KAMAN Rotor Tips

JULY–AUGUST, 1973

KAMAN AEROSPACE CORPORATION

CHARLES H. KAMAN
President–Kaman Corporation

WILLIAM R. MURRAY
President–Kaman Aerospace Corporation

FRED L. SMITH
Chief, Test Operations and Customer Service

ROBERT J. MYER
Director, Customer Service

Rotor Tips

Everett F. Hoffman *Editor*
Barbara R. Thompson *Editorial Assistant*

Volume VII No. 11

FEATURES

DEPARTMENTS

Rotor Tips is published by the Customer Service Department, Kaman Aerospace Corporation, Bloomfield, Conn. 06002. The material presented is for informational purposes only and is not to be construed as authority for making changes in aircraft or equipment. This publication DOES NOT in any way supersede operational or maintenance directives set by the Armed Services.

ON THE COVER

FLYING PRESIDENTS - Charles H. Kaman, left seat, President of Kaman Corporation, and William R. Murray, President of Kaman Aerospace, after a flight in the SH-2F helicopter which recently joined the Fleet. Mr. Kaman, who started as a pioneering helicopter manufacturer, now heads a corporation which serves five major markets and is engaged in activities ranging from aviation services, science, music and aerospace to industrial products and services. Mr. Murray, a veteran pilot, was the first to be employed by Kaman Aircraft when that company was founded 27 years ago. (Ruggiero photo)

KAMAN SERVICE REPRESENTATIVES

Donald P. Alexander
Richard L. Smith
John J. McMahon
Lloyd R. Gardner
NAS Imperial Beach, Calif.

Homer C. Helm
NAS Pensacola, Fla.

Horace F. Field
John Hendrickson
Joseph A. Peluso
NAF Naples, Italy

Donald T. Lockridge
Saul H. Freedman
Lionel A. Bentley
Donald R. Delaney
Kenneth Smith
NAS Cubi Point, P.I.

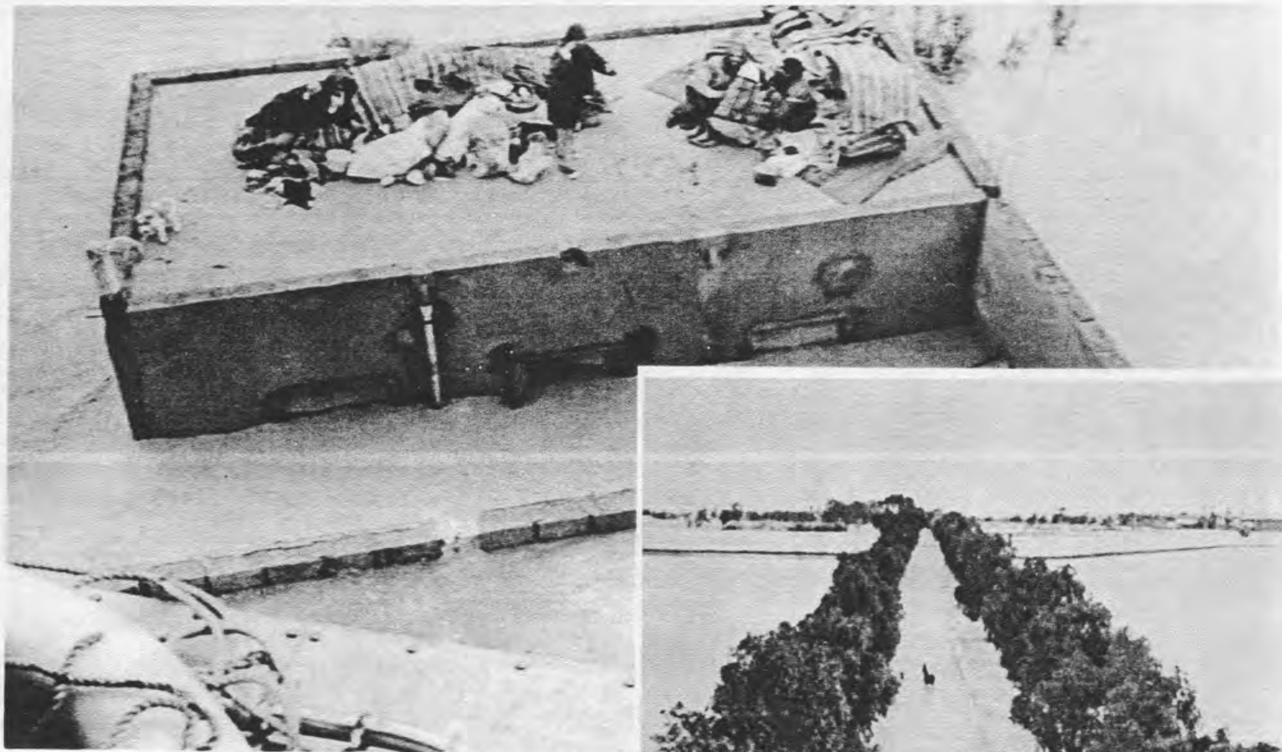
William G. Wells
Gerald A. Boutin
Richard A. Collier
Home Office

William Miles
NAS North Island, Calif.

Jack L. King
Norman M. Myers
Edward Noe
Robert C. Belisle
John H. Leavitt
Richard Slo
NAS Norf

William C. Barr
David M. Rush
Abraham R. Thoma
Iran

CUSTOMER OPERATIONS SECTION–ROBERT L. BASSETT, Supervisor



HH-2D From USS Springfield Aids Flood Victims

Top photos, a Tunisian dwelling surrounded by water in the Medjerda River Valley and flood victims waving from an inundated road. They are typical of the scenes detachment personnel encountered during rescue operations. In photo below, a refugee climbs aboard a Det 31 HH-2D SEASPRITE.

279 Tunisians Rescued By HSL-30 Det 31

Story by Lt Gordon I. Peterson, USN

Official USN Photos by PH3 Robert A. Wikert, USS Forrestal Photo Lab

"Recent rains precipitating serious flooding in Northwest Tunisia." This terse statement described the transformation of the normally tranquil Medjerda River into a raging torrent during the last week in March. The flooding stranded many thousands of Tunisians without food, water, or shelter as spring rains continued to fall for over a week. The USS Springfield, flagship of the U. S. Sixth Fleet, abruptly terminated its role in a NATO amphibious exercise and steamed for Tunisia when help was requested.

Highlighting Springfield's participation in the Tunisian Disaster Assistance was the performance of its helicopter detachment, HSL-30 Support Detachment 31. Departing Springfield at the southern coast of Sardinia in the afternoon hours of March 29, VADM G. E. Miller, Commander Sixth Fleet, utilized the detachment's HH-2D helicopter "83" to fly the 120 miles to Tunis. There the USS Forrestal (CVA-59), a giant attack carrier, was anchored off the coast and serving as a focal point for relief efforts to the flooded areas. The Forrestal's helo detachment of H-3s and U. S. Marine H-53 helicopters joined an international assemblage of Tunisian, French, Libyan, and Italian helicopters in rescue efforts.

Lt Gordon I. Peterson, Officer-in-Charge of the helicopter detachment aboard the Springfield, led a crew of two other pilots, two aircrewmen, and a Kaman Aerospace Corporation civilian technical representative during the

Despite the rising flood waters, the Tunisian shepherds steadfastly remained with their flocks and carried them to safety via the helicopter.

detachment's rescue operations that commenced the morning of 30 March. Following a visual reconaissance flight of the river valley with Vice Admiral Miller, the helicopter detachment proceeded to fly dawn to dusk missions to aid the many Tunisians in distress. Medical supplies, doctors, telephone linemen, food and blankets were all transferred during the first day's operations. An evacuation of numerous people stranded on a flooded road crossing the river was commenced in the afternoon hours. When the last of approximately 200 people were safely transferred to high ground, water completely covered the road. As many as 23 men, women, and children were packed into the HH-2D during this evacuation effort. One of the most notable rescues occurred when two men were plucked from rushing chest high water utilizing the aircraft's hoist. Personnel on this rescue were Lieutenant Peterson, Lt Lawrence C. Poh, and ADR1 James Bailey. In all, nine flight hours were logged on March 30.

Rescue missions commenced at sunrise on the morning of March 31. Many families were evacuated from flooded areas along with their personal belongings. Landings were made in any clearing large enough to accommodate the helicopter. Power lines, trees, debris, and terrified civilians were all hazards that were encountered. "Eighty three" was soon covered with mud, bearing scant resemblance to the spotless helicopter which had been carrying VIPs several days before. The detachment transferred a team of divers and their equipment to one of the stricken villages. The decision was made to evacuate a flock of over 500 sheep and numerous shepherds stranded on an inundated dike line in the middle of the flooded river valley. Many sheep had already died from starvation and snake bites. The sheep not only represented the livelihood for the shepherds, but were also an important source of food to the devasted area. Landing on the muddy dike line, "83" transported 257 sheep to safety by day's end.

Statistics for the detachment's two-day effort, indicated the magnitude of their performance. A total of 279 Tunisians were evacuated or rescued, five by use of the aircraft's hoist. Seventy five hundred pounds of cargo and 257 sheep were transported. Nineteen flight hours were flown in two days with no mechanical difficulties. All together, the air-

Det 31 pilots and crewmen who participated in Tunisian assistance flights are, left to right, Lt Thomas Dean, Lt Gordon Peterson, ADR1 James Bailey, AMS2 John Sherman and Lt Larry Poh.

Lt "Gordy" Peterson, top photo, watches as shepherds, at right, load their precious sheep aboard HH-2D.

craft of the rescue task force saved more than 1000 Tunisians and carried more than 140,000 pounds of supplies. Tunisian President Habib Bourguiba decorated Rear Admiral Turner, CTF 60, and Captain Linder, Commanding Officer of the Forrestal, for their efforts in directing rescue operations. Rear Admiral Turner praised the efforts of all helicopter crews involved in the operation, lauding their performance under adverse and hazardous flying conditions.

(Continued on page 26)

"It's not often that a technical representative has the opportunity to be directly involved on an operational mission with his company's product. It was really a thrilling experience." That was the way Norm Myers described his performance as an aircrewman and LSE* during HSL-30 Sup Det 31's recent participation in rescue missions in Tunisia.

Norm was aboard the USS Springfield to provide technical training to detachment maintenance personnel when the cry for help was sounded from flood-ravaged Tunisia. His services as an aircrewman/LSE were enlisted when it was apparent that the around-the-clock missions required some provision for crew relief. Two aircrewmen were carried on each mission for safety's sake. In addition to assisting the primary crewman during rescue hoists, the alternate crewman served as an LSE in the many confined landing zones.

The two days of rescue operations provided many memorable experiences, but one of the most unusual for Norm occurred while he served as an LSE on the narrow dike line from which sheep were being evacuated. "Everything was fine until I felt something squirming beneath my foot when I stepped backwards. I looked down and saw a two-foot snake," Norm related. The snakes were seeking higher ground along with many other animals as the water level rose rapidly.

Lt Peterson had nothing but praise for the services of his temporary crewman. "Norm had 15 minutes to pack his bags when we left the Springfield enroute to Tunis. He was gung ho all the way. We have always had the utmost respect and appreciation for the performance of Kaman tech reps in the past and now there is another chapter to their story," he said.

Norm lives with his wife Ann and three children near NAF Naples, his present assignment. He has been with Kaman for 15 years and is scheduled for rotation back to the States this summer.

*Landing Signalman, enlisted

Norman Myers, Kaman Aerospace Technical Representative assigned to NAF Naples, takes a "breather" while acting as an LSE and aircrewman during rescue operations.

FROM THE READY ROOM

By Al Ashley, Senior Test Pilot

An electric throttle system is used on the twin engine series H-2 helicopter in order to meet the unique power management requirements attendant to the twin GE-T-58 engine configuration. Specific requirements are the ability to: 1. Maintain precisely a preselected rotor RPM through wide ranges of power–automatically. 2. Maintain close power (torque) matching–automatically. 3. Control acceleration, particularly during the rotor engagement phase.

In order to successfully fulfill the power matching and rotor RPM control requirements, a high degree of precision is demanded of the throttle system in order to ensure that both engines respond simultaneously to collective/power requirement changes in a repeatable manner. When the objectives listed are not achieved, then power management becomes a time consuming job for the pilot.

The three main components of the electric throttle system are:

1. Control Quadrant—Located in the cockpit.
2. Throttle Actuator—Located on the engine fuel control. (See Figure 1.)
3. Electrical harness—Electrically connects the control quadrant in the cockpit to the throttle actuator located on the engine fuel control.

Let's analyze the function of each component individually and in its simplest terms.

The engine fuel control has a splined control shaft which, when rotated to a specific angular setting, causes the engine to go to a specific RPM and/or power level. It is this splined control shaft to which the throttle actuator is attached.

Figure 2 shows the engine condition for each angular setting of the splined control shaft:

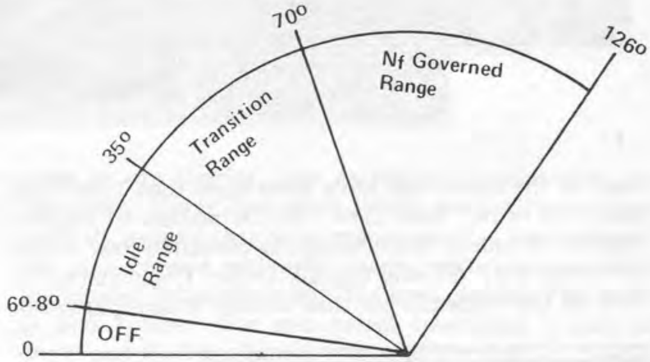


FIGURE 2

When the splined shaft is rotated to below 6 - 8°, the engine is stop-cocked (Off). When positioned between 8° and 35°, the engine is at idle with fixed fuel flow. Since fuel flow is fixed, Idle N_g speed will vary with OAT. This is why the acceptable idle N_g speed range is fairly wide (56 ± 4%).

