GRUMMAN AEROSPACE CORPORATION
BETHPAGE • NEW YORK 11714

8037

THE OV-1D MOHAWK SURVEILLANCE SYSTEM

OV-1A

VISUAL + PHOTO SYSTEM

OV-1B

VISUAL + PHOTO SYSTEM + SLAR

OV-1C

VISUAL + 2 PHOTO SYSTEMS + IR

OV-1D

VISUAL + 3 PHOTO SYSTEMS + SLAR or IR + RADIAC METER

THE MOHAWK SURVEILLANCE SYSTEM

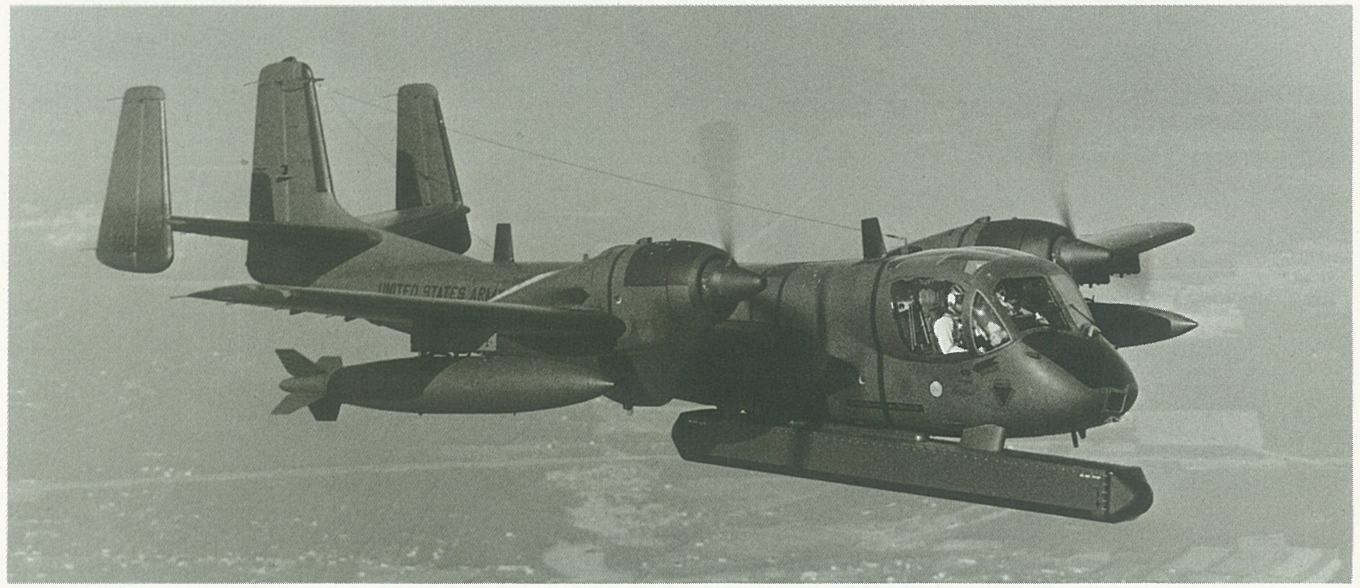
The OV-ID Mohawk is a completely integrated battlefield surveillance system that supplies the army field commander with information on the strength, disposition, and activity of enemy forces. This two-place, twin turboprop aircraft is equipped with photographic and electronic sensors which are capable of monitoring enemy operations in daylight, darkness and inclement weather. The OV-ID is ruggedly designed to operate from small unimproved fields in forward battle areas and is capable of being maintained without extensive support equipment.

The external appearance of this latest Mohawk is deceptively similar to the "A," "B" and "C" versions, but rapid reconfiguration provisions enable a single OV-ID to perform the surveillance functions of any previous Mohawk. In less than an hour, three photographic systems can be installed (or removed) and the radar and infrared systems can be interchanged. Thus the "D" can be quickly missionized in response to the field commander's varying intelligence requirements.

Several additional features were incorporated in the OV-ID to significantly enhance its surveillance capabilities. These include:

- An automatic data annotation system for complete identification of all sensor imagery
- A more accurate navigation system (inertial)
- Improved infrared and radar performance and displays
- A vertical panoramic camera system that photographs terrain from horizon-to-horizon
- A radiological monitoring system
- An aural recorder for transcribing the crew's descriptions of visual observations
- ECM equipment to provide greater assurance of mission success

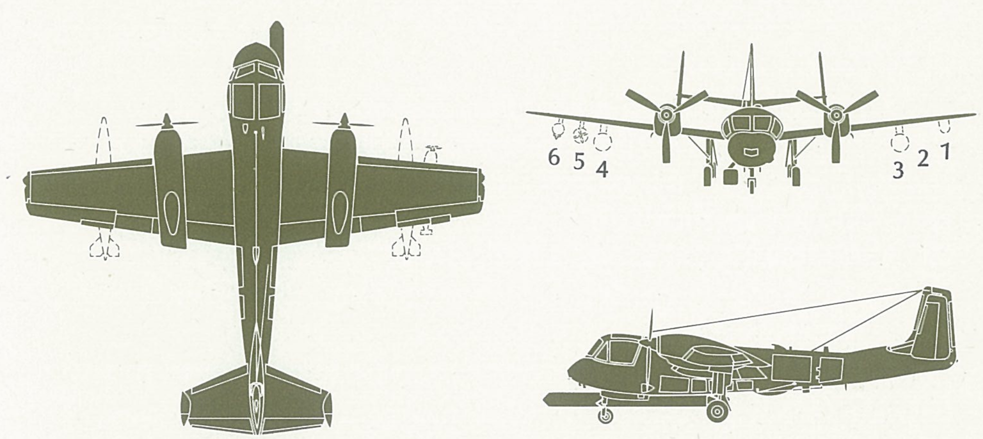
Significant improvements have also been made in the areas of engine power, wing and landing gear strength, equipment accessibility, communications and cockpit instrumentation.



WING AREA	360 SQ FT
POWER PLANTS	TWO LYCOMING T53-L-701
TAKE-OFF POWER	1400 ESHP EACH
PROPELLERS (10 FT DIA)	TWO HAMILTON STANDARD 53C51-27
FUEL CAPACITY -INTERNAL	276 GAL
-EXTERNAL	300 GAL

STORES

STATION NO.	STORE
1	ECM POD
2	EMPTY
3	150 GAL FUEL TANK
4	150 GAL FUEL TANK
5	LS-59A PHOTO FLASHER
6	ECM POD



WEIGHT SUMMARY	MISSION CONFIGURATION SLAR/PHOTO	IR/PHOTO
Structure	5,260 lb	5,260 lb
Propulsion	2,840	2,840
Electronics group (including ADAS and radar warning system)	1,183	1,183
Passive defense (armor provisions, flak curtains, bullet-resistant glass)	216	216
Fixed equipment	2,555	2,555
Total Weight Empty	**12,054 lb**	**12,054 lb**
Crew (2)	400	400
Internal fuel (276 gallons)	1,794	1,794
Photographic equipment (daylight)	219	219
SLAR equipment	750	—
IR equipment	—	553
ECM wing pod (station #1)	44	44
ECM wing pod (station #6)	183	183
Oxygen installation	51	51
Miscellaneous	246	246
Total Useful Load	**3,687 lb***	**3,490 lb***
Take-Off Gross Weight (Basic Mission)	**15,741 lb***	**15,544 lb***
Drop tanks (2), full fuel (150 gal. each)	2,368	2,368
Take-Off Gross Weight (Extended Mission)	**18,109 lb***	**17,912 lb***

**Data transmission system (JIFDATS) and 320 lb of armor not included.*

PERFORMANCE SUMMARY (at sea level and basic mission take-off gross weight unless otherwise indicated)

	SLAR/PHOTO	IR/PHOTO
Maximum speed at MRP, 10,000 feet, level flight, 40% fuel	251 kt	265 kt
Stall speed, landing config, 10% NRP, 60% fuel	73 kt	72 kt
Take-off distance over 50 foot obstacle	1175 ft	1145 ft
Landing distance over 50 foot obstacle, 60% fuel	1060 ft	1050 ft
Rate/climb, MRP, two engines	3466 fpm	3618 fpm
Service ceiling, 80% fuel	25,000 ft	25,000 ft
Endurance at 140 knots, 5000 feet, 10% fuel reserves	1.96 hr	2.04 hr
Max endurance (140 knots avg, 15,000 feet)	4.35 hr	4.54 hr
Range, 20,000 feet†	820 n mi	878 n mi
— Time	4.03 hr	4.11 hr
— Average speed	207 kt	217 kt

†With two 150 gallon external tanks, full fuel.

SURVEILLANCE, DATA ANNOTATION & TRANSMISSION

The OV-1D Mohawk can perform all the surveillance missions of previous Mohawks (visual, photographic, radar and infra-red) with greater photographic coverage, improved SLAR and IR performance, and expanded data annotation for all sensors.

Quickly interchangeable (60 minutes) SLAR and IR systems and three easily removable photographic systems permit this aircraft to be rapidly configured for photographic, SLAR/photographic or IR/photographic surveillance.

Photographic Surveillance Systems

The OV-1D is equipped with three independent photographic systems, all of which have automatic exposure controls and can be operated by either the pilot or observer: two KA-60C, 180 degree, panoramic camera systems which are used at altitudes below 5,000 feet; and one KA-76( ) serial frame camera, whose four interchangeable lens cones (1¾″, 3″, 6″, 12″) permit it to be used at any altitude. When an electronic flasher pod is carried, the KA-76( ) can also be used for low level night photography.

