**VP-9**

**2P STUDY BIBLE**

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**“RICK JAMES” VERSION**

**KNOWLEDGE TO MAKE YOU RICH BEEIACH**

**By LT Rick J Holt**

**Propeller System**

**Part A**

**System Components and Normal Operations**

**A1. Centrifugal twisting moment (CTM) effect on the propeller [Ch. 2].** When a propeller rotates at normal operating speed, its blades experience a stress that tends to twist them towards a flat pitch. This twisting moment is a natural dynamic phenomenon that affects blades of every design, and its total effect is the sum of prop speed, load, and friction factors. It is more directly related to the centrifugal forces generated by the whirling mass than to the aerodynamic loads, but with the reversible propellers the blades tend to pivot from either positive or negative pitch towards the zero-moment blade angle. This force is identified with its chief contributing factor, CTM. This is the strongest aerodynamic force acting on the prop. It tends to rotate the blades to a lower blade angle to remain in parallel to the plane of rotation. There is also torque bending (blades bend as they lag the torque), thrust bending (blades bend pointing in the direction of the thrust), centrifugal force (blades pull outward..stretching), and ATM for aerodynamic twisting bends the blade to a higher blade angle (easily overcome by CTM).

**A2. Propeller operation [Ch. 2, Foldout 13]-** It is a four bladed Hamilton Standard 54H60-77 propeller which provides an efficient and flexible means of converting engine SHP to thrust. It is a constant speed, variable pitch, full feathering propeller, having the added features of negative torque sensing, pitchlock (to prevent excessive overspeed), and a combination synchronizing and synchrophasing system, with blade angles from -13 to +86.65 degrees. (spit that out on your 2P board when we say ‘tell us about the prop’ & we will all be impressed, good opening line).

**a. On speed condition-**The servo spool position is stabilized by manifold pressure, porting fluid to the increase side to counteract CTM. This is because the “ON SPEED” position is when CTM, acting to force the pitch control piston toward low pitch, is exactly countered by the hydraulic force on the increase pitch side of the control piston.

**b. Effect of a power addition –** Fuel flow increases as does engine speed, flyweights spread out, the pilot valve moves left (towards increase), manifold pressure is ported to the balance face (the right side), and this causes the servo spool to move left connecting the manifold pressure to the increase pitch line. This keeps pressure in the flyweight chamber, pitchlock teeth separated, and increases pressure in the increase side of the dome. As pressure increases it moves the pitch control piston in the dome aft, converting the linear motion to the rotary motion on the blades to increase the pitch. The decrease pitch side ports fluid back through the decrease lines and into the pressurized sump where it is connected at the servo spool.

**c. Effect of a power reduction –** The opposite of the increase (spool is moved right when the pilot valve moves right and allows the balance face pressure to connect with the pressurized sump drain moving the servo spool to the right connecting the decrease with manifold pressure)

**A3. Electrical components [Ch. 2, Foldout 13]**

 **a. Feather button functions**

**1. Feather position**- Cuts off fuel electrically at the FCU, energizes the feather valve solenoid , energizes the aux pump.

**2. Neutral position(Run position)-** normal position of the FX Button, no action is taken.

**3. Un-feather position-**Energizes the aux pump, arms 45 deg airstart, blade angle decreases as fluid travels through the neutral FX valve.

 **b. Pressure cutout override-**De-energizes the feather cutout, energizes the aux pump, energizes the feather valve solenoid.

 **c. Pressure cutout switch-** Also known as the feather motor cutout switch, once the propeller is feathered, the combination of blade angle above 74° and feather motor cutout switch sensing increase-pitch pressure above 600 to 800 psi energizes the feather cutout relay. Energizing the feather cutout relay interrupts power to the feather pump and de-energizes the feather valve solenoid ( if the switch was mis-rigged and pressure continues to build or the aux pump continues to run without a leak then the pressure once it reaches 1250 psi would port out of the high pressure relief to the pressurized sump.

 **d. E-handle switch-** Also known as the wiper switches, when the E-handle is pulled you get the following actions: 4Fs and a BOGE

F-Mechanically and hydraulically positions the feather valve to the feather position

F-Electrically pulls in the feather button

F-Electrically and mechanically shuts off fuel at the fuel control

F-Mechanically closes the fuel tank emergency shutoff valve

B-Electrically closes the bleed air valve

O-Electrically closes the oil tank shutoff valve if the circuit breaker is in

G-Mechanically closes the generator cooling air shutoff valve (this door is also used to eng mounts)

E-Electrically dumps the engine driven compressor and closes the firewall shutoff valve (engines 2/3)

 **e. Feather cutout relay-** Measured on the beta shaft. Signals that the blade angle is above74° works in conjunction with feather motor cutout switch.