Since the angular setting for idle is such a wide range (8° - 35°), an acceptable bench setting is easily achieved

(Continued on following page)

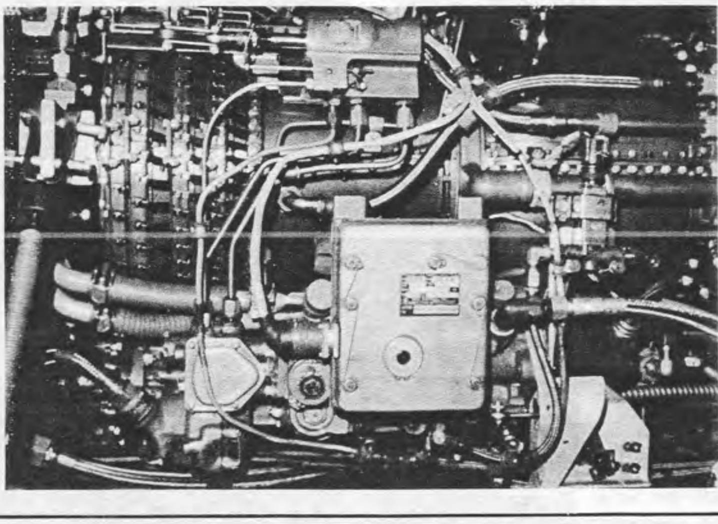


FIGURE I
Throttle Actuator

An article on Rigging the Electrical Throttle appears on Page 9 of the Technical Section.

FIRST SH-2F DELIVERED TO FLEET

Kaman began delivery to the Fleet recently of the seventh model in the H-2 SEASPRITE series. Designated the SH-2F, the improved Navy/Kaman Light Airborne Multi-Purpose System (LAMPS) helicopter is equipped with KAC's new 101 rotor system; increased strength landing gear and the latest avionics. Other changes include the relocation of the tail wheel six feet forward of its previous position and installation of more powerful twin T58-GE-8F turbine engines.

In left photo, KAC Test Pilot John Anderson exchanges pleasantries with LCdr John Mosser, right seat, a few minutes before takeoff for the Naval Air Test Center, Patuxent River, Md. Crewman is AW2 (AC) Ronald L. Cooper. Both Navymen are from the Rotary Wing Division at NATC. After evaluation at the Test Center, the SH-2F will be delivered to HSL-30, NAS Lakehurst, N. J.

Among those on the flight line to witness delivery of the first SH-2F were William R. Murray, President of Kaman Aerospace; Fred L. Smith, Chief, Test Operations and Customer Service; and Bert Howard, Test and Development Group Leader, in charge of the SH-2F Test Program.

In second photo, taken as second SH-2F is delivered to a Navy crew from the West Coast, are, left to right, Andy Foster, Chief Test Pilot; Al Ashley, Senior Test Pilot; Cdr Jerry L. Vanetta, HSL-31, NAS Imperial Beach, Calif; Cdr Dale P. Myers, Commanding Officer of HSL-31; Mr. Murray and Mr. Smith.(Ruggiero photos)

Electric Throttle System...

and final adjustment on the aircraft should not normally be required even though adjustment is possible. The specified bench setting should result in an angular setting for idle near 30°.

The range from 35° to 70° is referred to as the transition range—transition from idle to the N_f governed range. No N_f governing is provided in the transition range; therefore, the pilot must control throttle actuation in this range to accomplish smooth rotor engagements by controlling engine acceleration.

An angular setting above 70° brings the N_f governor into operation. In powered flight, needles married, the power turbine is directly connected to the rotor through appropriate shafting, therefore N_f (power turbine) and N_r (rotor) can be considered as a single unit and referred to as N_f/N_r.

By means of establishing a specific angular setting of the splined shaft in the range between 70° and 126°, the pilot is telling the governor to hold a specific N_f/N_r regardless of the load applied to the rotor system. When the splined shaft is rotated to a higher angular setting, a higher specific RPM (N_f/N_r) is called for by the pilot.

At this point a governor characteristic referred to as "droop" must be explained to more clearly define an important facet of the throttle system. At a given angular setting of the splined shaft in the N_f governed range (70° - 126°), if load on the rotor system is varied from a minimum power requirement to a maximum power requirement (as might be the case when going from down collective on the ground to the power required to hover) N_f/N_r will "droop" or reduce to a lower value. In order to retain the desired N_f/N_r at the higher power required, the splined shaft must be rotated to a higher angle. As a lower power level is called for by lowering collective, the splined shaft angular setting must be reduced to prevent the N_f/N_r from going above the selected value. Automatic adjustment of the splined shaft angular setting with collective application is called collective compensation. In the twin engine configuration, this adjustment must occur in equal amounts on both engines simultaneously in order to maintain selected N_f/N_r and proper power matching. Collective compensation is therefore an important input to the electric throttle system and is achieved through a potentiometer directly linked to the collective pitch lever. Electrical signals from the potentiometer are fed to the electric throttle system to advance or retard the splined shaft angular setting as collective is raised or lowered. Total authority of the collective compensation system in terms of splined shaft angular movement is 13°.

(Continued on page 22)

LAMPS

Activities ....

Med Medevac By SH-2D Crew

USS JOSEPHUS DANIELS, Med.—An SH-2D crew from HSL-30's Det 9 aboard this guided missile frigate (DLG27) teamed with a C-131 from NAF Naples to medevac an appendicitis victim to the hospital. The patient was aboard the Daniels, 40 miles at sea, when the attack occurred. He was placed aboard the LAMPS helicopter and airlifted to NAS Sigonella, Italy, where the C-130 was waiting. The plane continued the medevac to the NAF Naples Navy Hospital.

SH-2D pilot on the mercy mission was Lt J. C. Adamson. Lt(jg) F. L. Bridge was copilot and AW3 T. Dion was crewman.

LAMPS Det 2 Rescues Man Overboard

NAS IMPERIAL BEACH, Calif.—HSL-31's LAMPS Detachment Two, stationed aboard USS Stein, recorded its first rescue on 11 April approximately 30 miles south of San Clemente Island. Flight quarters had been set aboard Stein, and the flight crew was awaiting the word to start engines when SH2 Fernandez of the fire fighting team glanced down and saw SA Pinedo in the water. Fernandez spread the alarm immediately. AW1 R. Hodgkiss heard the alarm and ran to the aircraft and grabbed a smoke marker and threw it overboard to mark the spot. Petty Officer Hodgkiss then joined Lt Bruce Hoeller and Lt(jg) Mike Moore, pilot and copilot respectively, in the SH-2D LAMPS-configured helicopter.

The helicopter was quickly readied for flight. When Stein steadied, the helo was launched and Lieutenant Hoeller proceeded to the area where the overboard occurred. The rescue was effected in less than five minutes from the time the alarm was sounded until SA Pinedo was back on the deck of Stein, wet, cold, but happy.

KAC Engineers—Navy Maintenance Experts Meet

"Tell it like it is." This was the philosophy behind a four-day meeting recently between Kaman engineers and their enlisted guests: ADJC Isiah Davis and AMHC Tommy C. Leonard, HSL-30, NAS Lakehurst, N. J., and ADJCS Bruce D. Browne and AE1 Cloyde Edwards, HSL-31, NAS Imperial Beach.

Purpose of the meeting was to give Kaman Aerospace personnel the opportunity to talk candidly with veteran Navy personnel who have maintained the H-2 LAMPS SEASPRITE at sea under a wide variety of conditions.

During the first day of the meeting, the four Navymen were welcomed to Kaman by KAC President William R. Murray and Fred L. Smith, Chief, Test Operations and Customer Service. Engineers concerned with many different areas of the helicopter met with them during the mutual exchange of information.

FLEET FEEDBACK—Shown at table during one of a series of meetings between Navy enlisted experts and Kaman Aerospace engineers are, clockwise, AE1 Cloyde Edwards; AMHC Tommy C. Leonard; ADJC Isiah Davis; Herman Zubkoff, Service Engineer; Lew C. Schuler, Director of Engineering; Herbert W. Gewehr, Project Engineer, Mark III LAMPS; Robert A. Hintermister, Project Engineer; Power Plants and Drive Systems; Jack L. King, Senior Service Representative; and ADCS Bruce D. Browne. Standing is Ben Liff, Power Plant Group Leader. (Ruggiero photo)

KAMAN
Rotor Tips
TECHNICAL SECTION
Published by the
Customer Service Department
Kaman Aerospace Corporation
Bloomfield, Connecticut 06002

Kaman Rotor Tips technical information is supplied for informational purposes only and does not in any way supersede operational/maintenance directives established by cognizant authorities. The intent of this data will be incorporated, by future changes, into applicable manuals or directives.

Table of Contents

G. M. Legault, Manager
Service Engineering

J. P. Serignese, Technical Editor

ENGINE THROTTLE SYSTEM RIGGING - T58-8F ENGINE

By *A. Ashley, Senior Test Pilot*
N. Hankins, Service Engineer
H. Zubkoff, Service Engineer

In order to achieve proper throttle system and engine operation as described on Page 6 in this issue of Rotor Tips, it is important that the throttle system be installed and adjusted properly. Detailed procedures for installing and adjusting the throttle system on the engine are covered in NAVAIR 01-260HCA-2-4 and NAVAIR 01-260HCA-2-6.

The 101 rotor system is used in conjunction with the GE-T58-8F engine which operates at approximately 4% higher N_f speed than the -8B engine for a given angular setting of the fuel control shaft when in the governed range. This N_f speed is compatible with the 4% increase in operating rotor speed of the 101 rotor system.

Experience has shown however, that the N_f setting on the -8F engines, when received, is unpredictable, probably due to prior use on other model helicopters such as the H-3 or H-46, both of which require different adjustments.

For this reason, an N_f cam adjustment and a power turbine (N_f) stop screw adjustment may be required at time of engine installation on H-2 aircraft.

In order to achieve a proper N_f cam adjustment, the throttle system must first be adjusted to known settings to provide a repeatable starting point.

The recommended engine throttle rigging procedure for the -8F engine, when used with the 101 rotor system, is as follows:

1. Adjust throttle quadrant assemblies in accordance with instructions in APPENDIX 1.

2. Adjust Power Turbine Maximum Speed (N_f) stop screw to ensure a full 126° angular travel. This adjustment is required to ensure that the throttle actuator does not bottom out with full up beep and full collective compensation (up collective). The angular travel of the splined fuel control shaft should be checked prior to installing the engine on the helicopter for reasons of accessibility. (See APPENDIX 2 for adjustment procedure.)

3. Run up engines and engage rotors. At Minimum Beep (Min Beep), N_f/N_r should be 98-100% (one engine engaged). If not, make an N_f cam adjustment in accordance with instructions contained in APPENDIX 3 to get 98-100% N_f/N_r at Min Beep. For best engine/throttle performance, set each engine at the same Min Beep point. For example: if No. 1 engine is set to 99% at Min Beep using the N_f cam adjustment, set No. 2 engine to 99% also. Check Hard Over Down Limit (HODL) switch setting after performing N_f cam adjustment. Hard Over Down Limit switch setting should not be higher than 97.5% N_f/N_r. N_f cam adjustment can be altered slightly (1%) to ensure that the HODL switch setting is not higher than 97.5%. Make these adjustments on one engine at a time with the other engine at IDLE or OFF.

SERVICE ENGINEERS: N. L. Hankins, J. M. Nenichka, Avionics; R. J. Trella, Drive/Lube; W. J. Wagemaker, Rotors/Controls/Hydraulics; H. Zubkoff, Engine/Airframe/Fuel/Utilities.

4. Adjust Maximum Beep (Max Beep) to 106% using appropriate quadrant adjustment. Adjust Min Beep to 98% using appropriate quadrant adjustment. When adjusting Min and Max Beep settings, view tachometer straight-on to eliminate parallax. Recheck Min and Max Beep settings after flying for approximately 30 minutes and make final adjustments to obtain EXACTLY 98% N_f/N_r Min Beep and 106% N_f/N_r Max Beep. This will ensure the range tolerances specified in the current NATOPS.

5. After engine shutdown, check to see that with Max Beep throttle setting and a minimum of 80% collective, the throttle actuator does not bottom out. It is not permissible to allow the throttle control actuator to bottom at less than 80% collective, as this will result in premature actuator motor and/or actuator clutch failure.

When the -8F engine is installed with the standard rotor, the same adjustment procedures apply except that in step No. 3, N_f/N_r at Min Beep should be 93-95% when making N_f cam adjustment and N_f/N_r RPM at Hard Over Down Limit switch setting should not be higher than 94.5%. In step No. 4 adjust Min Beep to EXACTLY 95% N_f/N_r and Max Beep to 102.5% N_f/N_r. This will ensure the RPM range tolerances specified in current NATOPS for the standard rotor.

An N_f cam adjustment or a Power Turbine (N_f) stop screw adjustment will not be required when installing a T58-8B engine which is normally used with the standard rotor system. Steps No. 1, 2, 4 and 5 apply to the -8B engine as well as the -8F, except for Min and Max Beep settings which are 95% N_f/N_r Min Beep and 102.5% N_f/N_r Max Beep. N_f/N_r RPM at Hard Over Down Limit switch setting should not be higher than 94.5%.

APPENDIX 1 - THROTTLE QUADRANT ASSEMBLY ADJUSTMENT PROCEDURE.

NOTE

Refer to the accompanying schematic for all Test Points referred to in APPENDIX 1.

1. Apply 28-volt dc to primary bus (APU connected).

2. Connect a voltmeter to left quadrant Test Point (TP2).

3. Move engine condition lever to IDLE position. Voltmeter should read 3.2, plus or minus 0.2-volt dc. Ensure that fuel control actuator spline scribe mark is aligned with the Number 2 scribe mark. Voltmeter feedback reading at Test Point (TP1), should be 8.2, plus or minus 1.0-volt dc. Adjust potentiometer (R5) if necessary.

NOTE

Scribe marks on fuel control actuators are for reference only and may not line up exactly after final adjustments have been made.

4. Advance left engine condition lever to FLY position. Hold the RPM switch in DECREASE position for a minimum of 6 seconds. Test Point (TP2) voltmeter reading should be 6.8, plus or minus 0.3-volt dc. Check that fuel control actuator spline scribe mark is aligned with the Number 4 scribe mark. Voltmeter feedback reading at Test Point (TP1), should be 5.2, plus or minus 0.7-volt dc. Adjust potentiometer (R6), if necessary.

5. Hold RPM switch in INCREASE position for a minimum of 6 seconds. Test Point (TP2) should be 8.9, plus or minus 0.4-volt dc. Voltmeter feedback reading at Test Point (TP1) should be 3.1, plus or minus 0.4-volt dc. Check that fuel control actuator spline scribe mark is aligned with the Number 5 scribe mark. Adjust potentiometer (R3), if necessary. Minimum RPM to Maximum RPM voltage change should be 1.4 to 2.8 vdc. Move collective from full down to full up. Maximum voltage change should be 0.5 to 1.8 volts dc at TP2. If values are incorrect, adjust collective compensation rod in accordance with Step 7.