One of the panoramic cameras is mounted in the nose, aimed forward, 20 degrees below the horizontal. The KA-76( ) is installed on an actuator in the aft fuselage. A selector switch in the cockpit permits this camera to be rotated laterally to any of five positions (15 and 30 degrees left and right, and 90 degrees below the horizontal). Except for data annotation provisions, these two camera installations are the same as those of the OV-1C Mohawk. The second panoramic camera system, however, is a completely new installation. It is mounted in a fuselage blister aft of the KA-76( ), with its optic axis 90 degrees below the horizontal.

A CRT in each of the three camera systems exposes each film frame to real time navigation data and other identifying information from a central data annotation system. The previously used KA-60 panoramic cameras were not equipped for film annotation, and the earlier serial frame cameras (KA-76 and KA-30) provided only time, sortie, and pilot identification.

The data annotation system also supplies each photographic system with a V/h signal for automatic control of camera pulsing, film speed, image motion compensation, and overlap along the flight line.

When operating at an altitude of 2000 feet, the vertical KA-60C and KA-76( ) cameras are capable of photographing flight lines of 120 miles and 220 miles in length respectively with 60 percent overlap.

When flying above 5000 feet (the operating limit of the radar altimeter) or if the automatic V/h signal fails, a synthetic V/h signal is selected by the observer. The observer can also initiate all photo systems manually to obtain additional pictures during automatic modes or to select targets of opportunity when the cameras are in standby.

The windows of all cameras are constructed of optical quality plate glass and both vertical camera windows are protected by doors which close automatically when these photographic systems are de-energized.

Infrared Surveillance System

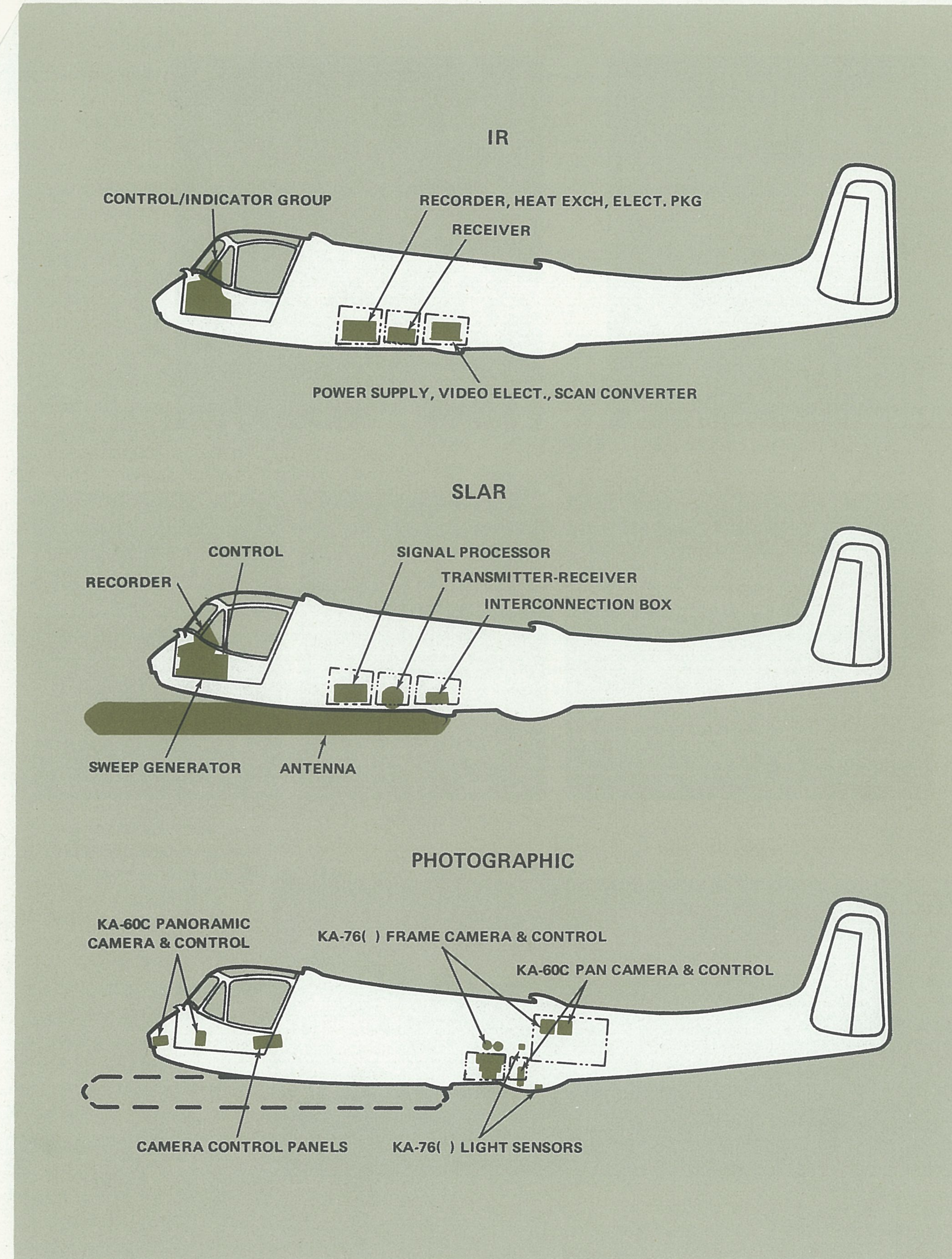
The AN/AAS-24 surveillance system displays and records a continuous, real time image of terrain beneath the aircraft by electronically detecting and reproducing thermal differences in terrestrial objects.

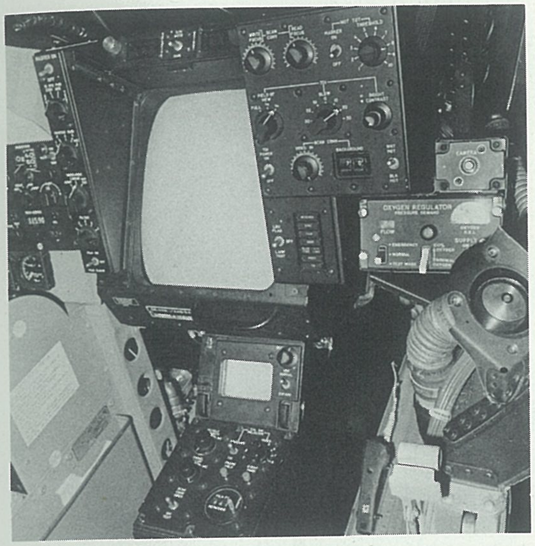
The system basically consists of a high resolution, electronically roll-stabilized receiver, a cockpit display/control console, and a remote film recorder. Minute variations in thermally emitted (infrared) light are detected as the receiver scans its field of view in a rapid succession of line sweeps. These variations are converted to electronic signals (video) and sent simultaneously to the cockpit console and the film recorder. In the recorder, a continuous pictorial image of the terrain is imprinted on five inch wide film together with identifying data from the OV-ID's central data annotation system. The same image appears on a large TV-like screen in the cockpit console, simulating a view through the bottom of the aircraft. Console controls permit the observer to slew and expand the field of view, adjust gain, and mark the film at points of interest.

Improvements over the AN/AAS-14 system used in earlier OV-IC Mohawks include:

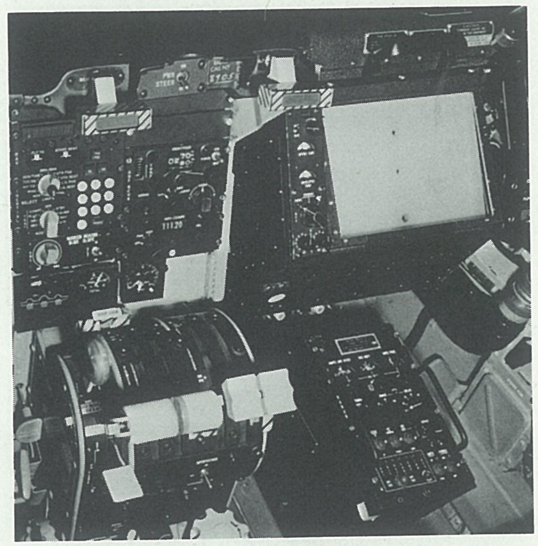
- Improved resolution
- Single, large, TV-type display (10.5 in x 8.5 in)
- In-flight selection of video transfer functions and filters
- Automatic marking of hot targets on film
- Image freeze mode to stop the moving scene for closer examination

In addition to these performance improvements, the AN/AAS-24 is modularly packaged for quick interchangeability with SLAR equipment and has built-in test features to facilitate flight or ground checking and isolation of faults to aircraft replaceable assemblies.