**A4. Electronic governor [Ch. 2, Foldout 13]** Sync box is the brains of the synchrophasing system, collects all the signals, like pulse generator, tachometer, feedback and the anticipation signal. All these signals make a reference signal and will be sent to the speed bias servo motor.

 **a. Sync servo-** Controls power to the speed bias motor. The individual Sync servo switches are activated prior to takeoff and remain on through the landing. Allowable RPM over/undershoot 96-106%. With the sync servo on for the engine, speed-derivative circuitry is energized, which when damping RPM variations are caused by changes in power plant loads or when adverse environmental conditions such as turbulence are trying to drive the propeller off speed, this circuit receives a reference signal from the engine tachometer generator. When RPM changes, the speed-derivative circuit senses the rate and amount of RPM change and signals the governor speed bias motor to change the speeder spring force, which temporarily resets the propeller governor. The second system is the power lever anticipation circuit, this system detects rapid power lever changes through the alpha shaft and electrically calls for an increase or decrease in blade angle before the propeller has a chance to go off speed. An electronic input to a magnetic amplifier from the alpha shaft (P/L movement) biases the speeder spring to change the prop blade angle before the mechanical governor can sense off speed.

 **b. Sync master-** After takeoff, a master is selected (#2 or #3 only), which energizes synchrophasing (props pass the leading edge at different times; lead/leg) and synchronizing (all props have the same RPM).

 **c. Speed bias servo motor** (see sync servo above)

 **d. Anticipation potentiometer** (see sync servo above)

 **e. Speed derivative circuit** (see sync servo above)

**A5. Propeller protective devices [Ch. 2, Foldout 13]**

 **a. Prop brake-**The propeller brake system is a friction type brake used to prevent wind milling when the propeller is feathered in flight or high winds when parked, decrease rundown time on shut down, prevent wind milling when the aircraft is parked (high winds). The brake operates automatically and is always in one of three positions.

1. Released: During ground start the starter motor torque mechanically releases the brake. When the engine accelerates above 21% RPM, gear box oil pressure (>50 psi) holds it in the released position. During an in-flight restart the propeller brake remains applied until 21% RPM at which point reduction gear box oil pressure releases the brake.

2. Applied: On engine rundown, as RPM decreases below 21% the oil pressure decreases sufficiently to allow spring force to act on the braking surfaces applying the brake.

3. Locked: If, at anytime, the propeller attempts to rotate backwards the brake will lock. When the propeller is feathered in flight, the twist of the propeller blades will attempt to rotate the propeller backwards which will lock the brake. The brake will remain locked until overcome by aerodynamic pressure as the blade angle decreases during restart, but it will still remain applied until 21% RPM.

 **b. Beta follow-up-** Beta follow-up is designed to stop the loss of pitch caused by a relatively gradual loss of engine power from a high power setting (i.e. fuel restriction, bleed air leak during takeoff). It also serves to limit drag from a wind milling propeller if an engine fails during takeoff and NTS fails to operate. Beta follow-up is a variable, hydraulic low-pitch stop, designed to maintain a minimum blade angle based on power lever position. This minimum blade angle is 11° from flight idle to 68° coordinator. It then increases to 22.5° at the 88° coordinator position. It remains at 22.5° through the 90° coordinator (takeoff) power setting. Beta follow-up requires controllable, reliable propeller hydraulic fluid to work.

 **c. Auto feather-** Electrically positions the feather button to feather. For auto feather to actuate:

1. Electrically armed. Arming is indicated by illumination of four auto feather lights.

2. Power lever position above 60° coordinator.

3. The propeller must be producing less than 500 pounds of positive thrust, sensed by the thrust sensitive switch on the reduction gear assembly.

4. No other feather button in the feather position.

Auto feather actuation is indicated by shutdown of the engine. In addition, the auto feather light of the propeller that has feathered remains on. In the event of a power loss occurring on more than one engine at the same time, electrical interlocks prevent more than one propeller from auto feathering. The auto feather priority is 4 - 1 - 3 – 2, in case of a power loss on multiple engines, the auto feather system selects one of the outboards first. Obviously the outboard engines will have the strongest effect on directional controllability during flight. To feather the “outboard engine” will reduce this directional control problem most. If the auto feather system has to choose between #1 or #4, it will choose the #4 first, because this will produce less of a swerve because #4 will offset thrust of the propellers (P-factor).