6. Repeat steps 2 through 5 for right-hand quadrant assembly.

7. With a voltmeter connected to the left quadrant Test Point (TP2) and the engine condition lever in FLY position, move the left collective compensation potentiometer arm away from the quadrant housing and observe the voltmeter reading. Proper arm position for gap filling the collective compensation rod is when the voltmeter reading starts to move. Reading should not start to move until center of the hole in the arm is approximately 7/16-inch away from the housing. Repeat the above procedure for right-hand quadrant. Hold arm at this position until rod end bolt hole is aligned and secure both quadrant arms to the rod with the attaching bolt and hardware. Minimum collective to Maximum collective voltage change should be 0.5 to 1.8 volts dc.

8. Using two voltmeters (one for each quadrant Test Point position; TP2) move collective stick up and observe both voltmeters. If one voltmeter reading starts to increase before the other, the meter reading which has not moved must start to move before the first meter reading increases above 0.1-volt dc from its original reading. If the check cannot be met, both quadrants must be removed for bench check of collective potentiometers.

APPENDIX 2 - N_f STOP SCREW ADJUSTMENT PROCEDURE (Refer to the accompanying illustration).

1. Check angular rotation of the fuel control shaft by using a suitable protractor inserted into the actuator splines. Angular rotation of the AM lever from OFF to the Max N_f speed stop should be 126 degrees.

2. If the actuator is not installed, temporarily install the lever arm (from the emergency throttle control actuator shaft) onto the fuel control shaft to facilitate shaft rotation.

3. Turn the fuel control shaft until the stop is against the Max N_f speed adjusting screw.

4. The slot in the control shaft indexing plate should align with the small rigging hole marked "MAX" in the index arm as shown in the illustration.

5. Adjust the Max N_f speed stop screw, if required as follows:

NOTE

Actuator must be removed to accomplish this adjustment.

a. Remove the lockwire from the adjusting screw.
b. Loosen the locknut and adjust the stop screw as required.
c. Tighten the locknut and lockwire the screw.

APPENDIX 3 - N_f CAM ADJUSTMENT PROCEDURE
(Refer to accompanying illustration.)

1. With engines shut down, remove and discard the sealed, lockwired adjusting screw cover.

NOTE

The adjusting screw is accessible from beneath the engine, behind the fuel control actuator and above the forward end of the manual throttle rack housing.

2. Remove lockwire and loosen the lock screw (adjacent to the adjusting screw), approximately 1-1/2 to 2 turns. This leaves a slight "drag" on the adjustment screw to preclude inadvertant over-adjustment and/or "creep."

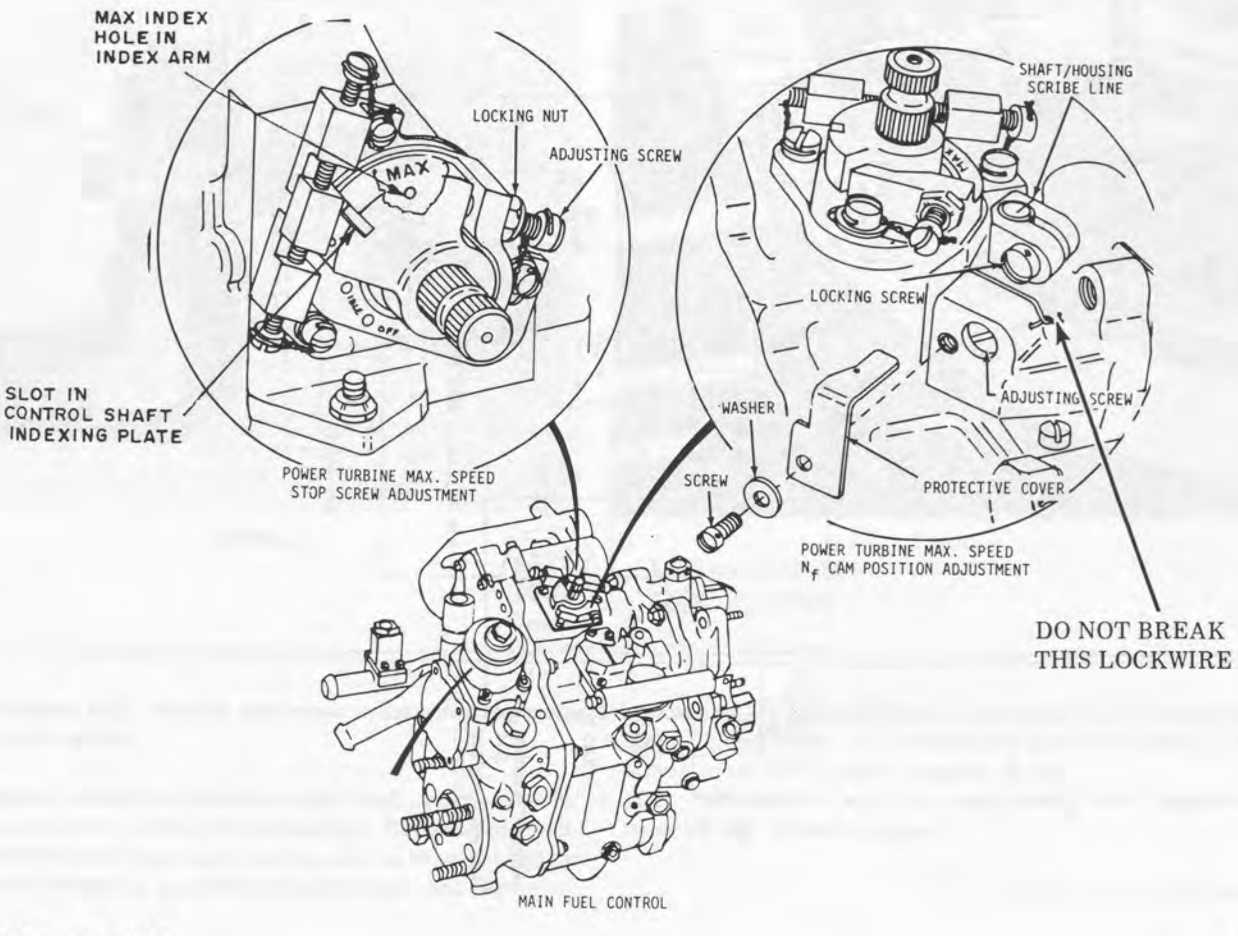
3. (For coordinating purposes, the mechanic and the pilot should be on the ICS system.) One-half turn of the adjustment screw will produce a 3 to 4 percent change in N_f. Normally, counterclockwise will decrease, clockwise will increase. However, on some fuel controls, this may be reversed, depending on previous adjustments. With the engine running at Min Beep, turn the adjusting screw,in 1/4-turn increments, in the direction that normally will produce the desired change. If the pilot reports N_f going in the opposite direction, return the adjusting screw to the original position, and then turn as required to obtain the desired N_f speed at Min Beep. Tighten the lock screw.

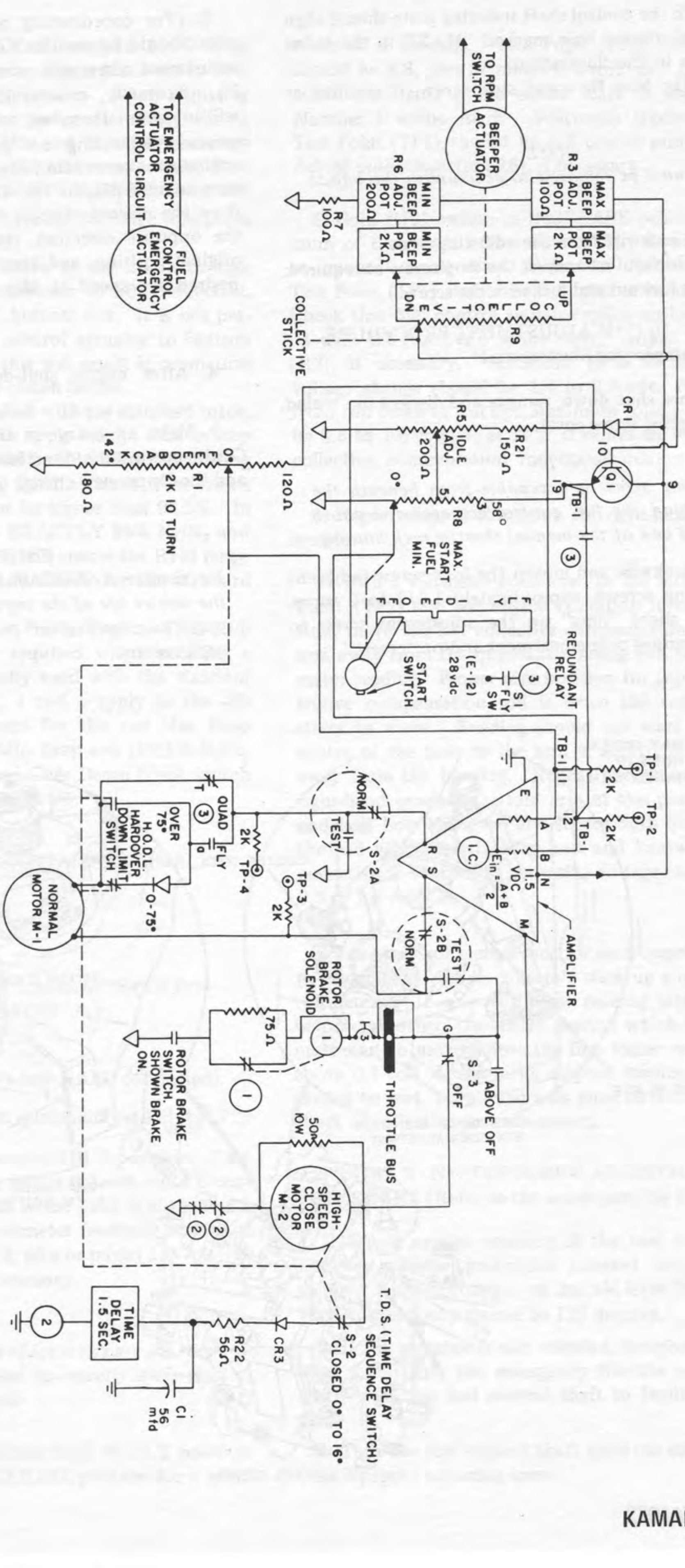
4. After engine shut-down, lockwire the lock screw.

5. Make an entry on the Accessory Historical Record Card, showing the direction of the adjusting screw rotation and the N_f percent change made.

CAUTION

No further N_f cam adjustments will be made during the service life of the engine, EXCEPT: an adjustment may be required in the event of a fuel control replacement.




TO RPM SWITCH ACTUATOR
BEEPER ACTUATOR
R3 ADJ. POT 100Ω
MAX BEEP
MAX BEEP POT 2KΩ
R6 ADJ. POT 200Ω
MIN BEEP
MIN BEEP POT 2KΩ
R7 100Ω
TO EMERGENCY ACTUATOR CONTROL CIRCUIT
FUEL CONTROL EMERGENCY ACTUATOR
COLLECTIVE STICK
UP COLLECTIVE LEVER DN
R9
CR1
Q1
R21 150Ω
R5 IDLE ADJ. 200Ω
58°
R8 MAX. START FUEL MIN.
120Ω
2K 10 TURN
180Ω
REDUNDANT RELAY
S1 FLY SW
START SWITCH
28vdc
TP-1
TP-2
TB-1
AMPLIFIER
I.C.
+15 VDC
TEST NORM S-2A
TEST S-2B NORM
TP-3 2K
TP-4 2K
QUAD FLY
OVER 75° H.O.D. HARDOVER DOWN LIMIT SWITCH
0-75°
NORMAL MOTOR M-1
ROTOR BRAKE SOLENOID
75Ω
THROTTLE BUS
S3 ABOVE OFF OFF
ROTOR BRAKE SWITCH. SHOWN BRAKE ON
50Ω 10W
HIGH SPEED CLOSE MOTOR M-2
T.D.S. (TIME DELAY SEQUENCE SWITCH) S-2 CLOSED 0° TO 16°
TIME DELAY 1.5 SEC.
R22 56Ω
CR3
C1 56 mfd
(TYP) NO. 1 ENGINE CONTROL SYSTEM SHOWN
NOTE: SYSTEM SHOWN WITH POWER OFF. THROTTLE BUS ACTUATOR CONTROL SWITCH IN NORMAL.
19-1224

H-2 FUEL PURIFIER ELBOW

H. Zubkoff, Service Engineer

A recent report indicated an unauthorized substitution in the fuel inlet line at the centrifugal purifier, was causing interference with the nose cowl frame member. Subsequent investigation revealed that the elbow, P/N 10C50X-S, called out in the IPB had been replaced with a standard AN833 elbow. (Refer to NAVAIR 01-260HCB-4-5, dated 1 May 1969, Changed 1 February 1973, Figure 7A, index number 30.) The result of such incorrect substitution can be seen by comparing Photos 1 and 2. Photo 1 shows the correct elbow installed; note the clearance (arrow). The arrow in Photo 2 shows the interference between the engine cowl and the elbow when an incorrect elbow is used.

Since engine location within the fixed position cowl can vary as a function of engine alignment, the clearance between the cowl and the fitting will vary. The normal clearance, using the correct elbow fitting is 0.25-0.50-inch. The standard AN elbow is approximately 5/8-inch longer than the correct elbow as shown in Photo 3. MORAL: Do not make unauthorized substitutions.