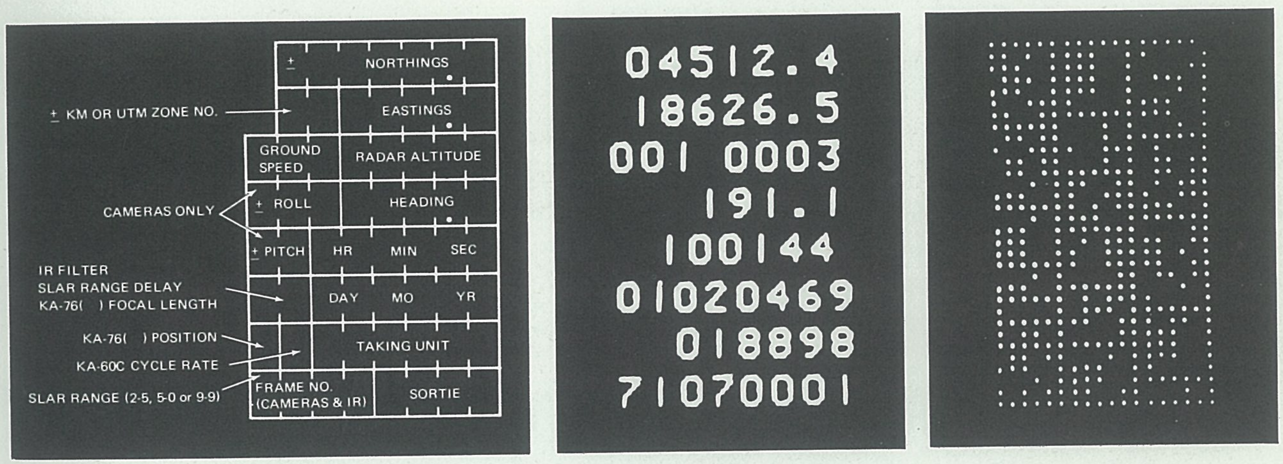




IR DISPLAY / CONTROL CONSOLE



SLAR DISPLAY / CONTROL CONSOLE



AUTOMATIC FILM ANNOTATION

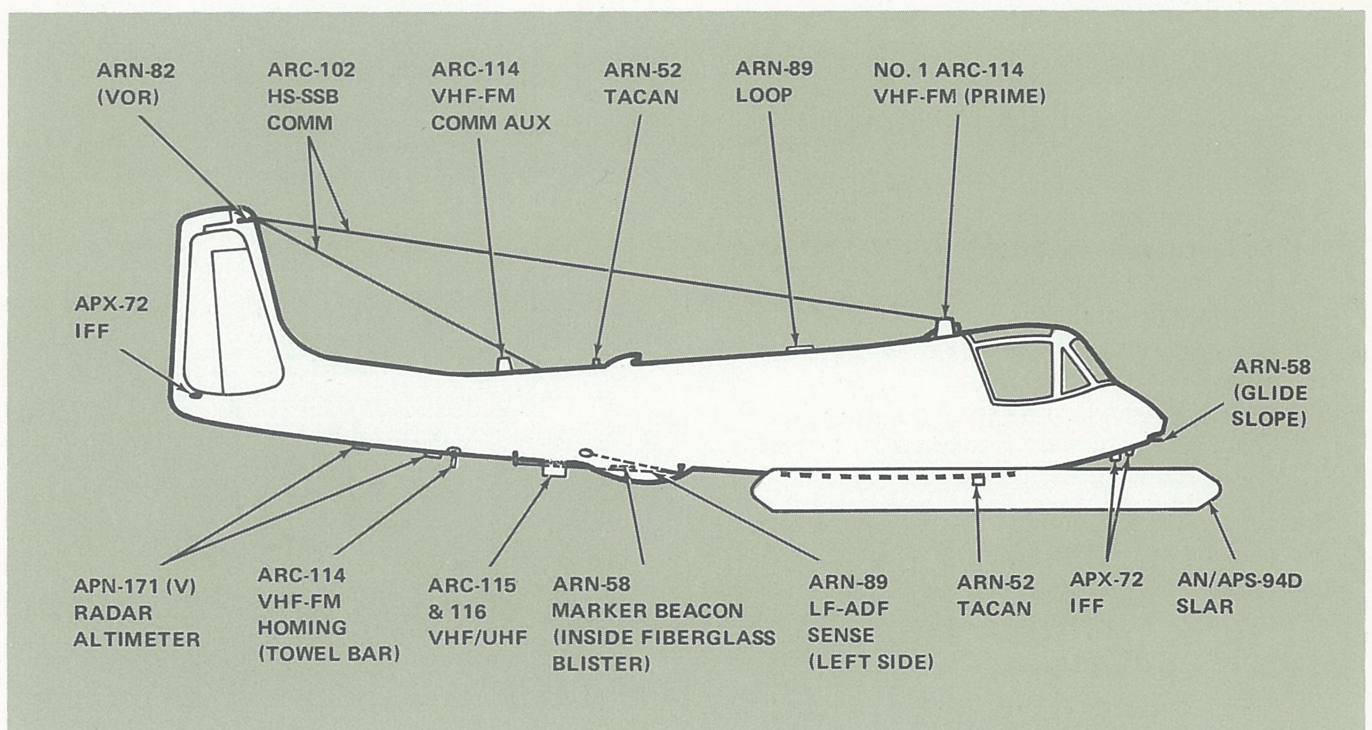
FWD PAN CAMERA PHOTO

COMMUNICATION

Radio Transceiver	Type	Freq Range MHz	No. Channels	Min Power, Watts
AN/ARC-102	HF-SSB	2-30	2800	100
AN/ARC-114 (two)*	VHF-FM	30-75.95	920	10
AN/ARC-115	VHF-AM	116-149.975	1360	10
AN/ARC-116	UHF-AM	225-399.95	3500	10

Interphone and Radio Control System
Both crew members are provided with identical control panels of the C-6533/ARC intercom, and headsets of the radio control system. These facilities permit the pilot and observer to: talk or receive on different transceivers simultaneously; independently monitor any or all communications and navigation receivers; and receive aural signals from the IFF, radiac, voice warning, and radar warning systems. ICS stations at the forward and aft camera installations permit two-way communication with the cockpit for ground checking.

Radio Communication
Five, solid-state, digital-tuned radio transceivers are available to the pilot and observer via the ICS, for two-way communication with ground stations, naval vessels, and other aircraft. These include VHF-FM, VHF-AM, and UHF-AM sets (all with separate guard receivers) and an HF-SSB set for long distance communication. Dual VHF-FM transceivers permit static free retransmission. The primary VHF-FM transceiver can also operate in a homing mode, providing signals to the course indicator and the ICS.



Inertial Navigation System
The AN/ASN-86 Inertial Navigation System (INS) provides the OV-1D with several navigational advantages over the doppler/gyrocompass system of previous Mohawks:

- Greater accuracy
- Increased reliability
- Provides position and destination in Universal Transverse Mercator coordinates as well as latitude/longitude
- Eliminates the need to estimate magnetic variation
- Gives cross track deviation in addition to track angle error
- Supplies grid heading to the data annotation system.

The INS basically consists of a gyro stabilized platform for sensing aircraft rotation and acceleration; a computer for determining aircraft flight data; and a control-indicator in the cockpit. The control-indicator provides the pilot with digital read-outs of: aircraft position and destination coordinates; range, bearing, heading and time to destination; ground speed; track angle; wind; and magnetic variation.

As the primary navigation system for the OV-1D, the INS also supplies signals to navigation instruments, the map display, the autopilot, the data annotation system, and the surveillance systems. It provides the flight director with a central reference for roll and pitch data, and supplies the autopilot with true heading for its "Heading Hold" mode as well as steering signals for up to nine pre-selected destinations in "Direct" or "Intercept" modes. Provisions are included to permit TACAN updating.

Radio Navigation Aids
Three radio navigation receivers provide the OV-1D with position identification, homing, and instrument landing capabilities. The LF automatic direction finder (ADF), and the VOR portion of the VOR/localizer, receive signals from LF and VHF omnidirectional transmitting stations. These stations are identified by voice broadcasts and/or coded transmissions heard through the aircraft ICS, while their bearings are displayed on the bearing-distance-heading indicator. Signals received by both portions of the VOR/localizer are sent to the course indicator where course deviation and steering commands are displayed for homing to a selected VOR radial or runway localizer.

NAVIGATION

Radio Receiver	Type	Freq Range MHz	No. Channels
R-844/ARN-58	Glide Slope/ Marker Beacon	329.3-335.0	20
AN/ARN-82	VOR/Localizer	108-117.95 *118-126.95	Continuous
AN/ARN-89	LF-ADF	*100-3000KHz	360

*Serves as emergency communications receiver in this frequency range.

Whenever a localizer frequency is selected on the VOR/localizer, the glide slope/marker beacon receiver is automatically tuned to the local runway glide path transmitter. Glide path information is then supplied to the approach horizon indicator and the autopilot. When the aircraft flies over a marker beacon, the marker beacon receiver activates an amber light on the instrument panel and an aural signal in the ICS.

Flight Director
The AN/ASN-33 flight director consists of a steering computer, a course indicator and an approach horizon indicator. Using information supplied by the inertial navigation system and radio navigation receivers, the indicators display aircraft attitude, magnetic heading, and position relative to radio stations and instrument landing patterns. The computer provides steering signals to the display and the autopilot for executing coordinated turns, maintaining a desired course, or following a landing pattern.

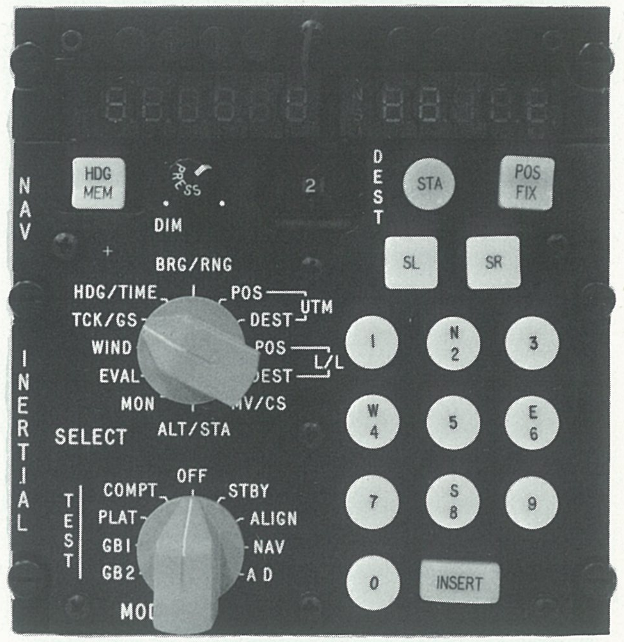
Map Plotter
The PT489/ASQ-104 map readout unit utilizes a movable marker and a six inch wide aeronautical chart strip to provide a real time display of aircraft position.