**d. Pitchlock-** Limits prop over speed by preventing further decrease of blade angle. Available between 17 deg and 57 deg blade angle & Cammed out below 17 deg and above 57 deg blade angle. Fuel Governor and Propeller Pitchlock Test Switch results in the on speed condition being reset to 106%. Intentionally pitchlocking the propeller could result in a loss of 2,500 SHP.

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The basic components of the pitchlock mechanism are two gears with angle teeth. The angled pitchlock teeth are designed so blade angle can increase through ratcheting action when engaged, but cannot decrease. They are spring-loaded, but held apart by pitch change oil pressure against the pitchlock ratchet piston. The stationary pitchlock ratchet teeth are splined to the propeller barrel so it turns with the propeller shaft but is not affected by changes in blade angle. The other is splined to the ring gears that drives the blades during pitch change. Cams are machined on the mating faces of the gears, and above 57° blade and below 17° blade angle, these cams overlap. This presents a positive interference which prevents the ratchet halves from engaging. This is considered “cammed out”. The reason the pitchlock system is cammed out below 17° blade angle to allow reverse possibility and cammed out above 57° blade angle to allow unfeather capability. During flight, the propeller always operates in a fairly high pitch range, between 14° to about 55° blade angle. A regulating and pressurizing valve uses either increase-pitch or decrease-pitch pressure to create a constant pressure in the flyweight chamber for use in the pitchlock mechanism. Centrifugal force from flyweights sense propeller RPM, acting against spring pressure to keep the pitchlock servo in the open position. An over speed of approximately 103.5 % or greater will unseat the valve and allow flyweight chamber pressure to shift the pitchlock servo to the closed position thus porting controlling fluid into the atmospheric sump and allowing the pitchlock teeth to come together (see above pic)

 **e. Pitchlock reset-(FEDC)** A reset system is used to reset pitchlock RPM from 103.5 % to 109 % whenever blade angle is still above 10° and the power levers are retarded below 28° coordinator. When these conditions are met, the pitchlock reset solenoid valve is energized, porting propeller pump manifold pressure to the pitchlock reset actuating valve. This actuating valve will equalize pitchlock flyweight chamber pressure on both sides of a pitchlock speed bias plunger. An additional spring then increases the pressure against the pitchlock flyweights, ensuring they will not close the pitchlock servo until 109% RPM. The pitchlock reset solenoid is de-energized as soon as the blade angle is below 10°, well into the range where pitchlock is cammed out. Pitchlock reset requires controllable, reliable propeller hydraulic fluid to work. Fuel scheduled in the Beta range (high powered abort) is sufficient to cause RPM greater than 103.5 %.

 **f. Low pitch stops-** Mechanically limits minimum blade angle in-flight to 13°. The low pitch stop is released by full decrease-pitch pressure supplied by both the main and standby propeller pumps, although either pump alone is capable of this task. The backup valve opens when power levers are brought below 28° coordinator, allowing the main and standby regulating valve to sense the demand for elevated pressure in the decrease-pitch lines to break the low pitch stops. In the front of the dome houses the servo and surge valve. The servo function opens at 260-310 psi to port fluid to the actuating chamber of servo piston for breaking the low pitch stops. The surge function opens when fluid pressure builds up to 630 psi in the decrease pitch line and ports this higher pressure to the increase pitch side of the dome. Successful release of the low pitch stop and subsequent blade angle reduction into the Beta range is indicated by illumination of the Beta light at 10° blade angle. There are 3 mechanical limit devices incorporated in the dome to maintain a minimum of 13° blade angle.

 **g. 45 degree airstart-** Backs up NTS during an air start by maintaining blade angle above 45°.

1. Feather button held in the UNFEATHER position.

2. Pressure Cutout Override (PCO) button not depressed.

3. Blade angle less than 45°.

System actuation energizes the air start control relay, which illuminates the NTS INOPR light, energizes the feather solenoid valve, causing the feather valve to shift to the feather position. This drives the propeller blade angle towards feather. The system will become de-energized once the blade angle increases to above 45°, but will reenergize when it again drops to 45°. This causes a flashing NTS INOPR light as the blade angle cycles around 45 degrees. The procedure for an NTS INOP light is to pull the emergency shutdown handle while continuing to hold out on the feather button, then push in the feather button and execute the emergency shutdown procedures. It is important that the feather button continues to be held out when securing the engine with the Emergency shutdown handle in order to maintain the 45° air start protection. The 45° air start protection requires controllable, reliable propeller hydraulic fluid to work.