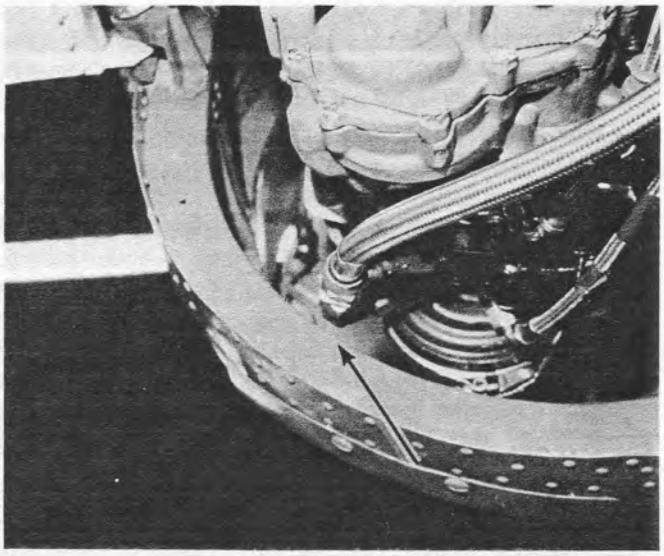


Photo 1

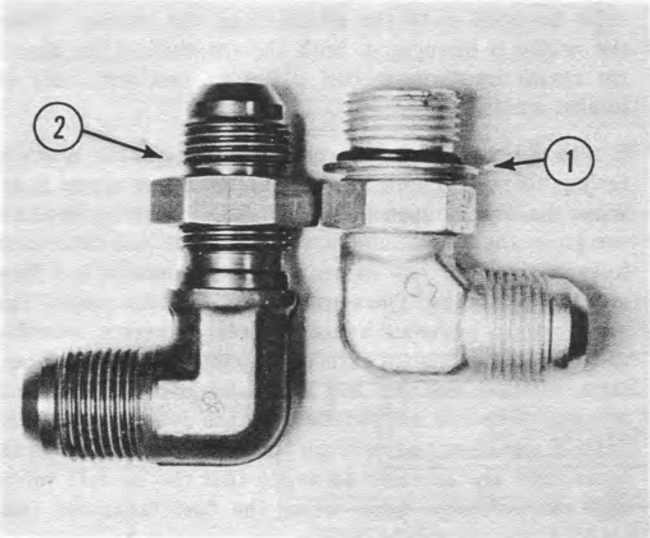


Photo 3

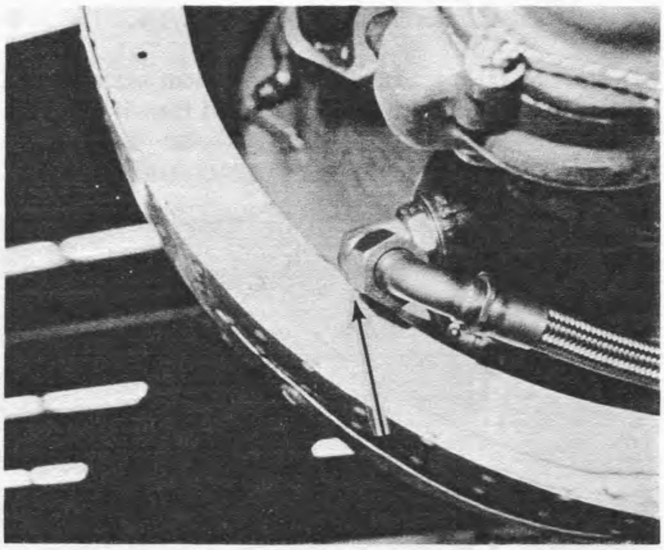


Photo 2

1. Elbow, 10C50X-S
2. Elbow, AN833

Q. **(Applies H-2) What is the repair criteria for the main drive shaft spacer?**

A. Repair criteria for the main drive shaft spacer were recently revised to reflect the following: Removal of up to 0.010-inch depth material in an area not to exceed 1-square inch after blending is permissible, provided that the newly reworked area will be at least 2 inches from other reworked areas. In addition, the cumulative reworked area on the spacer must not exceed 2 square inches. (This information will be incorporated into applicable manuals by future changes.)

R. J. Trella, Service Engineer

H-2 FUEL SYSTEM-----------------PART 1

By H. Zubkoff, Service Engineer

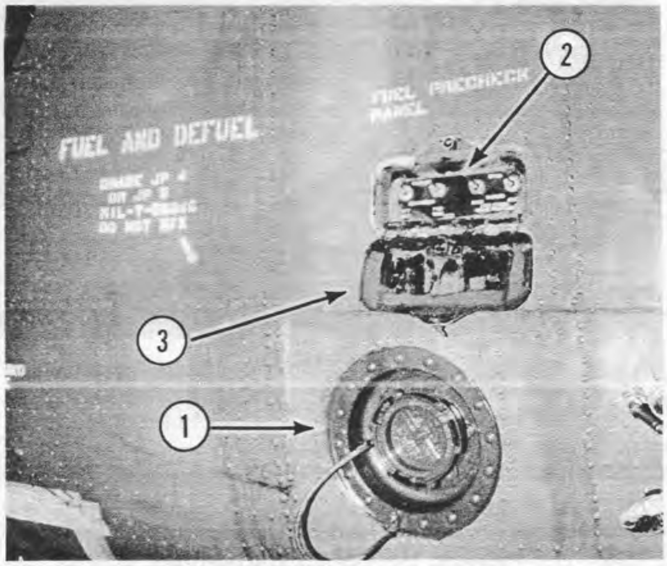
This article is the first in a series concerning the H-2 fuel system. Each article will discuss one portion of the system and the functional description of that area only.

PRESSURE FUELING AUTOMATIC FUEL SHUTOFF

Fuel, introduced into the H-2 at the rate of 250-300 GPM at 50-55 PSI can rupture the tanks and damage associated structure IF servicing is not terminated AS SOON AS the respective tanks are full. An automatic fuel shut-off system is therefore provided (one for each tank) to sense a full tank and automatically shut off any further fuel flow into that tank.

The pressure fueling fuel shutoff system includes the following major components:
1. Pressure fueling nozzle adapter.
2. Precheck panel.
3. Fuel/defuel shutoff valve.
4. Dual pilot solenoid precheck float valve.

1. Pressure fueling nozzle adapter, located externally on the RH side of the fuselage, just aft of the aux fuel tank support (Photo 1) is so constructed that the servicing hose nozzle must be properly engaged and locked, in order to open both the adapter and the nozzle. When the nozzle is disengaged, both the adapter and the nozzle are closed by spring-loaded plates to preclude entry of foreign matter.



1. Pressure fueling nozzle adapter
2. Precheck panel
3. Access panel

Photo 1

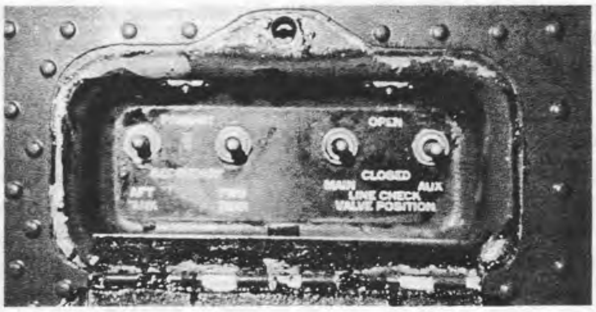


Photo 2

2. The Precheck panel, located adjacent to the pressure fueling adapter (Photo 2), is protected by an access door. When the door is opened, a micro-switch is actuated which energizes the panel circuitry and opens the aux tank solenoid-operated vent valves to permit pressure fuel flow into the aux tanks. There are 4 switches on the panel. The two forward switches actuate valves to permit selective fueling or defueling (of external or internal tanks). (Operation of these switches will be discussed in a subsequent article.) The two aft switches are the fuel shutoff PRECHECK switches; one each for the forward and aft internal tanks, and are provided to verify that the shutoff valves will automatically close when the fuel tanks are full.

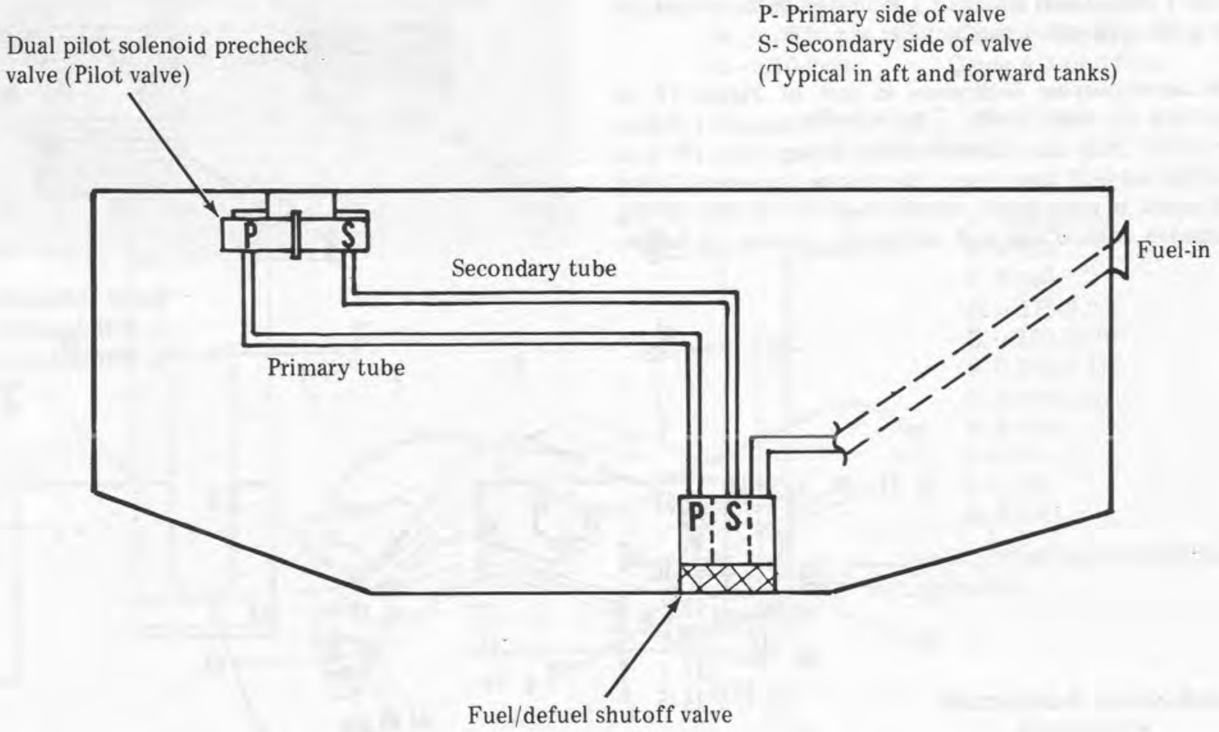
3. One fuel/defuel shutoff valve is mounted on a sump plate in both the aft and the forward tanks. The shutoff valves are connected by tubes to the pressure fueling adapter, therefore, all fuel pressure-serviced into the tanks will flow through the shutoff valve. Fuel will flow into the tanks when the valve is open; conversely, fuel flow will cease when the valve is closed.

4. A dual pilot solenoid precheck float valve (pilot valve) is mounted in each tank at the full-tank level. Floats in the pilot valve will sense a full tank and will transmit this signal to the shutoff valve which will then close to terminate pressure fueling.

The accompanying diagram illustrates the installation of the shutoff valve and the pilot valve. Notice both valves contain a Primary and a Secondary side or chamber. Operation of either side is unaffected by the other, and either side, by itself, is capable of causing the shutoff valve to close. As can be seen in the illustration, the Primary (P) and the Secondary (S) sides of the shutoff valve are connected by separate fuel tubes to the P and S sides of the pilot valve. Pressurized fuel entering the tanks forces a spring-loaded piston in the shutoff valve (at the fuel-in port) to the open position. This allows fuel to flow through the shutoff valve and into the tank. At the same time, some of the fuel flowing through the shutoff valve is diverted (inside the valve) into the P and S chambers, then through the separate P and S tubes, up to the pilot valve P and S float chambers. The pilot valve float chambers are vented to the tank so that fuel entering the chambers will drain out into the tank.

During pressure fueling, the diverted fuel flow from the shutoff valve P and S chambers, enters the pilot valve float chambers through float valves. The float valves remain open as long as the floats are in the down position. When the tank is full, fuel entering the float chambers through the chamber vents, raises the floats, causing the valves to close. When the float valves close, the fuel flowing into the pilot valve chambers through the tubes from the shutoff valve creates a back pressure. This back pressure is immediately sensed in the shutoff valve P and S chambers, and reacts through a series of passages and poppets against the spring-loaded piston at the shutoff valve fuel-in port. Assisted by the spring-force and piston design, the back-pressure overcomes the servicing pressure, thus causing the piston to move to the closed position, shutting off any further fuel flow into the tank.

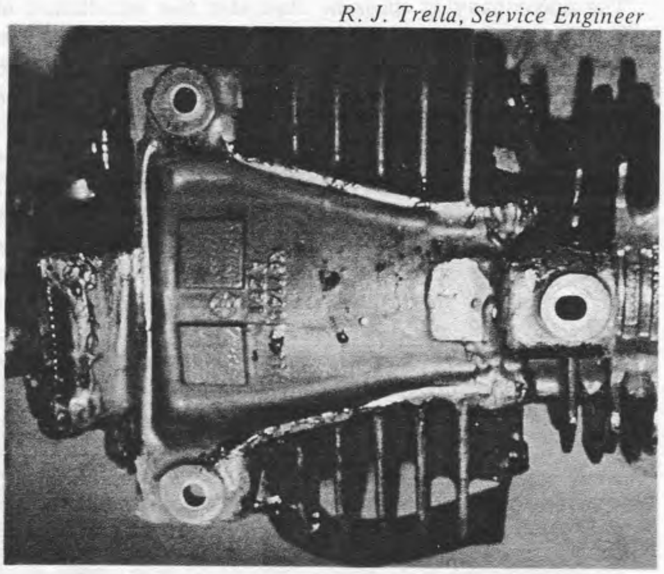
The PRECHECK step, *required as soon as pressure fueling begins,* is necessary to assure the operator that the fuel/defuel shutoff valve will close automatically when the tank is full. When a PRECHECK switch is moved to P a solenoid-operated plunger, incorporated into the pilot valve Primary float chamber, physically moves the float to the raised position, closing the float valve, thus simulating a full tank. The sequence of events which then follows is identical to the operation described above when the tank is full of fuel. When the PRECHECK switch is moved to S, the float in the Secondary chamber is moved to simulate a full tank. During precheck, if one part of the shutoff system (P or S) fails to operate, fueling may be completed as long as the other side of the system functions. However, subsequent pressure fueling should not be attempted until the discrepant condition has been corrected. Pending this corrective action, gravity fueling should be accomplished.



H-2 INTERMEDIATE GEARBOX INSTALLATION

R. J. Trella, Service Engineer

The intermediate gearbox mounting pad bushing, P/N K671420-11, superseded by K671420-13, is deliberately manufactured to an elongated configuration. A visual comparision of the three mounting pad bushing ID's is shown in the Photo. The special elongated bushing is quite obvious. The intermediate gearbox assembly consists of three housings: an input housing; a center housing; and an output housing. In order to align the internal gear tooth patterns, it is necessary, at Overhaul, to shim between these housings. Consequently, no two gearboxes will have the same three-point mounting footprint. While the two lower mounting pads (on center housing) will always be constant and therefore fit over the pylon holes, the upper mounting pad (on output housing) may fall short or beyond the preceding gearbox mounting pad position. In order to compensate for this variation, the elongated bushing was provided. Acceptable bushing bore dimension is: 0.377-0.376 by 0.485-0.475 inch.