The movements of the marker and the map are controlled by easting and northing outputs from the aircraft's inertial navigation system. When the marker reaches either side of the chart strip, the map drive automatically moves the adjacent strip into position and the marker is automatically reset to the correct geographical position.

Radar Altimeter
The AN/APN-171(V) is an all weather, pulse type radar altimeter that indicates the aircraft's actual altitude above the nearest object, from zero to 5000 feet. It maintains an accuracy of three percent with stepless resolution even during pitch and roll and over heavy ice and snow. This altimeter is completely immune to doppler effect and will operate reliably over water, from zero to fifty feet, for automatic flight control.

Automatic Flight Control
The AN/ASW-12 automatic stabilizing and flight path guidance system relieves the pilot from the task of continuously monitoring and adjusting aircraft attitude and altitude. The system's vertical gyro, barometric altimeter, and accelerometer work in conjunction with the Mohawk's compass system to detect aircraft roll, pitch, yaw, side slip and altitude changes. As movements are sensed, corrective signals are generated and sent to actuators in the aircraft's flight control systems. Cockpit controls permit selecting various stabilization modes, introducing heading and attitude changes, executing coordinated turns, and coupling the system to radio navigation aids for control of the aircraft's flight path.

TACAN
The OV-1D includes complete provisions for the ARN-52 tactical air navigation (TACAN) set. With this system, range and bearing to selected TACAN stations and air-to-air ranging to any TACAN equipped aircraft within radio line-of-sight is displayed on the pilot's bearing distance-heading indicator (BDHI). The pilot may also select a particular TACAN radial for ground track navigation or couple the TACAN system to the autopilot for automatic flight control. Deviations from the selected radial are then displayed by the course bar and the steering pointer of the course indicator.



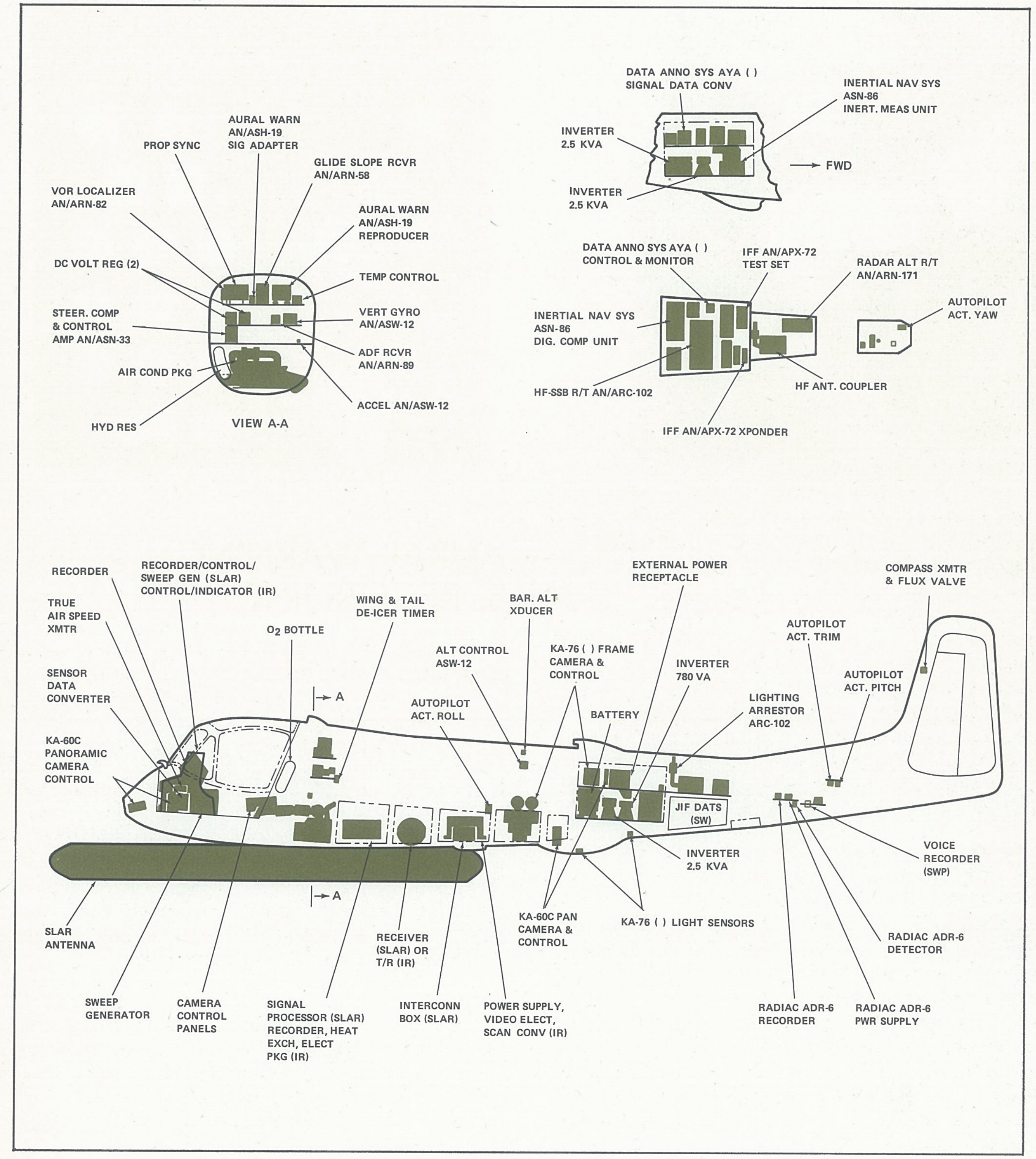
INS CONTROL / INDICATOR

AURAL WARNING & RECORDING

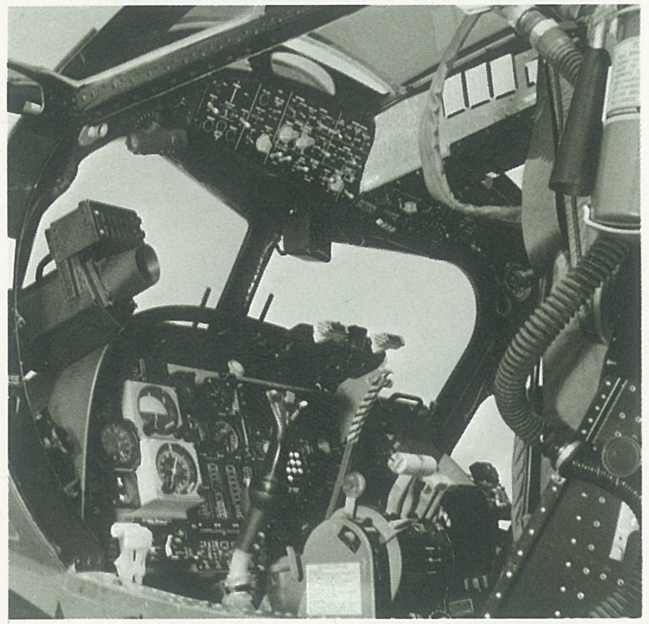
This system basically consists of the ASH-19 aural reproducer and a continous in-flight performance recorder (CIPR) interfaced with the Mohawk's intercommunication system (ICS).

Warning
If one of the aircraft's approximately 50 fault sensors is activated, the reproducer plays one of 20 tape-recorded voice warning messages into the ICS. In case of multiple faults, a programmed priority sequence determines which message will be reproduced. A message is played repeatedly until: the fault is corrected; a higher priority message is activated; or the override switch is thrown.

Recording
The CIPR transcribes all aural activity in the ICS, thus permitting both crew members to record visual observations without distraction. The CIPR's drive starts and stops in response to aural activity. Thus, real time between signals is compressed for rapid mission review.



COCKPIT



Visibility
The bubbled canopy of the Mohawk was specifically designed for optimum visibility. The rounded side hatches provide both crewmen with maximum side and rearward visibility and allow them to see terrain directly under the fuselage. A transparent hatch permits complete vision directly overhead and the fall away nose section gives unobstructed vision 20 degrees down over the nose.

Instruments and Controls
The pilot's instrument panel is logically arranged with all instruments convenient to the pilot and visible to the observer. Navigation instruments are directly in front of the pilot and radio navigation aids are on the upper right. Nine, dual-channel, tape indicators on the lower right permit the pilot to quickly scan all engine performance parameters. The caution panel and pilot's oxygen controls are located on the bottom of this panel.

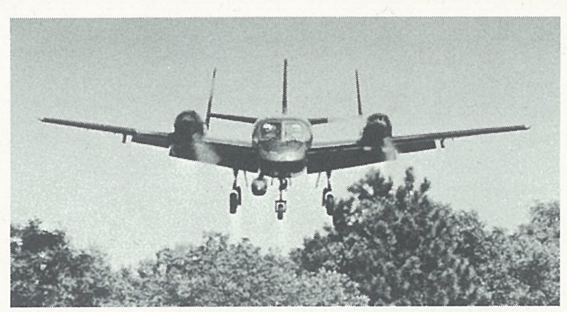
A control and display console (either radar or IR) is installed on the right, in front of the observer. A central engine and flight control pedestal provides one set of control levers, equally accessible to both pilot and observer.

