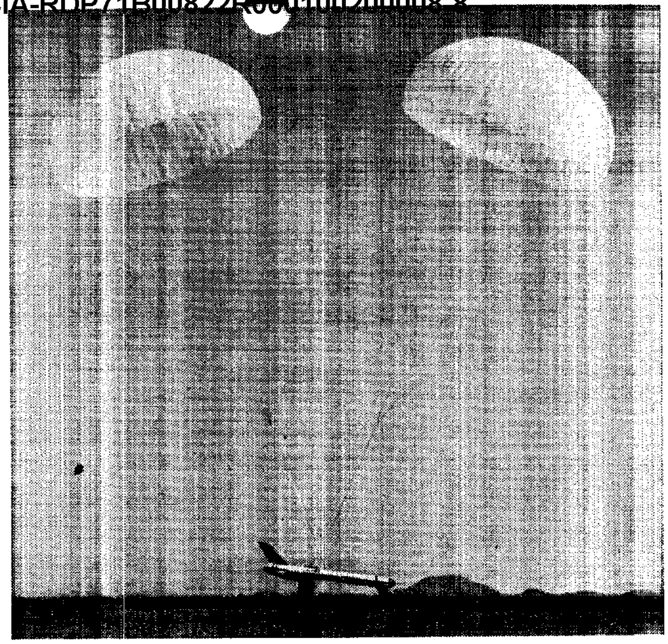
A UHF data link for line-of-sight communication between the drone and ground are provided, as well as a reverse data link, which employs a transponder, for beyond line-of-sight transmissions from ground control.

The remaining length of the bird contains a highly sophisticated Inertial Navigation System (INS), Flight Control Unit (FCU), CAT (Command and Triangulation system), cooling system, hydraulic-driven alternator and auxiliary electrical power, and the propulsion system.

To lift the 4.5-ton vehicle from its zero-length launcher, a 4000-lb.-thrust solid-propellant booster is used. Devel-



SHORTLY AFTER LAUNCH, 4000-lb.-thrust solid booster drops off. J60 3000-lb.-thrust engine then supplies power.



MOMENT OF TRUTH—Just before touchdown, vertical swing is negligible. Impact on all three bags occurs simultaneously.

oped by Picatinney Arsenal the booster is dropped from the air-frame shortly after launch.

About the end of the booster nozzle is a jetavator which permits ±5° vector control in the pitch axis.

Principal power is derived from a J60 Pratt & Whitney 3000-lb.-thrust turbo-jet engine. (It is worthy of note that the auxiliary-power alternator energized with ground power is used as the engine starting motor.)

Fuel for the big engine is carried in each Fiberglas-honeycomb wing. The outer skin of the wings is also fabricated from Fiberglas.

The drone fuselage presently is of aluminum. However, Fairchild is now studying other materials including Fiberglas for the outer skin.

• **Guidance and control**—Heart of the guidance system for the *SD-5* is the INS. It consists of a three-gyro stabilized platform, developed by Minneapolis-Honeywell, and a digital processor and programer, developed by Hughes Aircraft. A drum-type memory unit is employed for programing complete flights.

All test vehicles are provided with a radio command backup to assure ground or chase-plane control if necessary.

TARA, with its altitude determining radar and computer subsystem, supports the INS. In the "hug" mode, it provides clearance-over-terrain data to the INS. For other missions, it provides override commands to the Flight Control Unit for obstacle clearance.

Besides its navigational function from launch to return to recovery area, the INS programer directs all the sensory subsystems over appropriate target zones. Flight paths over targets may be anything from a single pass over a specific area to a sweep pattern covering a whole zone.

Electronic outputs from the various sensors may be directed through the INS to a Flight Data Processor. From the processor, data can be presented in a cathode-ray tube and photographed for storage, and/or they can be transmitted via the uhf data link to ground stations for readout and storage.

Upon return to the recovery area, the master control station acquires flight control of the drone with CAT, the Command and Triangulation system. Essentially a short-range radio command and locating system, it employs a uhf slave receiving station and an Army BasicPac Mobile Computer (built by Philco) to bring the bird into a relatively small drop zone and to initiate the recovery system.

• **Recovery and reuse**—Fairchild's recovery system is elegantly simple, but remarkably effective. Engineers here at the Drone Test Range said that to date no failures have been attributed to this system.

Just before initiating the recovery system, all remaining fuel is dumped from outlets on the wing tips. Contained in the fuselage on the topside of the drone are two 78-ft. parachutes. Upon release, they are each pulled rearward on either side of the rudder by a small pilot chute and a larger drogue chute. The mainchute lines are restrained until the chutes are evenly filled and fully elongated. The restrainer is then cut automatically and the twin chutes open fully.

At the same time three double concentric pneumatic bags are released and inflated: one protruding downward from beneath the drone nose and one bulging below each wing. Each bag contains a smaller inflated bag.

On impact with the ground, blowout patches in each of the outer landing bags release air and thus cushion and help stabilize the vehicle. The inner bags remain intact, keeping the vehicle at a safe height above ground.