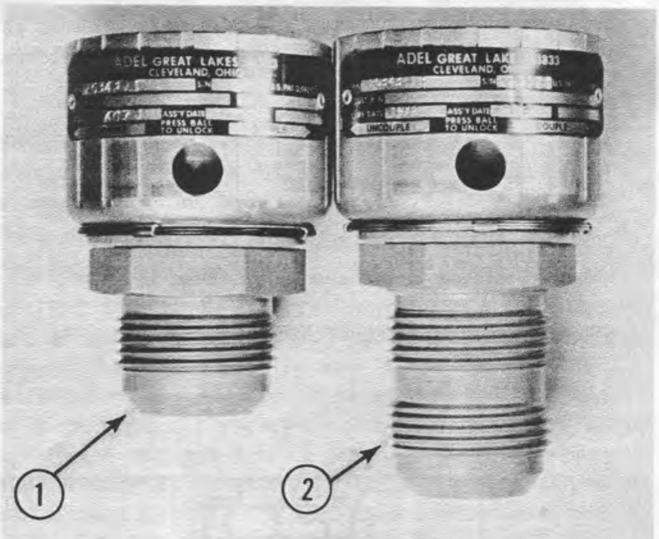


H-2 SDG OIL SYSTEM QUICK DISCONNECTS

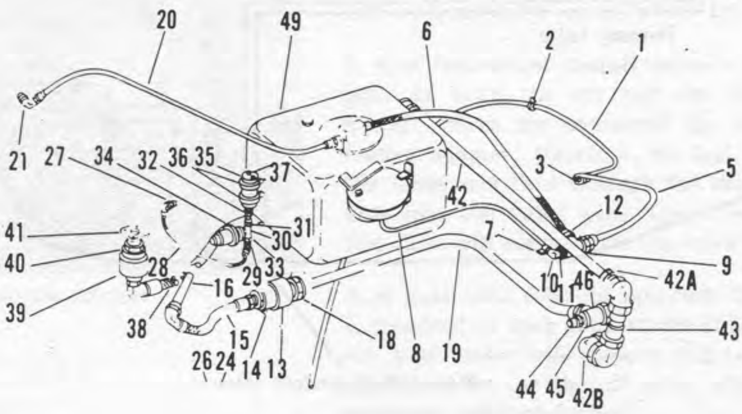
H. J. Zubkoff, Service Engineer

Index number 13, Figure 12, in NAVAIR 01-260HCB-4-5, dated 1 May 1969, Changed 1 February 1973, should list the quick disconnect part number as a -1B.

The accompanying illustration is part of Figure 12, in NAVAIR 01-260HCB-4-5, 1 May 1969, Changed 1 February 1973. Note that the disconnect fitting (Item 13) is in the SDG oil OUT line. Use of the shorter (incorrect) fitting will result in a decreased overall length of the line causing preloaded connections and, ultimately, leakage or failure.



Quick Disconnects
1. P/N 20343-1
2. P/N 20343-1B



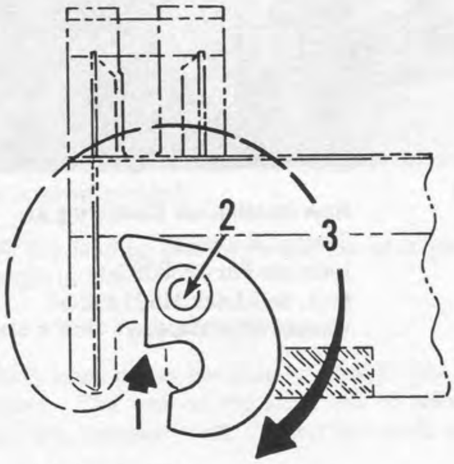
H-2

BOMB SHACKLES

H. Zubkoff, Service Engineer

A recent design change authorized use of a MOD 5 (P/N 63A119F2) bomb shackle as a completely interchangeable alternate to the standard MOD 4 shackle. The MOD 5 shackle has individual locking hooks which close when the external store is pushed up against the hook cam as shown in Illustration 1.

In order for the automatic-close feature to function, the shackle MUST be restrained from moving upwards into the support structure when external stores are pushed against it. Illustration 2 shows the authorized method used to restrain the shackle. Note the rubber filler block installed in the shackle attach-slots. Use of this block is mandatory on all MOD 5 shackles, regardless of which model aircraft the shackle is used on.



Pressure exerted at point 1...
forces a pivoting action around point 2...
causing hook to rotate to closed position, point 3...

Illustra on 1

Due to anticipated higher gross weights of external stores carried on SH aircraft, it is necessary and mandatory to use a bearing block in the upper end of the shackle attach-slots as shown in Illustration 2. The block prevents direct contact between the shackle mount bolts and the shackle pin, thus precluding excessive wear.

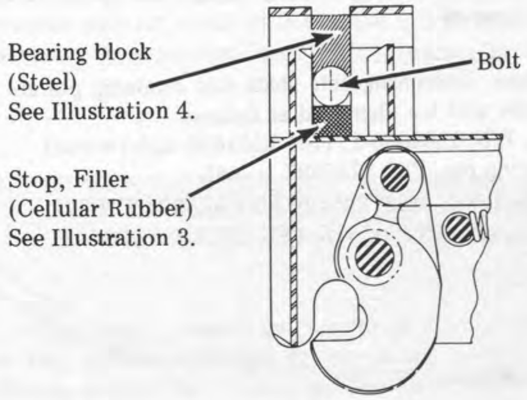
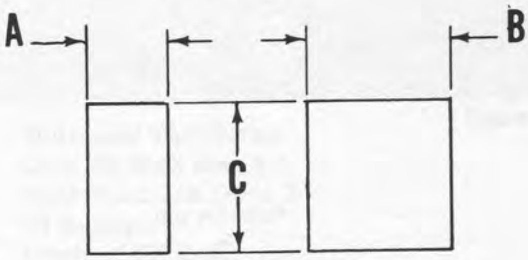


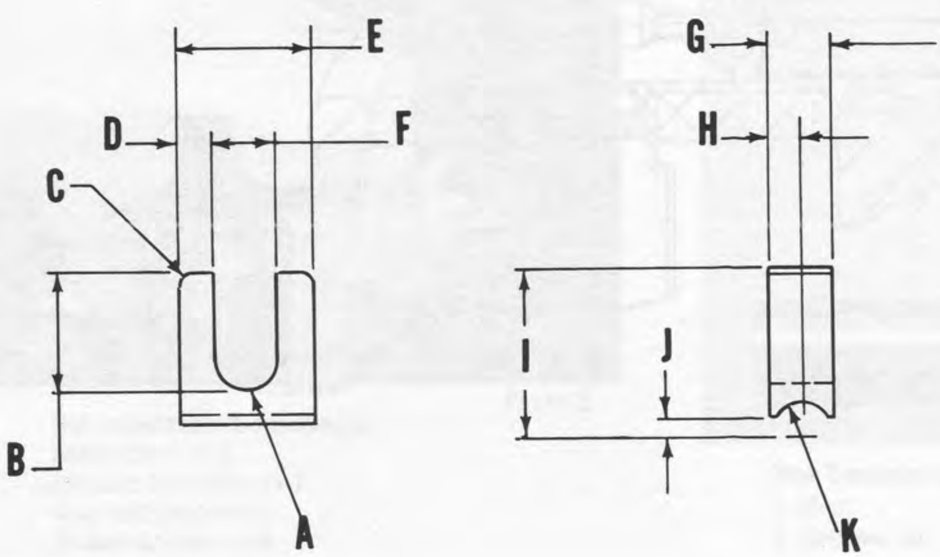
Illustration 2



A - 0.38-inch
B - 0.70-inch
C - 0.70-inch

Cellular rubber, SH; MIL-R-6130, Type II, Grade A; Cond firm.

Illustration 3. Filler Stop
K679718-13



A. Full radius
B. 0.680
C. 0.040
D. 0.175-0.205
E. 0.760-0.790
F. 0.380-0.410
G. 0.340-0.370
H. 0.185
I. 0.98
J. 0.100
K. 0.190

4130 Steel bar, MIL-S-6758 Cond N.

Illustration 4. Bearing Block
K631487-13

H-2

LIQUID SPRING REPLACEMENT

H. Zubkoff, Service Engineer

The corrosive action of salt spray from overwater flights and/or shipboard operations can ultimately cause the liquid spring upper shaft, P/N 3283129-3, to seize. A review of the situation has resulted in a design change to facilitate shaft removal.

The new, interchangeable shaft and retaining pin are now available and are identified as follows:
Shaft, P/N 3283096-1; FSN RM1620-420-7989BH
Retaining pin, P/N 3283097-1; NSL
Lockbolt, P/N MS21295-56; FSN 9Z5305-777-5759
Washer, P/N AN960C416; FSN 9Z5310-531-9515

As shown in the accompanying illustration and Photo 1, the new retaining pin protrudes above the landing gear main member 1/2-inch and is designed with integral wrenching flats. The new shaft protrudes beyond the side of the

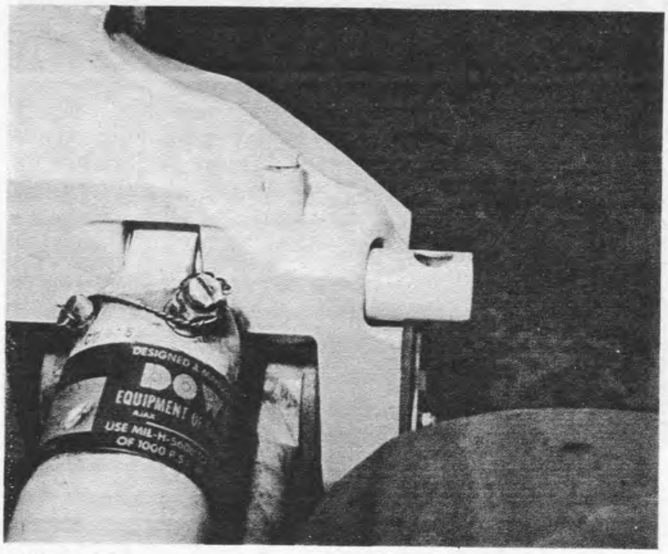
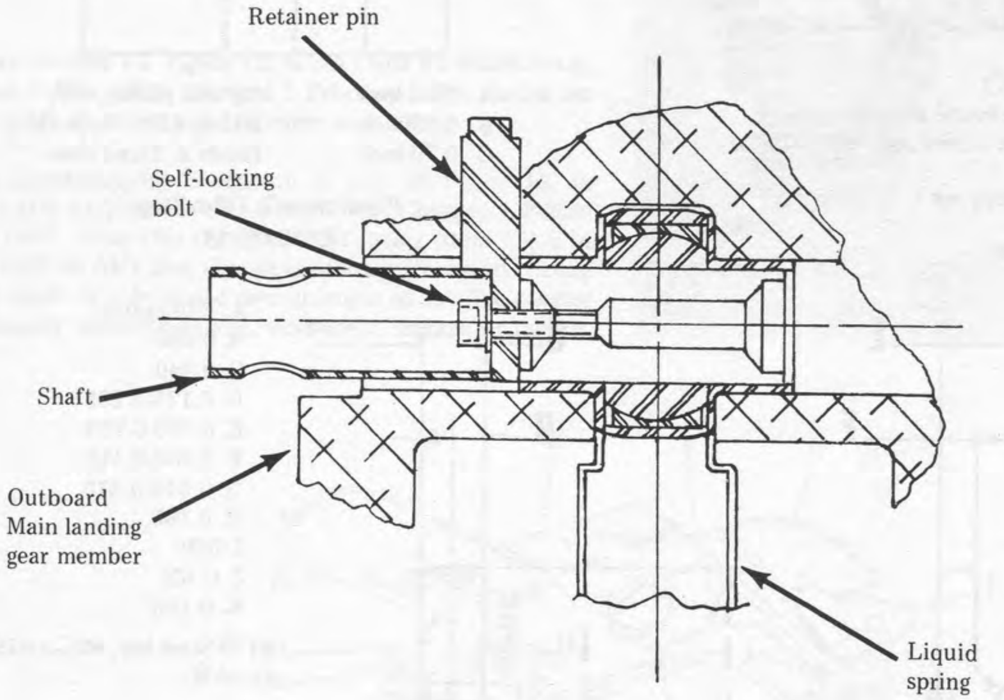


Photo 1

New Installation Consisting of:
Shaft-3283096-1
Retainer Pin 3283097-1
Bolt, Self-Lock MS21295-56
Washer-AN960-C416



main member approximately 1-inch and is provided with wrenching holes (Photo 1). To remove the shaft, after removal of the retaining pin, insert a rod through the wrenching holes, rotate and remove the shaft.

The following removal procedure for the present shaft, shown in Photo 2 (P/N 3283129-3), is recommended when changing a liquid spring:

1. Remove the lockbolt and retainer pin.

2. Apply penetrating oil to the shaft bore, through the retainer pin hole. Allow a few minutes for the oil to penetrate. Using a suitable size drift, drive the shaft *inboard* slightly.

3. Install a standard impact puller (1/4-28 shank) and remove the shaft.

It is possible that after prolonged exposure to a corrosive environment, the shaft may be so tightly seized that the preceding removal efforts will not be successful. Rather than replace the complete main landing gear, the following procedure is recommended:

1. Remove the landing gear hydraulic actuator per NAVAIR 01-260HCA-2-2.

2. Fabricate a drift as shown in Photo 3.

3. The shaft bore passes completely through the landing gear member. The end of the shaft can be seen at the bottom of the actuator well. Insert the drift into the actuator well, with the angle-end against the shaft and drive the shaft out. Prior to re-installation of the actuator, thoroughly clean and lubricate the shaft bore.

Pending conversion to the new shaft and retaining pin, a Special 245-day removal, cleaning, and lubrication requirement has been established for the present installation in accordance with NAVAIR 01-260HCB-6-3, 1 October 1971, Maintenance Requirement Cards (MRC) Number 35, item 4.