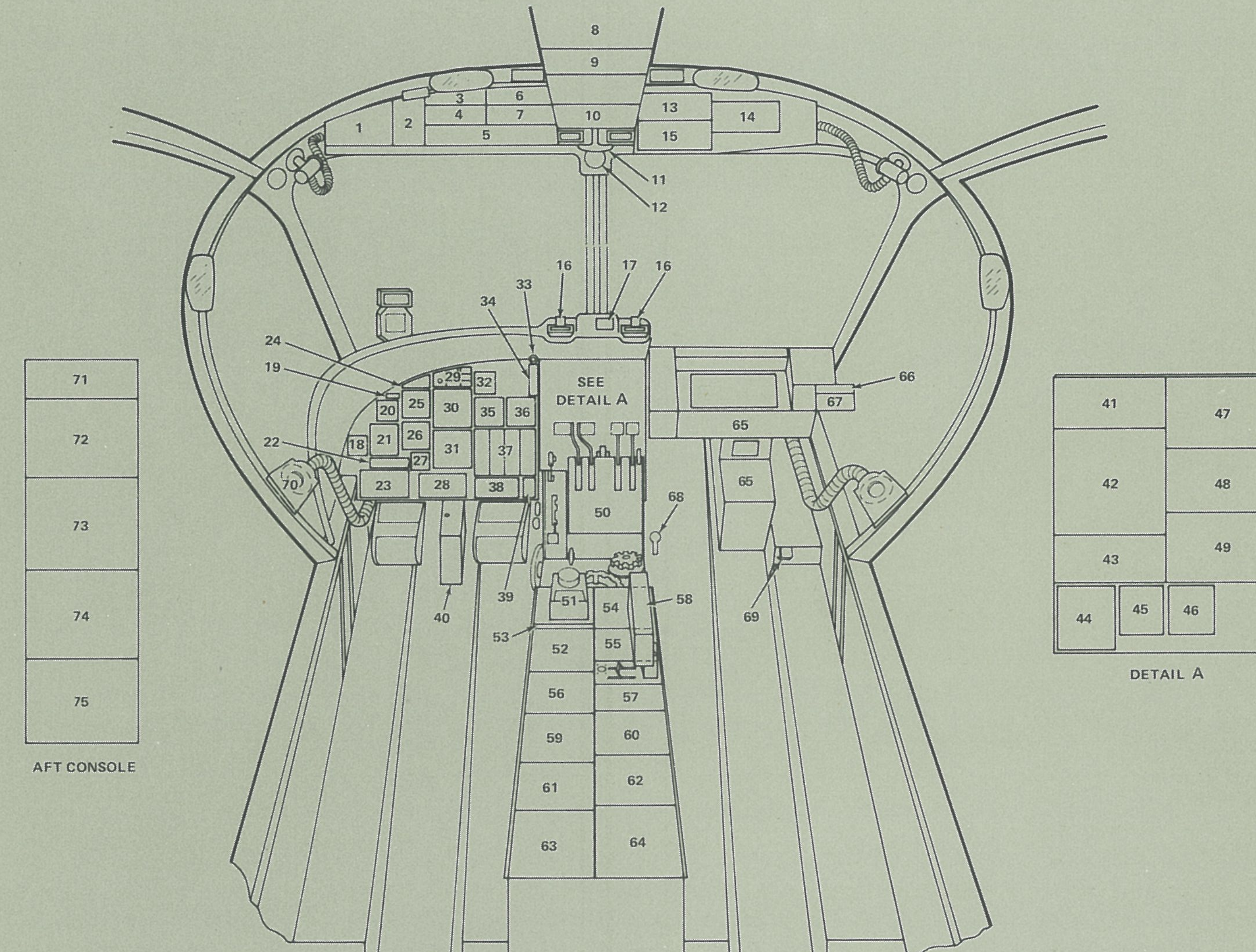
The controls for all communication and navigation radios, photographic systems, and the pilot's ICS are located in the double width console between pilot and observer. Stores release, secure voice and circuit breakers are housed in a single-width overhead console. "Eyebrow" panels, above the windshield, accommodate master engine, fuel, electrical and air conditioning panels on the left; and the radiac meter and observer's ICS controls on the right.

Escape
A Martin-Baker ejection seat provides safe escape at all altitudes and speeds (above 100 knots) within range of the Mohawk. An ejection seat is presently under development to provide for safe ejection at speeds down to 60 knots or lower. For ejection, the occupant pulls either the face curtain or the firing handle on the leading edge of the seat bucket. If time permits, the hatch may first be jettisoned otherwise ejection is through the overhead hatch. After ejection, the main parachute, stowed on the seat behind occupant's shoulders, is automatically deployed and separates him from his seat. A barostat delays deployment of the parachute if ejection is initiated at high altitude; a "g" limited delays it if ejection is at very high speeds. A seat mounted bail-out oxygen system is automatically actuated upon ejection.

The seat bucket is designed to accept an energy-absorbing-type seat cushion and a survival equipment container. An electrical actuator provides five inches of vertical seat adjustment.

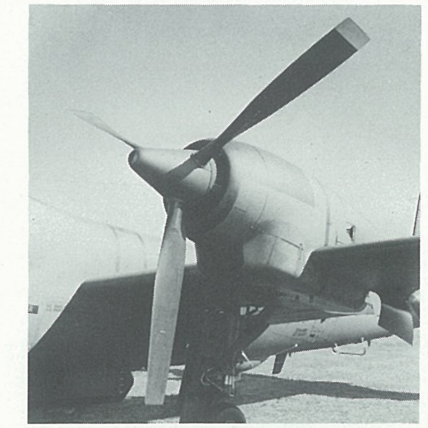
Ground Fire Protection
The Mohawk is designed and constructed for maximum protection from ground fire. The crew compartment has a 1-inch-thick flak- and bullet-resistant windshield, a ¼ inch-thick dural cockpit floor, and removable flak curtains on the fore and aft cockpit bulkheads in the area above the floor. A field kit will provide additional armor protection in the cockpit area for those aircraft sent to combat areas.





1 ENGINE CONTROL
2 FUEL MANAGEMENT
3 LIGHTING CONTROL – EXTERIOR
4 LIGHTING CONTROL – INTERIOR
5 AIR CONDITIONING CONTROL
6 ANTI-ICE/DEICE CONTROL
7 ELECTRICAL POWER
8 CIRCUIT BREAKER PANEL
9 BLANK
10 STORES SELECT PANEL
11 HATCH JETTISON HANDLE
12 STANDBY COMPASS
13 AN/ADR-6 RADIAC METER – IND
14 AN/ADR-6 RADIAC METER – CONTROL
15 OBSERVER'S ICS CONTROL, C-6533/ARC
16 ENGINE FIRE CONTROL HANDLES
17 POWER STEERING SWITCH
18 OUTSIDE AIR TEMP IND
19 WHEELS WARNING LIGHT
20 RATE OF CLIMB IND
21 VERTICAL GYRO IND
22 VOR, ADF, TACAN SELECTOR PANEL
23 WARNING LIGHT PANEL
24 LANDING CHECK LIST
25 AIR SPEED IND
26 BEARING DISTANCE HEADING IND
27 TURN & SLIP IND
28 PILOT'S OXYGEN REGULATOR
29 { FIRE DETECTION TEST; MASTER CAUTION LIGHT, RESET & TEST; AUTO FEATHER SWITCH; MARKER BEACON LIGHT & TEST
30 FLIGHT DIRECTOR AN/ASN-33 – HORIZON IND
31 FLIGHT DIRECTOR AN/ASN-33 – COURSE IND
32 CLOCK
33 WINDSHIELD WIPER CONTROL
34 TAKEOFF CHECK LIST
35 BAROMETRIC ALTIMETER
36 RADAR ALTIMETER AN/APN-171 (V)
37 PRIMARY ENGINE TAPE IND (TORQUE, EGT, % RPM, PROP RPM)
38 SECONDARY ENGINE TAPE IND (OIL TEMP, OIL PRESS., AMPS, VOLTS, HYD PRESS.)
39 PARKING CHECK LIST
40 MAP CASE
41 VOR CONTROL AN/ARN-82
42 INERTIAL NAV DISPLAY & CONTROL AN-86
43 MARKER BEACON CONTROL AN/ARN-58
44 WHEELS & FLAPS IND
45 FUEL QUANTITY IND
46 FUEL FLOW IND
47 ECM CONTROLS
48 TACAN CONTROL AN/ARN-52
49 ADF CONTROL AN/ARN-89
50 CONTROL PEDESTAL
51 AUTOPILOT AN/ASW-12 – FLIGHT CONTROLLER
52 AUTOPILOT AN/ASW-12 – NAVIGATION COUPLER
53 BLANK
54 COMM TRANSCEIVER AN/ARC-115, VHF-AM
55 COMM TRANSCEIVER AN/ARC-114, VHF-FM
56 COMM TRANSCEIVER AN/ARC-116, UHF-AM
57 COMM TRANSCEIVER AN/ARC-102, HF-SSB
58 MAP PLOTTER (STORED POSITION)
59 IFF CONTROL AN/APX-72
60 MANUAL V/H CONTROL
61 PILOT'S ICS CONTROL C-6533/ARC
62 CAMERA CONTROL – FWD PAN, KA-60C
63 CAMERA CONTROL – AFT PAN, KA-60C
64 CAMERA CONTROL – SLIDE CAMERA, KA-60C
65 DISPLAY & CONTROLS FOR SLAR, AN/APS-24 OR IR AN/APS-94
66 CAMERA PULSE BUTTON, KA-76( )
67 OBSERVER'S OXYGEN REGULATOR
68 RADIO FOOT SWITCH
69 ICS FOOT SWITCH
70 AIR DIFFUSERS
71 BLANK
72 SPACE & WEIGHT FOR DATA TRANS – RELAY CONTROL
73 SPACE & WEIGHT FOR DATA TRANS – TRANSMIT. CONTROL
74 AURAL WARNING & RECORDER CONTROL
75 COMM TRANSCEIVER, AN/ARC-114, VHF-FM (AUX)

POWER PLANT & PROPELLER



The OV-1D Mohawk is powered by two Lycoming T-53-L-701 turboprop engines. Each develops a military power rating of 1400 SHP at sea level static with a propeller speed of 1678 RPM. The engines drive three-bladed, 10-foot diameter, hydromatic propellers incorporating full feathering, full reversing, auto feather, and electronic synchronizing/synchrophasing features. The OV-1D's propeller blades are fabricated from a higher strength aluminum alloy with a nickel sheath on the leading edge for erosion protection.