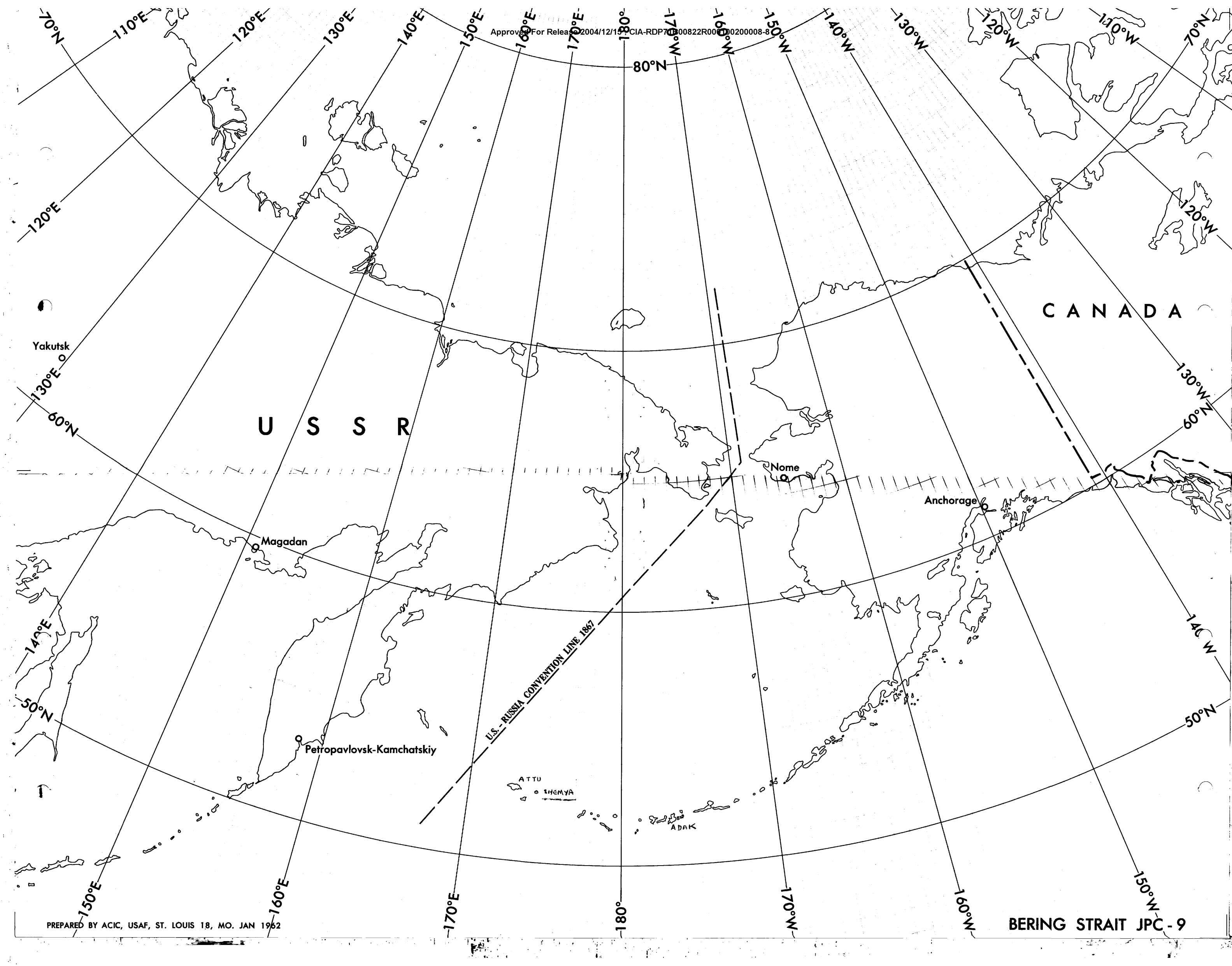
After a short delay (roughly 20 sec.) an impact switch releases the parachute assembly.

With relatively simple maintenance and repacking, refueling, and checkout the drone should be ready for its next mission.

• **What next?**—R&D tests of the all-weather drone will continue for some time yet. The next major step in the program is to study and determine operational requirements for the system.

Another aspect bound to receive more study are various applications for these drones. A drone of this type offers an inherent capability for dispersal of chemical and biological agents, dispensing of bomblets, and delivery of high-priority cargo—as well as other applications already alluded to, such as surveillance and photogrammetry.

Much work remains to be done in minimizing requirements for the launch and flight control complex maintenance and checkout systems needed to support the *SD-5*. Overcomplication on the ground could negate all the designed flexibility of the bird. The overall system must be as mobile and must react just as fast as the Army units whom it may someday assist. ⌘


U S S R
C A N A D A
Yakutsk
Magadan
Petropavlovsk-Kamchatskiy
Nome
Anchorage
ATTU
SHEMYA
ADAK
U.S. - RUSSIA CONVENTION LINE 1867
80°N
70°N
60°N
50°N
110°E
120°E
130°E
140°E
150°E
160°E
170°E
180°
170°W
160°W
150°W
140°W
130°W
120°W
110°W
PREPARED BY ACIC, USAF, ST. LOUIS 18, MO. JAN 1962
BERING STRAIT JPC-9