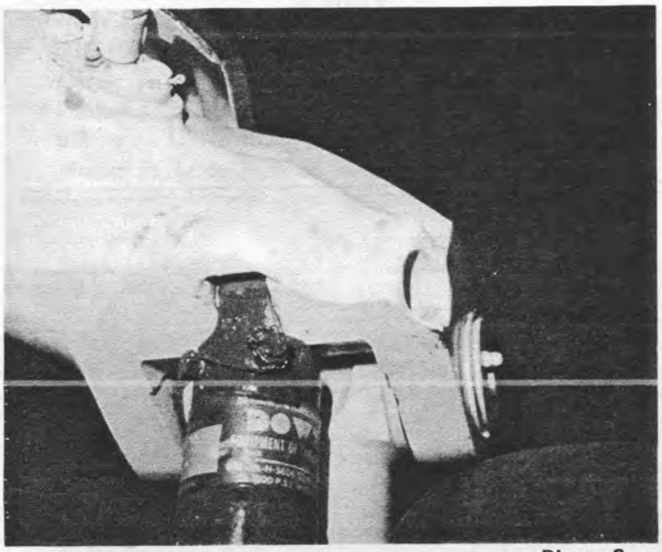


Photo 2

Old Installation Consisting of:
Shaft-3283129-3
Retainer Pin-3283134-1
Bolt-MS21094-4008
Washer-AN960-C416

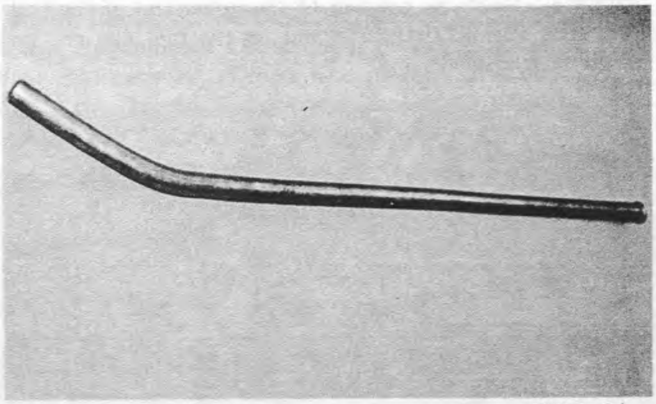


Photo 3

Drift-Local Manufacture
Drift-Old Shaft Removal-
Steel Rod 1/2 in. Diam. X
24 in. length
Center of 30° Bend
4 inches from end.
(Apply angle end against shaft)

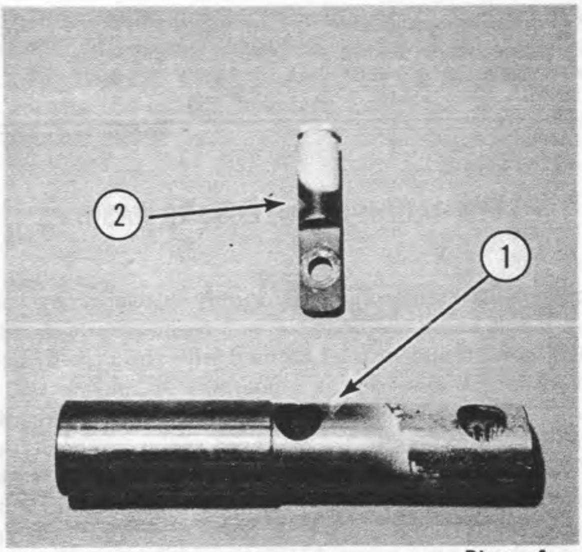


Photo 4

New Components
1. Shaft
2. Retainer pin

H-2 REMOTE TOPPING CABLE ASSEMBLY CLAMP-UP

H. Zubkoff, Service Engineer

The remote topping cable assembly on the LH engine can chafe if it contacts the engine access door. Contact will occur when the right angle driver assembly is in the 5 o'clock position as shown in Photo A.

To prevent chafing, install the right angle driver assembly as shown in Photo B (2 o'clock position), tightening the knurled nut fingertight. Clamp the topping cable to the battery start fuel line as shown in Photo B. Install the clamps as closely as possible to the upper end of the fuel line. Use an MS21919H5 clamp on the fuel line and an MS21919H8 clamp on the topping cable. Secure the clamps with an MS27039-1-08 screw, two AN960PD10L washers (under head and nut) and an NAS679A3 nut. It is suggested that detachments inspect the LH engine remote topping cable for evidence of chafing. If damage is evident, replace the assembly and add the clamps. If no damage is found, add the clamps to prevent damage from occurring.

This information will be incorporated into applicable manuals by future Changes.

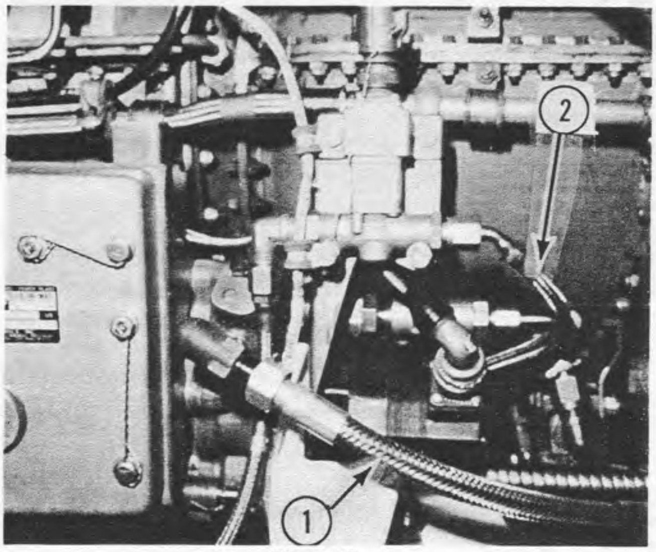


Photo A

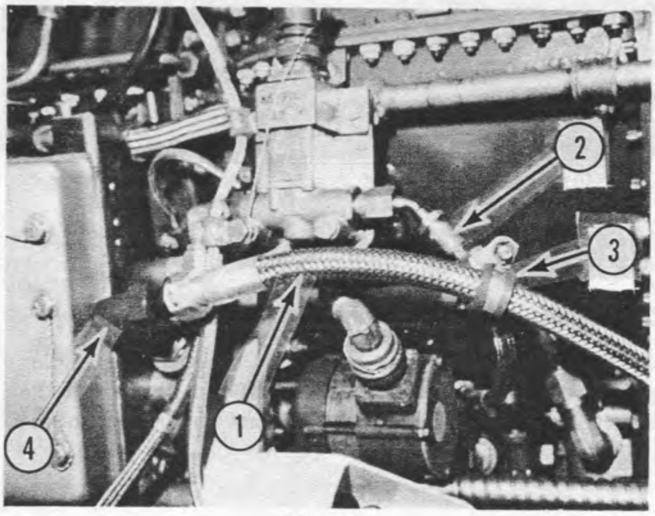


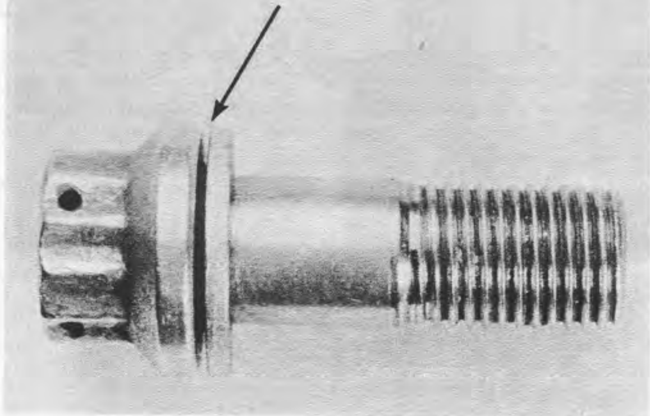
Photo B

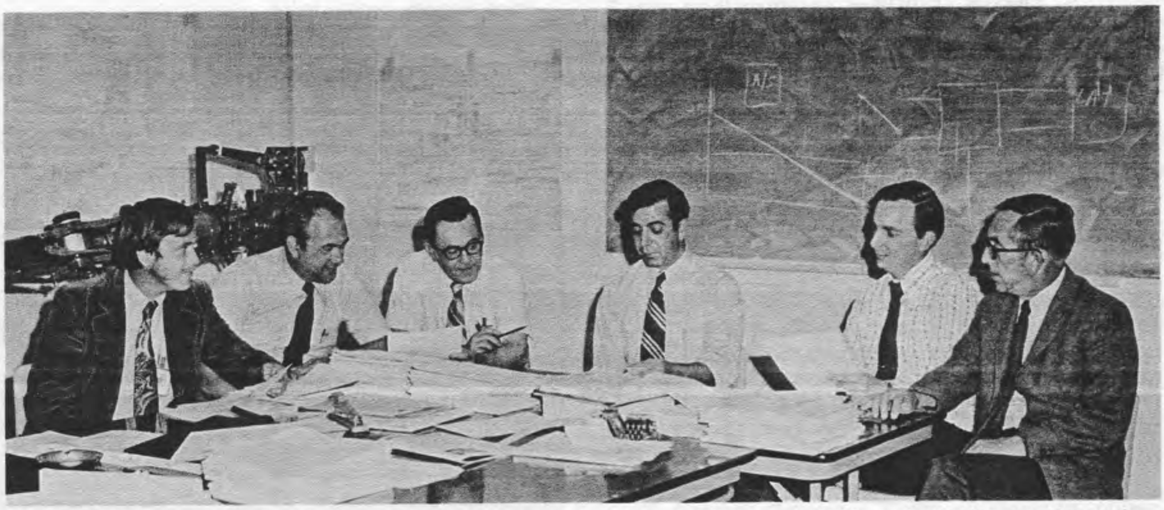
1. Remote topping cable
2. Battery start fuel line
3. Clamp-up
4. Right angle driver assy.

FILLET RADIUS-COUNTERSUNK WASHERS

Certain bolts used in the Navy supply system have a large fillet radius under the bolthead and design criteria dictates that a countersunk washer be used with this type of bolt. The countersunk washer is a potential Murphy in that it could be installed incorrectly and cause bolt failure by creating stress risers in the bolthead radius. (The accompanying Photo depicts an improper installation; notice the gap indicated by the arrow.) Remember, countersunk washers must be installed with the countersunk side *TOWARD* the bolthead.

H. Zubkoff, Service Engineer





TRAINING—Technical briefings, discussions and training sessions are held periodically at Kaman's Bloomfield, Conn., plant for Customer Service Department personnel in service representative, training or similar capacities. Shown during one such session on the SH-2F, now being delivered to the Fleet, are, clockwise, Service Representatives Richard L. Smith, Donald P. Alexander and Gerald A. Boutin; Instructor Tony Rita, an engineer from the Test and Development Department; Service Engineer Joseph M. Nenichka and Service Representative Saul H. Freedman. Others who recently attended similar sessions were Service Representatives Jack L. King, Donald T. Lockridge, Robert C. Belisle and John J. McMahon. (Ruggiero photo)

(USN photo by PH2 J. Harpster)

1000-HOUR PILOTS—Shown above is Capt Javad Deyhim who recently received a plaque from Kaman Aerospace after logging his 1000th hour in an HH-43 HUSKIE. Capt Deyhim, a pilot in the Imperial Iranian Air Force, is stationed at Mehrabad AFB. At right, Capt Paul T. Corrigan, COMNAVACTSPAIN, Commanding officer of USNS Rota, Spain, presents a KAC 1000-hour plaque to LCdr Stephen Tobey, center. LtCommander Tobey, who is attached to the SAR Unit at Rota, accumulated his 1000 hours in the H-2 SEASPRITE. On hand to offer congratulations was Horace F. Field, Kaman Senior Service Representative. Two other H-2 pilots who recently qualified for 1000-hour plaques are LCdr Henry L. Clay, III, and LCdr Gail W. Edgar. Both are attached to HSL-30 at NAS Lakehurst, N. J.

NAS PENSACOLA, Fla.—A UH-2C crew from the CVT Det here launched after notification that Capt T. P. McGinnis, commanding officer at NAS Whiting Field, had become seriously ill. Captain McGinnis was medevaced from Whiting Field to the hospital at NAS Pensacola in 15 minutes.

Manning the SEASPRITE were Lt Michael S. O'Leary, pilot; Lt(jg) Kerry J. Sullivan, copilot; Cdr Owen G. Blackwell (MC), a doctor; ADR3(AC) Dennis D. Waggoner, aircrewman; and HM3 John C. Bruno, corpsman.

Electric Throttle—*Continued from page 7*

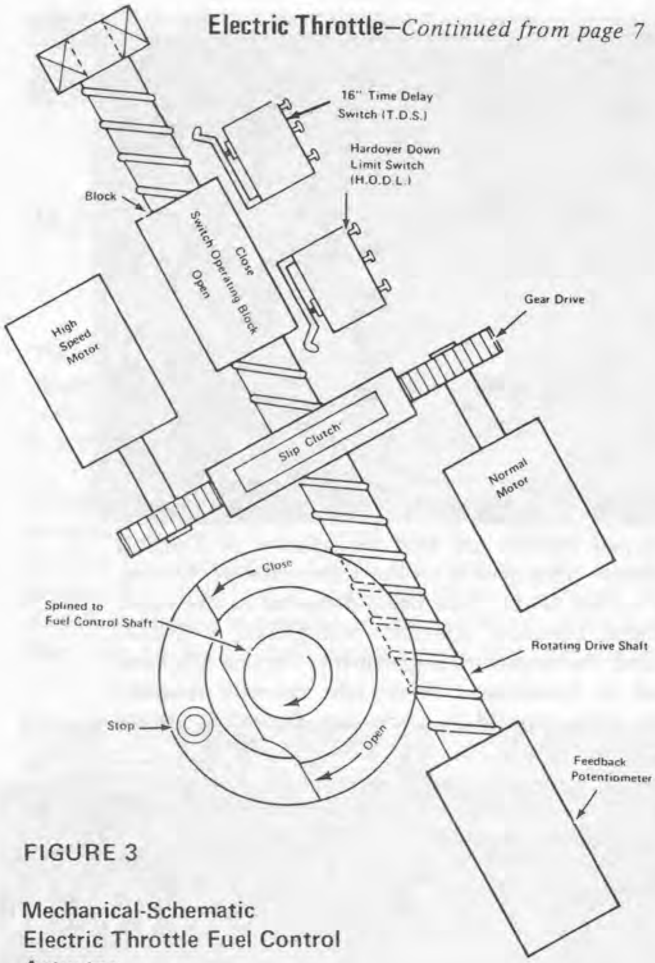


FIGURE 3

Mechanical-Schematic
Electric Throttle Fuel Control
Actuator

THROTTLE ACTUATOR

Figure 3 above shows the major elements of the electric throttle fuel control actuator with the function of each major element described.

Normal Motor—This motor is designed to drive the actuator at speeds compatible with normal throttle operations such as when the engine condition lever (throttle lever) is advanced from idle toward fly position during rotor engagement.

High Speed Motor—This motor is designed to operate the actuator very fast between idle and OFF so that a hot start can be quickly aborted. Having two motors available provides a degree of redundancy because the engines can be returned to OFF with either motor.