Cockpit control levers permit the propeller on a failed engine to be feathered manually in flight or automatically during takeoff. Engine overspeed protection is provided by a fuel control governor and, in the event the governor fails, a mechanical pitch lock on the propeller prevents exceeding 107-109% speed.

Each engine drives a combination starter-generator, a de-icing generator, and a hydraulic pump, and in addition supplies compressor bleed air for the air conditioning system. The starter/generator is utilized for all engine starting; both in flight and on the ground. The de-icing generator provides a-c power for heating the propeller blades, the spinner, and the air inlet cowling when required. The engine inlet struts are heated by engine compressor bleed air.

The engine nacelle has two side panels which hinge at the top and swing upward for easy access to all controls, fuel ajustments and accessories. Another panel, on the bottom of the nacelle, hinges at the forward end and swings downward to provide access to the oil cooler, oil cooler ducts, and the oil cooler flap.

The right and left power plant packages are interchangeable including propeller, engine accessories, and engine mount with vibration isolators. The high strength erosion protected propeller blades of the OV-1D may be used on previous Mohawks. The fire extinguishing system consists of two pressurized containers of bromotrifluromethane located in the main equipment compartment and connected by valving to both engine compartments. In the event of a fire, temperature sensors in the engine or exhaust compartment activate a voice warning message in the ICS and a light in the cockpit. Then either crew member can operate fire controls that cut off fuel and hydraulic fluid and release the extinguishing charge from either or both containers to either engine.

Fuel System

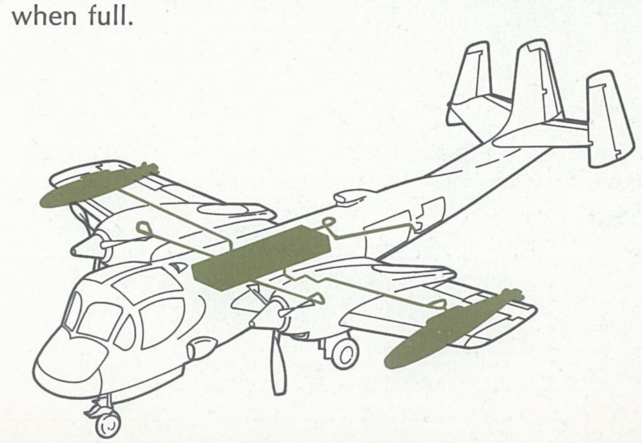
The fuel system of the OV-1D is simple and reliable. All fuel is contained in one, internal, self-sealing, 276 gallon tank and two, external, 150 gallon drop tanks. Forward and aft centrifugal pumps in the main tank provide uninterrupted fuel flow to both engines for all aircraft attitudes. Two electrically driven vane pumps in the wings transfer fuel from the drop tanks to the main tank.

An ejector pump backs up the forward centrifugal pump and a fire and explosion suppressing foam is used both inside and outside the main tank. Self sealing fuel lines and armor plate provide protection from ground fire between the tank and the engines.

Switches in the cockpit control the main tank fuel pumps, the drop tank transfer system, and a fuel gate valve for each engine. Flow meters indicate the rate of fuel flow to each engine, and a capacitance type fuel measuring system indicates total fuel quantity and the fuel in each tank.

The crew is warned of fuel transfer, low fuel quantity, and low fuel pressure by lights in the cockpit and voice warning messages in the ICS.

All tanks may be filled by gravity (using a 3 inch filling connection at each tank) or by single point pressure fueling. Each tank is automatically cut off when full.



FLIGHT CONTROLS

Primary
Conventional movements of the pilot's pedals and control stick actuate the Mohawk's primary attitude control surfaces (rudders, elevators, and outboard ailerons) through simple mechanical systems (cables, cranks and push rods). Two completely independent control systems link the elevators with the control stick. Lateral movement of the control stick actuates spring tabs on the outboard ailerons and the outboard ailerons move in response to the aerodynamic forces produced by movement of the spring tabs.

To protect the control surfaces during tiedown, gust-locks are built into the rudder, elevator, and aileron control systems. These locks are engaged by levers on the control pedestal.

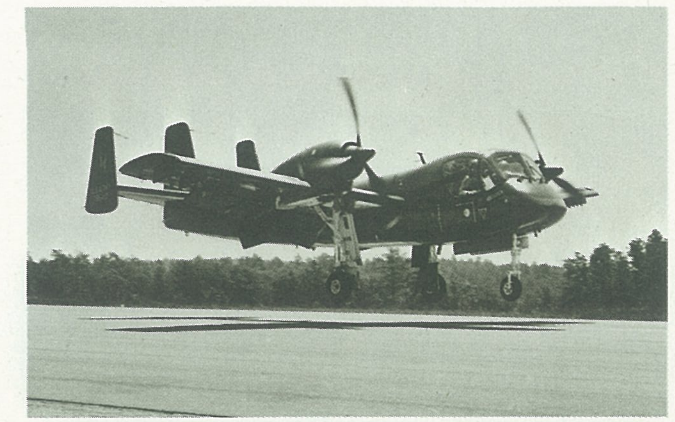
Auxiliary
WING FLAPS and INBOARD AILERONS — The auxiliary control system is comprised of one flap and one inboard aileron per wing. When the flaps are in the extended position, the inboard ailerons are also extended thru interconnecting linkage. With the flaps extended, lateral movement of the control stick results in normal action (up or down) of the inboard ailerons, thereby providing additional aileron control at low speeds. When the flaps are retracted, the inboard ailerons will be automatically retracted and locked in the neutral position. Failure of the inboard aileron system does not affect the operation of the outboard ailerons.

SPEED BRAKES — Two aerodynamically synchronized speed brakes are located on the sides of the aft fuselage. They swing about vertical hinges and are hydraulically powered.

TRIM TABS — A steady flight attitude can be maintained in all three axes by manually positioning rudder, elevator, and aileron trim tabs. These tabs are connected to three wheels in the control pedestal by simple cable and drum systems.

LANDING GEAR

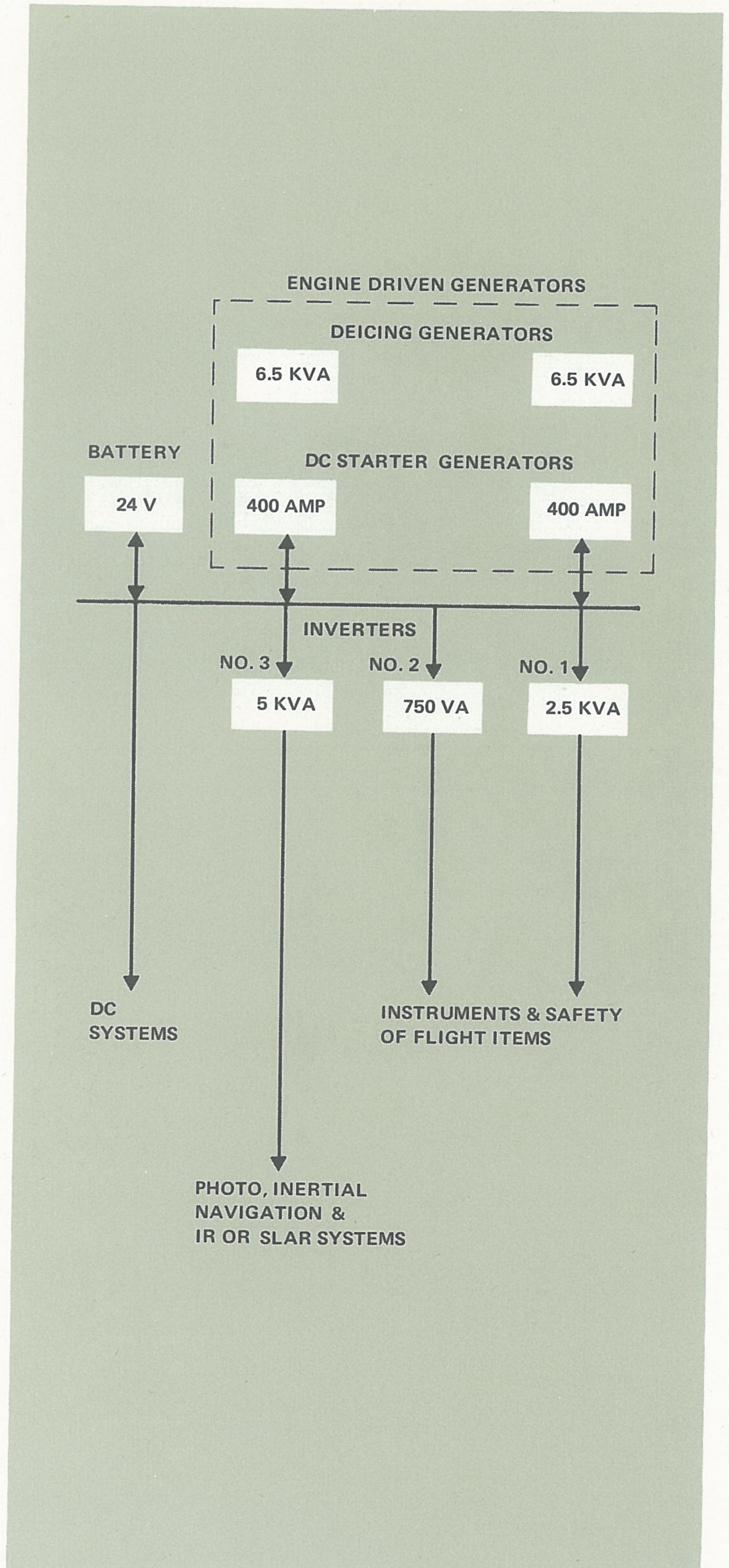
The OV-1D is equipped with conventional tricycle landing gear and a tail bumper. The main gear consists of two identical pneudraulic shock struts, each with a mechanical shrink rod and mounting a single wheel and brake. The shrink rod compresses the strut during retraction, so that the wheel can be housed in the engine nacelle. The nose gear consists of a pneudraulic shock strut with a single fork mounted wheel. The nose wheel is steerable to facilitate ground handling.