Hard Over Down Limit Switch—This switch causes the actuator to stop running should a failure of the throttle intelligence system cause the actuator to run toward OFF when the engine condition lever is in the fly position. The switch is actuated by the switch operating block. Since the operating block is driven by the rotating drive shaft, its position is always in a specific relationship to the angular position of the splined shaft on the fuel control. The setting of this switch is accomplished on the bench and since certain engine/fuel control combinations require different spline shaft angular settings for the same N_f/N_r readings, wide variations in N_f/N_r readings can be seen when checked. This is of no real consequence as long as rigging check confirms that the switch does not permit the actuator to assume an angular position out of the N_f governed range (below 70°). The switch should not be set so high as to prevent achieving the recommended minimum N_f/N_r Beep range setting. As long as this criteria is met, then the hard over down limit switch is performing its intended function.

Feedback Potentiometer— The feedback potentiometer is located within the throttle actuator and is mechanically linked to the splined shaft in such a manner that its output varies with shaft angle. By this means, actuator position information is fed back to the control quadrant.

CONTROL QUADRANT

The electric throttle fuel control actuator is controlled from the cockpit by means of engine condition levers on the throttle quadrant, see Figure 4, opposite page, and the "beeper" switches located on the collective stick.

The engine condition levers are provided to facilitate establishing "engine condition" such as OFF, IDLE, and FLY or any intermediate position. The levers further facilitate rapid actuation of the throttle system and preselection of an engine condition, such as during an engine start in which the engine condition lever is moved from OFF to IDLE at the appropriate time. The condition lever has detents to ensure that the lever remains in the position selected.

The "beeper" actuator is part of the throttle quadrant and is operated by switches located on the collective stick. The beeper actuator drives a potentiometer that sends electrical signals to the throttle system intelligence network. The function of the beeper actuator is to provide a means to make very small movements of the fuel control throttle actuator. This enables the pilot to precisely adjust N_f/N_r RPM and to match power output from each engine (torque matching).

THROTTLE SYSTEM ADJUSTMENTS

No two engines are identical as to RPM/power output for a given angular setting of the fuel control splined shaft. For this reason, an adjustment feature must be provided in the throttle system to compensate for these engine differences. These adjustments are located on the throttle quadrant and are used to set N_f/N_r RPM at minimum and maximum beep limits as well as an adjustment for idle. An idle adjustment should rarely be required for reasons stated earlier.

Prior to making final adjustments to min and max beep settings, the helicopter should be flown for approximately 30 minutes to exercise the fuel control and to stabilize fuel control and engine temperatures. In order for the RPM range specified in the NATOPS Manual to be valid, the throttle system must be adjusted to the specific RPM value called for. For example, in order for min beep RPM to fall within its specified RPM range (94 - 96% RPM -

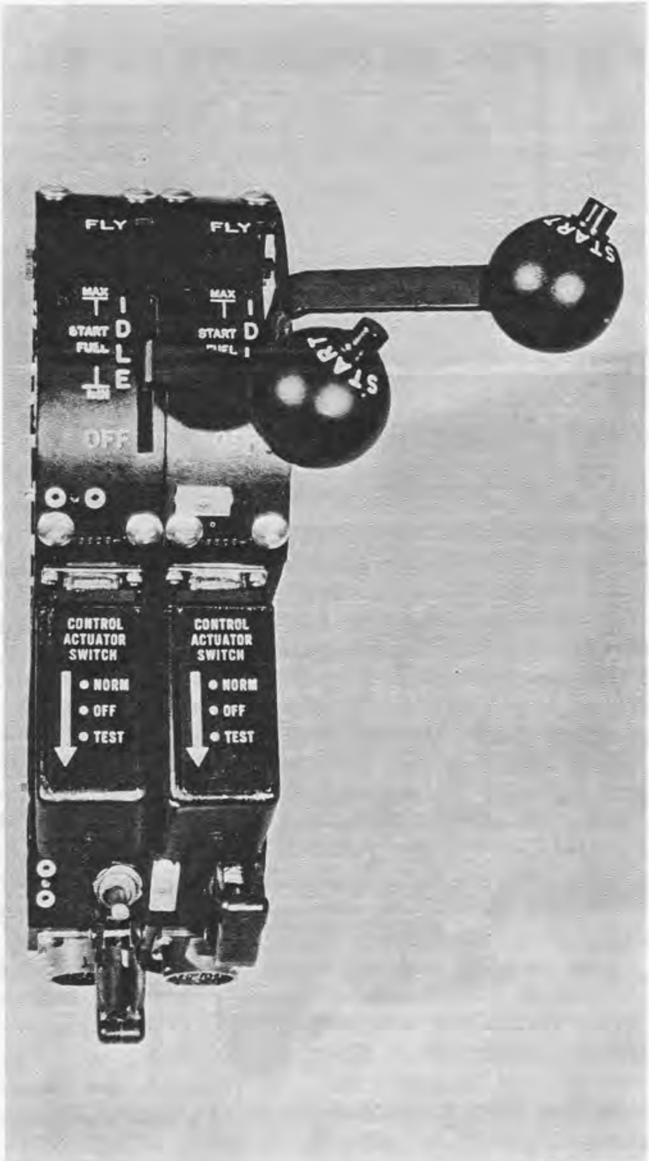


FIGURE 4
Throttle Quadrant

Standard Rotor) for all temperature conditions, it must be adjusted to the specified value (95% N_f/N_r) after being flown for approximately 30 minutes. The acceptable range for normal operations should not be confused with adjustment criteria.

In order to realize the full potential of the electric throttle system in the H-2, proper set up and adjustment is a must.

When these adjustments are properly made, acceptable throttle system performance is maintained over long periods of time or until a throttle system or engine component replacement requires re-adjustment.

MISCELLANEOUS FACTS

A. The electric throttle system is provided with a back up power source (aux battery) intended to ensure a means to secure the engines in the event of total failure of the helicopter electrical system. Beeper actuator is not powered with the aux battery.

B. Each throttle quadrant is equipped with a three-position switch (Actuator Control Switch) which performs the following function:

1. OFF position - Turns off fuel control actuator electrical power. Power is still available to stopcock the engine if the engine condition lever is moved to OFF. Only power to the normal throttle actuator motor is removed.
2. Normal position - Turns on electrical power to the Fuel Control Actuator so that it can operate normally.
3. Test position - placing the switch in the test position introduces a hard over down in the Fuel Control Actuator to test the operation of the Down Hard Over Limit Switch.

C. Hard over down limit protection is provided only when the engine condition lever(s) is in FLY position.

D. The IDLE detent on the throttle quadrant is a two-position detent. When the engine condition lever is placed in the top of the detent, auxiliary starting fuel is allowed to flow for normal starting. With the lever in the lower end of the IDLE detent, a solenoid valve is actuated in the auxiliary starting fuel line turning off the flow of auxiliary starting fuel, thus providing the pilot with a means of controlling a tendency to overtemp during engine start.

E. The Beeper Actuator on the throttle quadrant will still run even though the Actuator Control Switch on the throttle quadrant is turned OFF.

F. Use the Aux Battery to power the throttle system only when total failure of the normal electrical system has occurred or with battery switch OFF and NO External Power. This is to prevent inadvertant engagement of the starter when starter switch is depressed to actuate aux battery circuitry.

G. In order for the throttle system to perform as advertised, the helicopter rotor system must be properly rigged. Rotor cone adjustments can effect Beep Range Settings as well as collective compensation characteristics.

Tips to Reduce Electric Throttle System Maintenance

A. Avoid making unnecessary idle speed adjustment.

B. Avoid making unnecessary hard over down limit switch adjustments keeping in mind the intended purpose of the switch and the RPM variation that can occur with different engine/fuel control combinations.

C. Before making final throttle adjustments, be sure that rotor system is properly rigged (cone setting) and the helicopter has been flown for approximately 30 minutes. Adjust to the specific RPM value specified in current NATOPS. Do not use normal range tolerances as adjustment criteria.

D. Use care when adjusting max and min beep settings. To avoid damaging the adjustment potentiometers, use the correct size screwdriver and very gently turn the adjusting screw to achieve the desired results. Do not force the adjusting screw as damage to the potentiometer will result.

MEDEVACS, SEARCH AND SAVE
BY OCEANA SAR UNIT

NAS OCEANA, Va.—H-2 crews from the SAR OPS unit here made three medevacs, joined in a police search and saved a shipwreck victim according to reports submitted recently to Kaman as part of the company's mission award program. The unit operates three HH-2D's and one UH-2C.

Lt Curtis W. Frandsen, Officer-in-Charge, also reports that the unit has assumed the responsibility for many photographic missions in the area, including those taken of new ships arriving in the Norfolk-Hampton Roads area. SAR OPS Oceana H-2's are recovering four to six drones a week as another duty. In addition to the service performed, the drone-pickup missions provide excellent pilot and crew training, Lieutenant Frandsen said.

Medevacs

A UH-2C from the SAR unit launched after notification that a man aboard the tugboat Boston was thought to have appendicitis. When located, the tug was proceeding downwind in Chesapeake channel with a large empty oil barge in tow. The tugboat had a high central mast so the initial approach was made on the starboard side into a six-to-eight-knot wind. However, the wind over the bay felt stronger than the reported field winds and the initial approach was waved off. A second approach was made into the wind, which was quartering on the tug's starboard quarter. This positioned the helo directly over the mast. AMS3 Barry C. Smith was lowered to the deck to prepare for the transfer. While on deck he directed removal of the tug's mast to make the transfer easier. The patient in a stokes litter and the crewman were then picked up without incident although the transfer was complicated by the fact the tug was barely underway and executing a weaving course to keep steerage on her tow and the channel clear.

Once the patient was aboard, the UH-2C flew directly to NAS Norfolk. Afterward, Lieutenant Frandsen praised AE2 Theodore Wicker, the first crewman, for an "outstanding job of positioning the helo over the moving tug and keeping it there." Copilot on the mission was Ens Harry A. de Butts.

Another UH-2C crew flew 40 miles to sea to pick up a patient aboard the USS Dahlgren. A landing was made on the stern and the patient, suffering from severe head injuries, was placed aboard the SEASPRITE. The injured man was taken to the Portsmouth Naval Hospital. Lieutenant Frandsen was pilot on the flight and Lt(jg) Gary Miller was copilot. Crewmen were AT1 Richard L. Holmes and Petty Officer Smith.

In the third medevac, a man on the USS Barnstable County, an LST 30 miles at sea, was picked up and taken to the Portsmouth Naval Hospital for an emergency appendectomy. Pilot of the HH-2D on the mission was Lt(jg) John J. Stahl, III; copilot was Lt(jg) William Bonner. Crewmen were Petty Officer Holmes and AT3 Dennis L. Moses.

AWARDS CEREMONY—Eleven members of the Oceana SAR Unit were honored by Kaman recently for mercy or rescue missions flown in H-2 SEASPRITES. Attending the ceremony during which the KAC Mission Awards were presented, was Capt R. C. Mandeville, back row, right, Commanding Officer of Oceana. Receiving awards were front row, left to right, Lt(jg) Gary Miller, AT3 Dennis Moses, AME3 Tim Patrick, AT1 Richard Holmes, AE2 Ted Wicker, and Lt Curtis Frandsen, Officer-in-Charge. Rear row, Lt(jg) John Ford, Lt(jg) Warren Eckert, Lt(jg) Jack Stahl, ADJ2 Joseph Oates, and AMH2 Ken Conner. (USN photo)

Police Search

On the police search mission, the Oceana SAR helo launched in an effort to track down a suspected kidnaper and child molester in the Nansemond area of Virginia. He had just been seen in a wooded swamp area and it was felt an aerial search might be effective. The mission was planned to pick up the sheriff at the Suffolk Airport, a small field with no tower. Manning the UH-2C were Lieutenant Frandsen, Lt(jg) Warren Eckert, and Petty Officers Wicker and Smith.

Approximately five miles short of the field the helo encountered heavy rain and strong winds from an approaching cold front storm line. The ceiling dropped to 250' and visibility to less than a mile. At the field, 45-knot winds were blowing when the landing was made. The helo remained "on deck" 10 minutes during light hail and waited until the winds subsided.

The SAR crew then proceeded to search for approximately two hours in an area around the Dismal swamp and Lake Drummond. The ceiling was 250 to 300-feet with one-mile visibility over 140 to 150-foot trees. The search was flown at 50 to 60 knots to enable the crew and sheriff to vertically search the area. Navigation was achieved by using canals and occasional voice communication with airliners overhead.

Despite the extensive air search, no sign of the fugitive was found. The flight did, however, aid police in pinpointing their search and the suspect was located several days later.

In a letter to Air Operations afterward, the Chief of the Nansemond Police Department, said, "We wish to take this opportunity to express our sincere appreciation to your officers Curt Frandsen, W. R. Eckert, T. N. Wicker and B. C. Smith for their outstanding cooperation and assistance."

Shipwreck Victim Saved

A UH-2C crew from the Oceana SAR unit launched after a man was spotted almost 20 miles off-shore surrounded by debris. When the helo arrived in the area, the survivor was clinging to a mast sticking above the wreckage of a small boat. One smoke was dropped to determine wind direction and a "race track" pattern was flown, bringing the UH-2C into the wind. Due to the wreckage and numerous wires in the vicinity the "wet man" was not lowered into the water. Instead the crewman used the SEASPRITE's loud hailer to direct the survivor into the rescue sling. He was hoisted to the helicopter without difficulty and treated for shock, cold and exposure. Two additional smokes were dropped to aid the Coast Guard in locating the wreckage and the helicopter headed for NAS Norfolk.

Manning the rescue helicopter were Lieutenant Frandsen, Ensign Wirt, and Petty Officers Smith and Holmes.

HH-43 'Pedro' Saves Downed Pilot

LAST COMBAT RESCUE FOR FAMED 37th

DA NANG AFLD, RVN—To an HH-43 crew from Pedro Flight fell the honor of making the 37th ARRSq's last—and one of the quickest—combat rescues before the squadron was inactivated several months ago.

1stLt William I. Latham, Jr., and his crew were enroute to a training area when the HH-43, "Pedro 61," heard a nearby OV-10 declare an emergency. Lieutenant Latham immediately headed back to the base for the fire suppression kit. On the way the OV-10 was sighted and seconds later the pilot ejected.

Pedro 61 set down in a rice paddy and was on the ground just before the survivor landed 20 feet away. He was checked for injuries and then taken aboard the HH-43 for return to the base. The quick response to the emergency later won the rescuemen praise from both the Da Nang Base Wing Commander and the president of the accident investigation board from the downed aircraft's home station.

Sharing in the mission were 2ndLt James P. Moulton, HH-43 copilot; Sgt Michael P. Parchment, helicopter mechanic; Sgt Jesse McCoy, medical technician; and Sgt Bobby Gaskins, fireman.

In another mission, as members of the 37th's Pedro Flight, two members of the crew aboard an Army helicopter were picked up after it made an emergency landing at night in a rice paddy. After the HH-43 landed, the airborne firemen, SSgt Allen W. Knipher and Sergeant Gaskins, stepped out onto what appeared to be solid ground but which turned out to be knee-deep mud. Capt Allan O. Spitler hovered the helicopter next to a dry spot so the firemen and survivors could board without sinking farther. The HH-43 then returned to base where arrangements were made to safeguard the downed aircraft and pickup the rest of the crew left on the scene.

Others with Captain Spitler were 1stLt Robert O. Cavazos, copilot; Sergeant Parchment, helicopter mechanic; and SSgt Gregory A. Brown, medical technician.

In a third mission, an HH-43 crew on a training flight responded when an Army helicopter crashed on a small, heavily-populated island in the Song Han River. Pedro 61 immediately flew to the scene and SSgt David E. Newman and Sgt Pete Reyes, the airborne firemen, were let down to evacuate survivors from the burning aircraft. It was found, however, that all five crewmembers were clear of the downed helicopter.

Pedro 60 returned to base, picked up the fire suppression kit and flew back to the island to prevent the flames from spreading to the shelters which had been erected by refugees—already made homeless by the North Vietnamese invasion. While the firemen controlled the flames and kept ammunition on the wrecked aircraft from exploding, the rest of the crew kept the crowds of spectators from the vicinity.

Others aboard the HH-43 with Captain Latham, the pilot, were Lieutenant Cavazos, SSgt Edwin Gay, and Sergeant Brown.

KAC Technical Symposium For Test Pilots

KAMAN TECHNICAL SYMPOSIUM—Front row, left to right, Roy Tuttle, William Weaver, LCdr D. R. Vetter, USN; Capt G. L. Keyser, Jr., USAF; Capt J. C. O'Connor, USA; Capt D. R. Schroeder, USAF; Lt E. T. Schneider, USN; Maj W. B. Woodson, USA; LCdr C. R. Kizer, USN; Cdr W. E. Aut, USN; LCdr Daniel Smolnick, USN; Jack Goodwin. Rear row, Fred Silverio, Dr. Andrew Lemnios, Donald Robinson, John Schauble, Owen Polleys, Peter Russell, Fred Smith, LCdr John Mosser, USN; Robert Bowes, LCdr G. E. Hurley, USN; LCdr R. J. Henry, USN; Al Ashley,William McLaughlin, John Anderson, Sam Seay. (Ruggiero photo)

A technical symposium was held recently by Kaman Aerospace for students and members of the staff of the U. S. Naval Test Pilot School, Naval Air Test Center, Patuxent River, Md. Attendees from the school were the Deputy Director, Cdr W. E. Aut, USN; Flight Instructors, LCdr C. R. Kizer, USN, Maj W. B. Woodson, USA, LCdr R. J. Henry, USN, and LCdr G. E. Hurley, USN; Academic Instructor, Robert Bowers; and Students, Capt G. L. Keyser, Jr., USAF, Capt J. C. O'Connor, USA, Lt E. T. Schneider, USN, Capt D. R. Schroeder, USAF and LCdr D. R. Vetter, USN. Also attending was LCdr John Mosser, USN, TDY to Kaman from NATC. They were welcomed to the Bloomfield, Conn., facility by Charles H. Kaman, President, Kaman Corporation.

Technical presentations made during the day-long meeting were: Dynamic Anti-Resonant Vibration Isolator(DAVI) and Stowable Aircrew Vehicle Escape Rotoseat (SAVER), Donald Robinson, Director of Research & Development; Controllable Twist Rotor (CTR) and Circulation Controlled Rotor (CCR), Dr. Andrew Lemnios, Chief Research Engineer; Elastic Pitch Beam Tail Rotor, John Schauble, Chief of Structural Analysis; SEALAMP, Owen Polleys, H-2/LAMPS Helicopter Program Manager and Sam Seay, Project Engineer-Shipboard Systems; Hauldown Systems, John Anderson, Experimental Test Pilot; Shipboard Landings (Small Ships), Roy Tuttle, Chief of Static Stress.

After a buffet luncheon, the visitors were taken on a plant tour by Al Ashley, Senior Experimental Test Pilot, and John Anderson.

Symposium consultants were: W. Norman Stone, Vice President-Engineering; Lew C. Schuler, Director of Engineering; Fred L. Smith, Chief, Test Operations & Customer Service; William Batesole, Chief Project Engineer. Jack Goodwin, Assistant Chief Test Pilot, was Kaman Program Chairman.

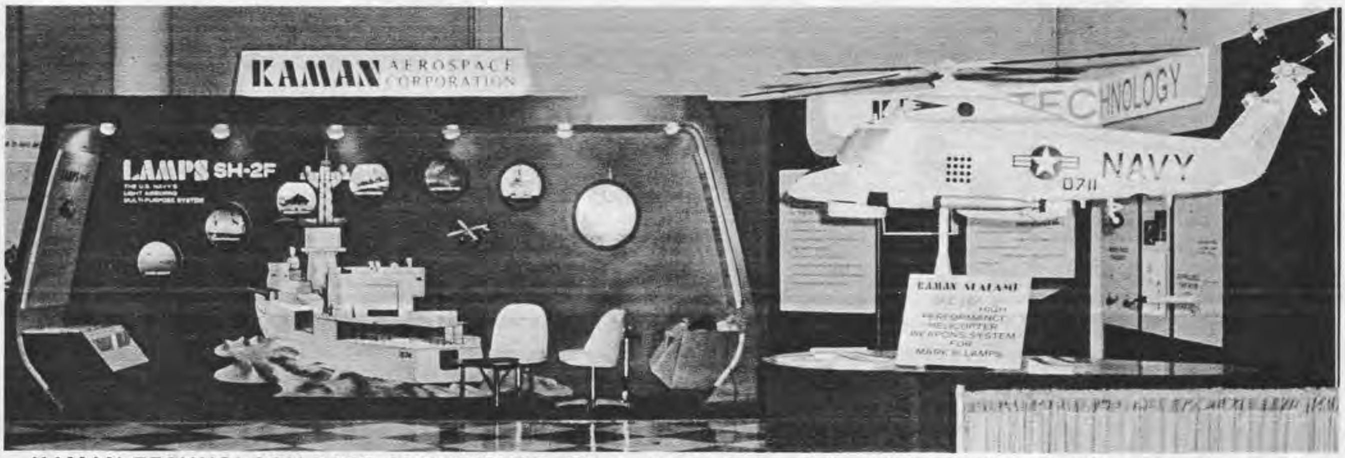
Other symposium attendees were LCdr Daniel Smolnick, Chief, DCASO KA, Bloomfield; William Weaver, Assistant to the Chief, Test Operations & Customer Service; Frederick Silverio, Project Engineer, Avionic Systems; Peter Russell, Senior Production Pilot and William McLaughlin Manager, Public Relations.

Tunisians Rescued—*Continued from page 5*

Statistics do not represent the detachment's efforts to Lieutenant Peterson, Lieutenant Poh, Lt Thomas R. Dean, Petty Officer Bailey, or AMS2 John Sherman. Their participation will be remembered for the small child carried on one flight clutching a chicken, her sole possession, to her chest. The pilots and crewmen will recall for many years the shepherds who remained with their sheep despite the rising flood waters. There is a young Tunisian girl that now keeps a Kennedy half-dollar as a prized memento of the helicopter that rescued her, given to her as she sat wet and afraid aboard "83."

The helo detachment of the USS Springfield responded quickly and efficiently to the call for help. As a part of the overall Sixth Fleet response, "83" was a part of a team effort. The best comment regarding the relief efforts was provided by President Bourguiba when he hailed the Sixth Fleet as "Our shield in the Mediterranean. . .a friend we can count on in time of need!"

Kaman Exhibit At AHS Meet



KAMAN TECHNOLOGY PAST AND FUTURE—That was the theme of the KAC exhibit at the 29th annual forum of the American Helicopter Society in Washington, D. C. Prominent among the displays was the model of SEALAMP, Kaman's proposed new high performance weapons system for Mark III LAMPS. Also featured was a panel showing SH-2F LAMPS operations at sea. Other panels provided information on the 101 Rotor System for the SH-2F; the Controllable Twist Rotor (CTR); Circulation Control Rotor (CCR); Vibration Reduction and Rotor Dynamics Management Programs; and KAcarb bearings. (Ruggiero photo)

(Continued from back cover)

formerly used by U. S. Coast Guard helicopters operating from ice breakers and cutters. Under this concept, the pilot is assisted in landing the helicopter on the desired spot by attaching a cable from a winch on the ship to his aircraft. When tension is applied to the cable, a centering effect results, and the helicopter is guided to the deck. Upon landing, the helicopter is secured to the deck in a jaw-type mechanism, hence the name "Beartrap."

"Harpoon"

The Harpoon system is commonly in use in the French Navy. This system features a probe with mechanical locking hooks attached to a hydraulic actuator cylinder. The cylinder is secured by a universal ball joint to a hard point inside the airframe. The locking hooks on the probe secure instantly and automatically when they engage a grid on the ship's deck, and the hydraulic cylinder retracts creating a high tension in the probe, thus firmly securing the helicopter to the deck.

KEESLER AFB, Miss.—The HH-43s of Det 4, 44th ARRSq (MAC), ended their mission here recently and are preparing for inactivation.

During its stay here, the detachment provided special assistance to the community. In August 1969, for example, crew members flew 122 sorties at the time of the Hurricane Camille disaster in relief operations including damage assessment, medical evacuations and airlift of critically needed items from medicine and food to safe drinking water. More than 30 persons were rescued in life-saving operations in the Waveland-Bay St. Louis area alone.

Commander of the unit, LtCol Delmar G. Worsech, plans to retire shortly and make his home in Wisconsin. Members of the detachment will be reassigned locally or to other bases.

The two systems installed in the modified HH-2D being used during current testing are designed for ready interchangeability without degradation of the helicopter's structural integrity or flight characteristics. They are designed for testing and evaluation under maximum magnitudes of ship's motion corresponding to sea state six.

Upon completion of evaluation of these and other systems, the Navy may select one for incorporation in ships operating LAMPS helicopters.

NATC Improvements

Commander Lineback also described other problems connected with helo landings aboard small ships and the means NATC and NAEC have undertaken to eliminate them. Obstructions on some ships have been moved or redesigned and deck markings have been changed. For example, markings now include the location from which day and night HIFR (helicopter in-flight refueling) operations can best be conducted. A modified Fresnel landing light similar to the one in use with fixed-wing planes aboard a carrier has also been installed to aid the pilot in making his approach to the ship in darkness or poor visibility situations.

Deck light for night landings was researched and many combinations and colors were tested by NATC personnel aboard several different ships.

"Best Possible System"

Although his talk was of a technical nature, Commander Lineback interposed frequent informal remarks which showed the professional awareness he, as an NATC pilot, has of the problems confronting LAMPS and other helicopter pilots operating from small ships in a vast ocean.

In his concluding remark, this awareness and dedication to the NATC task was once again evidenced. "Our only objective," he said, "is to provide the best possible system for the pilots in the Fleet."

LAMPS DYNAMIC INTERFACE TESTING

Cdr Harry Lineback during talk at Kaman (Ruggiero photo)

To the uninitiated, landing a helicopter aboard a ship like a destroyer escort (DE) or Guided Missile Frigate (DLG) may seem like a comparatively simple task. The helo lines up with the deck and settles down to a nice soft landing, the flight deck crew secures the "bird," and the pilot heads for the ward room and a cuppa' coffee. None of those listening to a recent talk on "LAMPS Dynamic Interface Testing" could fail to be impressed with the many factors which actually must be considered when such a landing is made. Factors like the strong winds which might be sweeping across the small flight deck, or the motion of the vessel itself as it yaws, pitches, and rolls in heavy seas.

Progress Briefing

The speaker was Cdr Harry Lineback, a pilot from the Rotary Wing Section of the Flight Test Division, Naval Air Test Center, Patuxent River, Md., and for almost an hour he briefed his audience on the progress which has been made since 1963 when NATC first began meeting and solving the problems connected with small ship-helo operations. The H-2 SEASPRITE has been used extensively since the LAMPS Dynamic Interface Testing began two years ago. This, the latest in the series of tests, is aimed at determining the launch-recovery capabilities of a helo at sea. Much of the testing has been done in cooperation with LAMPS detachments from HSL-30, NAS Lakehurst, N. J., and HSL-31, NAS Imperial Beach, Calif., which were deployed aboard ships like the USS Fox and the USS Wainwright. NATC has, and still is, receiving much valuable information from LAMPS detachments operating aboard similar vessels in the Mediterranean and WestPac.

NATC To Visit 18 Ships

Other testing has been or is, being conducted at Patuxent River, NATC Lakehurst and Kaman's Bloomfield, Conn., facility. Present plans call for NATC personnel to visit 18 ships in 1974 and Commander Lineback anticipates that it will take eight years to complete the program.

Not Enough Ships, Helos, Pilots

"We are going through now, what the fixed-wing people went through 25 years ago," he said. "The biggest problem is that there aren't enough ships or helos available to perform the tests."

During his talk, Commander Lineback reminded his listeners that landing a helicopter in a confined area on a pitching deck is only one problem, another is handling the aircraft after it touches down on an "unstable platform" which has been known to tilt 13 or more degrees. Under these conditions, the simple act of chaining or otherwise securing the aircraft calls for split-second timing on the part of the flight deck crew.

Hundreds Of Landings

Hundreds of H-2 landings have been made by fleet squadrons aboard DE's, DLG's, DD's and similar vessels. From time to time there have been incidents, but the fact that these have been comparatively few speaks well for the skill shown by all of the participants—pilots, aircrewmen, LSE's (Landing Signalman, Enlisted) and the flight deck crew. It speaks well also for the methods and equipment which have been and are being developed by the Naval Air Test Center (NATC) and Naval Air Engineering Center (NAEC) to make the landing operation less hazardous.

"Beartrap"

NATC is presently engaged in testing various hauldown and securing systems for helicopters landing on small, non-aviation ships in high sea states. One of these systems is called "Beartrap," and another named "Harpoon." Beartrap is currently in use by the Canadian Forces and was

(Continued inside back cover)