The aircraft hydraulic system provides power for main wheel braking, nose wheel steering, and retracting and extending all gear. A high pressure air storage system can be used to extend the gear in the event of hydraulic failure.

Both nose and main landing gear wheels are fitted with low pressure tires to provide acceptable rough ground operating characteristics. Ski mounting provisions are also incorporated on all gear.

The landing gears of all Mohawks are basically the same. However, in the OV-1D gear, redesigned metering pins improve sink speed capability (limit sink speed is 15.4 feet per second at an aircraft landing weight of 14,300 pounds); material changes and redesign minimize stress corrosion; and improved bushing material and lubrication provisions increase basic corrosion resistance. These improvements do not change the basic geometry of the landing gear; therefore, all major assemblies and sub-assemblies of OV-1D landing gear may be used on previous Mohawks.



ELECTRICAL POWER

A 24 volt, 34 ampere hour, nickel-cadmium battery provides starting power to each engine starter-generator via the aircraft d-c bus. Once the engines are operating, each engine driven starter-generator provides the d-c bus with up to 400 amperes at 28 volts for powering all d-c systems.

Each engine also drives a 6.5 kva alternator which supplies ac for de-icing its propeller, spinner, and air inlet. All other a-c power is obtained from three rotary inverters which receive power from the d-c bus and generate 115/200 volt, three phase, 40 Hertz current: 5 kva unit powers the inertial navigation and surveillance systems; a 2.5 kva unit furnishes a-c for instruments and navigation aids; and a 750 va standby unit provides emergency power.

If one of the d-c generators should fail, switching provisions will automatically transfer the inertial navigation system to the 2.5 kva inverter, disconnect the 5 kva inverter, and drop all d-c loads not required for safety of flight. If the 2.5 kva inverter fails, the standby inverter will supply a-c requirements of the safety of flight equipment.

The battery remains connected to the d-c bus during engine operation to permit recharging; to provide supplementary power for voltage regulation, if needed; to permit restarting an engine in flight; and to provide emergency power in the event both starter generators fail.

HYDRAULIC POWER

Two engine-driven, variable-volume hydraulic pumps (one per engine) supply hydraulic power at 3000 psi for the operation of the following systems:

- Inboard ailerons (for landing and take-off)
- Flaps
- Speed Brakes
- Landing Gear
- Wheel Brakes
- Nose Wheel Steering
- Windshield Wipers

The two pumps draw from a common reservoir in the fuselage that is pressurized by engine bleed air to maintain proper pump inlet pressure at high altitudes.

If the hydraulic power system fails, the landing gear can be extended by a single-shot stored air system.

AIR CONDITIONING

Cockpit
An air cycle system supplies a mixture of heated and cooled engine bleed air for automatic (or manual) control of cockpit temperature and for window defogging. At sea level flight speeds of 180 knots or more, this system will maintain cockpit temperature between 60° and 80° F with outside conditions ranging from extreme cold day to extreme hot day (—60° to 103° F). The same cockpit distribution system can be provided with ram air for cooling and defogging through a manually controlled air scoop. Two additional manually controlled scoops provide air to face nozzles for each crewman.

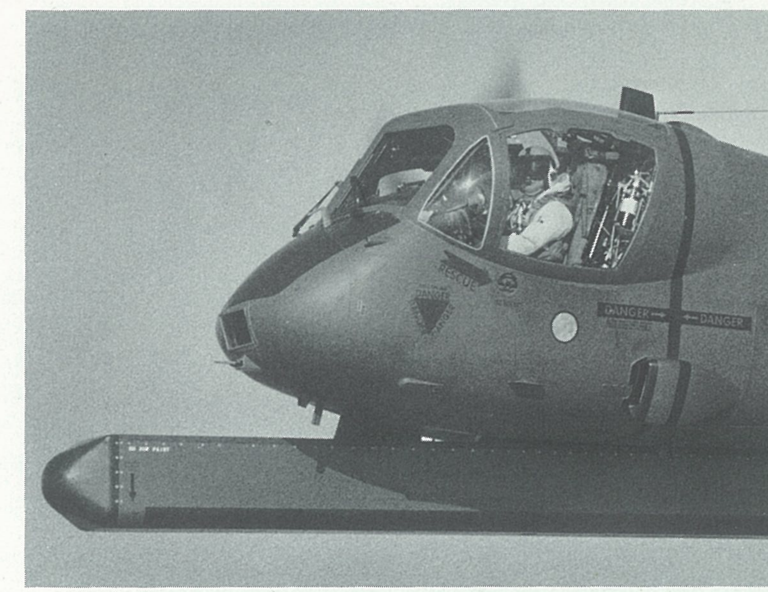
Camera Compartments
A separate fully automatic heating system supplies controlled amounts of engine bleed air to all three camera compartments to protect film and camera and to prevent window fogging.

ANTI-ICING/DE-ICING

Each engine drives its own anti-icing generator which provides a.c. power for heating the propeller blades, the spinner, and the air inlet cowling when required. The engine inlet struts are heated by engine compressor bleed air to prevent icing.

When the de-icing system is activated, a control valve is repeatedly cycled open and closed to supply pulses of engine bleed air to rubber boots on the leading edges of the wings and empennage.

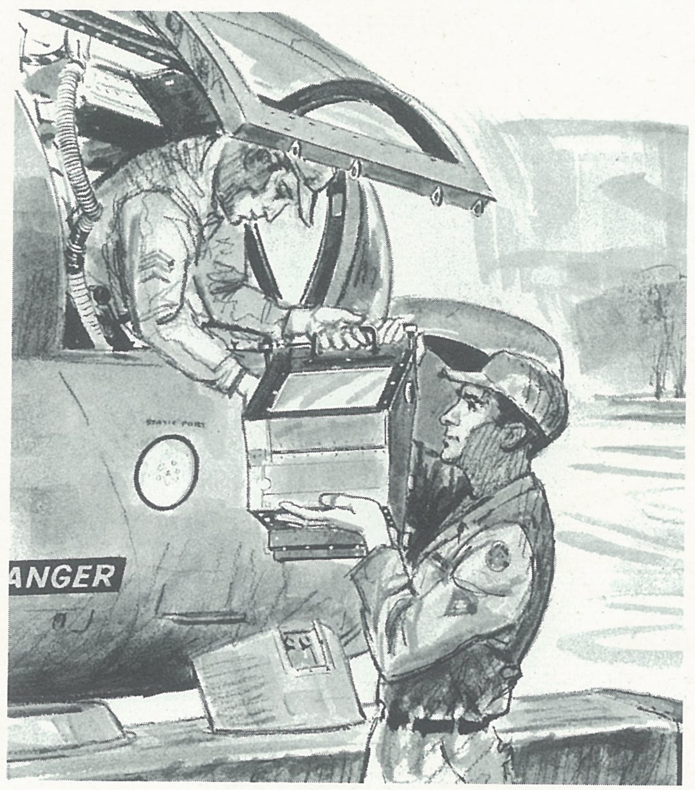
Switches in the cockpit permit control of the anti-icing and de-icing systems, including selection of wing and/or tail de-ice, and cycles for light or heavy icing conditions.



RAPID RECONFIGURATION CAPABILITIES

Provisions for easily removing three photographic systems and rapidly interchanging SLAR and IR systems permit the OV-1D to be quickly "missionized" in response to changing intelligence requirements. The nose and a half-dozen quick opening access doors can be swung open to expose all of the aircraft's surveillance systems. All cameras may be easily removed, installed or reloaded. Any of four lens cones can be installed on the KA-76( ) camera and a photo flasher pod can be secured to the wing for low level night photography. The IR and the SLAR systems are interchanged by swapping palletized electronics packages and modularized cockpit consoles. The SLAR antenna can be easily removed, and its connection points covered with fairings.

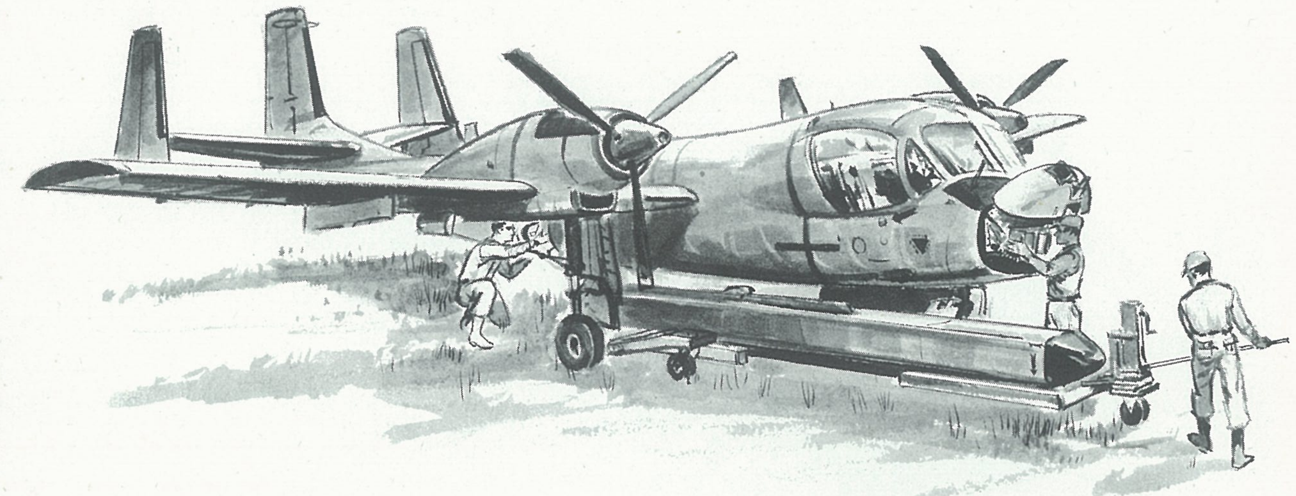
Because of quick opening access doors and quick-disconnect cables and attachments, the entire reconfiguration can be completed in 60 minutes.



EXCHANGING COCKPIT CONSOLES
- *Unscrew fasteners, disconnect cables, and remove four radar components sequentially (recorder, indicator, sweep generator and equipment rack)*
- *Sequentially insert, fasten, in place, and connect cables to IR components*

REMOVING SLAR ANTENNA
- *Remove quick-release panels on forward and aft connection fairings*
- *Disconnect two waveguides, remove three connecting bolts, and remove entire antenna assembly*
- *Fasten fairing caps to fuselage*

EXCHANGING ELECTRONICS MODULES
- *Open three quick-release access doors*
- *Pull quick release pins and disconnect cables and two wave guides*
- *Remove three SLAR modules and replace with three IR modules*
- *Connect cables and insert hold down pins*
- *Close access doors*



MAINTENANCE & SERVICE

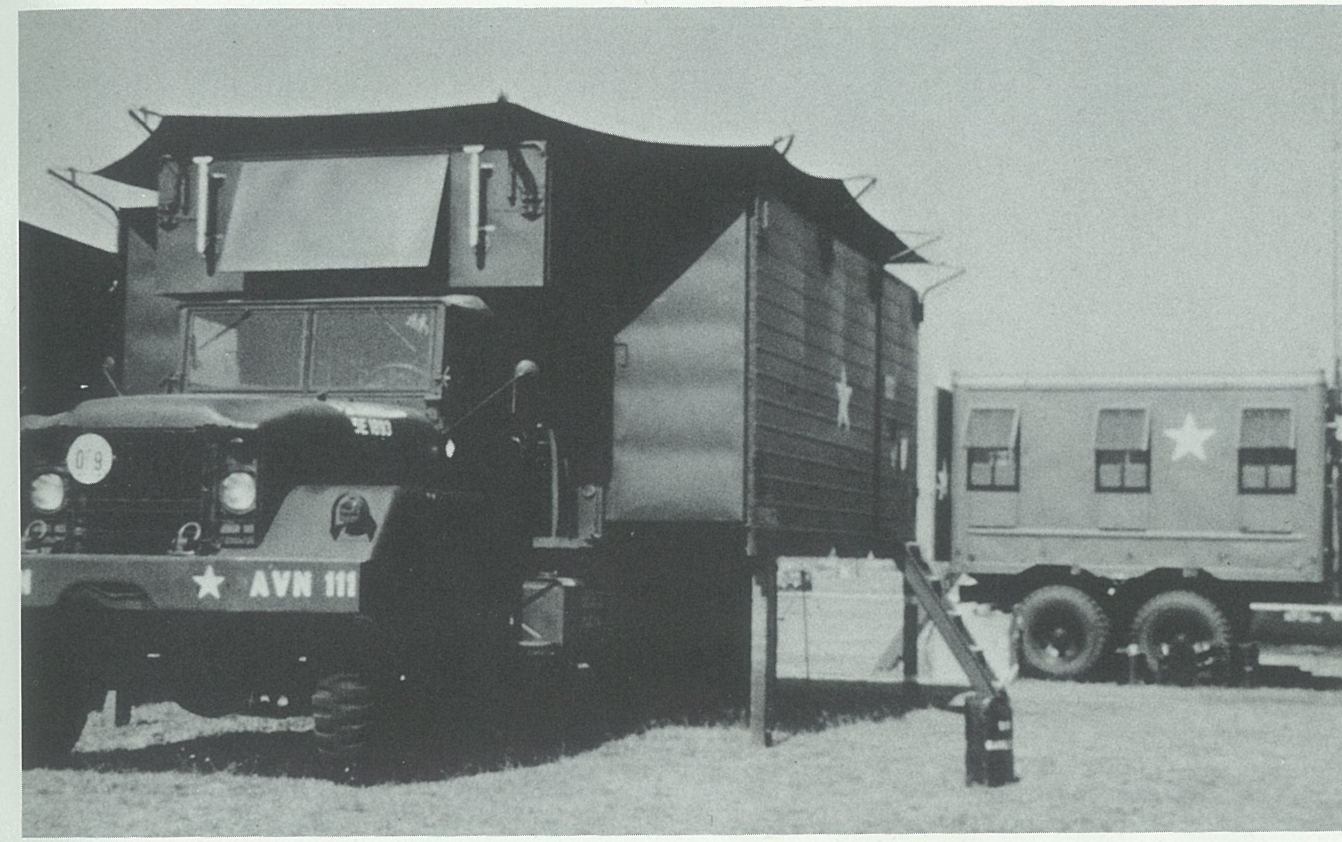
For optimum serviceability, quick access is provided to all aircraft equipment. Whenever possible, access is directly from the ground with minimal dependence on work stands.

The nose of the OV-1D swings upward to reveal the forward panoramic camera. Equipment under and immediately behind the cockpit is reached through the nose wheel doors. Five quick opening access doors, under the wings, simplify the interchange of IR/SLAR electronics modules and the removal of both aft cameras. The inverters, navigation system, and other avionics in the aft fuselage are accessible through large quick-release doors on both sides and on the bottom of the aircraft. The single fuel cell is readily replaceable through two removable panels on the top of the fuselage. Additional access panels are provided for servicing where required.

In addition to ease of accessibility, all major assemblies are interchangeable: The power plant assemblies will fit either wing; the left and right members of major landing gear components, stabilizers, elevators, outboard fins, and rudders are interchangeable. The wing tips, horizontal and vertical tails, and fuselage nose and tail sections are all readily replaceable as units.

Mohawk electronics are maintained in the field by the replacement of faulty black boxes. In many instances, electronic test equipment is available as an aid in determining the precise location of a malfunction.

SUPPORTING GROUND COMPONENTS



Tactical Image Interpretation Facility
The AN/TSQ-43 ( ) is a portable tactical imagery interpretation facility mounted within a M4 van body installed on a prime mover chassis. The facility contains all of the equipment required by the imagery interpreter for the interpretation and handling of photographic, SLAR, and IR imagery obtained from the Mohawk. The TSQ-43 ( ) is equipped with a trailer-mounted power supply and heating and air conditioning systems that permit completely independent operation in the field for extended periods.

Laboratory Darkroom
The ES-38 is a portable film processing laboratory darkroom mounted in a shelter and carried by a 2½ ton truck. The darkroom contains complete provisions for developing and printing the various types of film used in the Mohawk surveillance systems. A trailer-mounted power supply, self-contained water supply, and heating and air-conditioning systems permit the ES-38 to operate independently in the field for extended periods.

Data Transmission System (JIFDATS)
A surface terminal for the joint services in-flight data transmission system (JIFDATS) is currently under development. This terminal will be capable of receiving photographic, infrared and radar surveillance imagery from the OV-1D Mohawk either directly or via an airborne microwave relay.

MISSIONS

The Mohawk has served as a surveillance system in CONUS, Europe, Alaska, Korea, and South-East Asia proving its effectiveness in guerilla, defined-front, and cold-war operations.

In guerilla-type operations, the Mohawk negates the one advantage the guerilla has: use of darkness and weather to cloak his activities to defeat a superior enemy. The Mohawk's surveillance sensors deny the guerilla the protection once afforded by these conditions: the radar, by detecting movements on land or water; the infrared, by detecting heat emissions, such as cooking fires or boat engines. These sensors are not dependent upon ambient light, but are equally effective at night when the guerilla is most active.

Where the front is more clearly defined, the SLAR-equipped Mohawk can operate beyond the range of enemy tactical air-defenses in a stand-off mode to monitor vehicular traffic for a considerable distance in the enemy-held area. Thus, a regular patrol could be maintained to preclude surprise build-up and attack without committing border violations. Once the activity is localized, a Mohawk configured for photographic and/or infrared surveillance may be dispatched on a penetration mission to pinpoint and further define the activity.

In the penetration mission, the aircraft is flown into enemy-held territory at minimum altitude using terrain features to mask its passage. (Tests and combat experience have proven that an aircraft operating at lower speeds and minimum altitudes is exposed to fire no more than high-speed aircraft, which must fly at higher altitudes to preclude literally flying into the ground.) Once in the target area, the penetration aircraft climbs rapidly (pops up) to a somewhat higher sensor altitude, makes its run, and then returns to the protection of the terrain, where its quiet operation (owing to its free turbine engine and low propeller speed) further reduces exposure to ground fire.

The OV-1D's capability to be quickly 'missionized' in the field provides a flexibility of operation not available before. The SLAR and IR sensor installations may be interchanged in 60 minutes. The cameras can be quickly reloaded or removed and the lens cone of the KA-76( ) camera can be easily changed. A photo flasher, two ECM pods, and two fuel tanks can be installed or removed from stations on the wing.

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