 **h. Negative torque sensing**- Prevents excessive drag, a back up on takeoff, walks out the blade angle out on restarts. For #1/4 engines NTS actuates in the -150 to -500 SHP range, and on #2/3 NTS actuates in the -100 to -500 range (the difference is the EDC load), the reason that the value of -100/-150 SHP is chosen is because if the range should start at 0 SHP there isn’t a possibility for restarting the engine during an in-flight restart. Once an engine is in the negative range the extended NTS pushrod actuates the linkage in the propeller control valve housing. At power lever positions greater than 24° coordinator (below this NTS is camed out by the FX and disarm cam), the linkage shifts the feather valve to the feather position (figure 6.11), resulting in increased pitch and lessening the negative torque.

Over rotated A shaft = stuck power lever on NTS check



 **i. Decouple**- Abackup for the NTS system. If the NTS system fails to function properly or fails, the safety coupling will decouple the reduction gearbox from the power section between -500 and -1,700 SHP at 100 percent, thus automatically limiting excessive loads on aircraft structures and excessive drag on the aircraft. If you are decoupled you could deplete all the oil out of the gear box and it may catch on fire (unable to scavenge to RGB).

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**Part B**

**B1. Prop pump light and fluid leak**- On the ground- in low RPM you only get 72% of the pumps output pressure, so you may get a PPL in low but not in normal. Hence the note in NATOPS, “The propeller pump No. 1 light may come on when the engine is in low rpm. This is caused by lower rpm propeller pump output combined with the higher propeller oil operating temperatures associated with ground operation. If the propeller pump No. 1 light goes out in NORMAL rpm, no corrective action is required.” However, if it is on the initial start, you must secure the start and have it serviced. My own belief is that if the light comes on in low before I takeoff (ie. at the hold short) I am still in the first start of the day situation, and I am coming back. If light is on in normal, I’m coming back. IF the light is off in normal but when you push the power lever up and the Beta light goes out and a PPL #1 comes on, it could be pitchlock resest. Pull the C/B for pitchlock reset, if the light is still on , I’m coming back. If it goes out then it’s pitchlock reset causing the PPL to come on. IF PP2 light comes on I’m COMING BACK. Probably not servicing, it’s probably a bad pump. Reason this is, because PPL #2 sits lower in the tank so if you get #2 without #1 PPL, you can bet on the pump being bad. If you see a prop leak on preflight, call it in. Maintenance will let you know, if its iffy then you will do a penalty turn (usually 10 minutes).

In flight-Get prepared for pitch lock, complete the first two memory items, important to get the blade angle high. “A propeller malfunction is a propeller pump light/fluid leak or an off speed condition. The illumination of a single propeller pump light or a visible propeller fluid leak may prevent full feathering capability. A propeller off-speed condition exists when indicated rpm is greater than 1 percent above or below mechanical/electronic governing rpm for that engine, or if any sustained rpm oscillation occurs. In each of these cases, the off speed condition must be detected audibly. Propeller malfunctions may be complicated; therefore, the following procedures should be referenced during execution.” Begin the procedure in 15.12.1, you got a prop malfunction!

**B2. Prop fails to feather on loiter shutdown-**If it feathers in the first 4 steps, continue with the loiter shutdown checklist. If not, continue with the fails to feather checklist and then complete the emergency engine shutdown checklist.

**B3. Prop fails to feather on emergency shutdown-** Complete the Fails to FX checklist when called for on the Emergency shutdown checklist until it feathers, then complete the emergency shutdown checklist.

\*1. Feather button - In (check the wiper switch C/B)

\*2. PCO - Press (600-800 cut out switch went out early)

\*3. Alternate bus (propellers 1 and 4) - Select (popped C/B higher amps on alt bus)

\*4. PROP FEATHER circuit breakers - Check in (popped C/B check both/all 3 if alt used)

\*5. Airspeed - Decrease toward 150 KIAS (min airspeed with safe margin above stall)

**Note**

Subsequent airspeed selection should be based on aircraft gross weight and

controllability.

If feather button light remains on:

\*6. PROP FEATHER CONT circuit breaker – Pull (no reason to continue to run the Aux pump)

If the propeller remains in an over speed condition, refer to Operation with a Pitchlocked Propeller procedure. Refer to Operation with a Pitchlocked Propeller, paragraph 15.12.2.

**B4. Prop fails to feather on emergency shutdown (fire)** – Procedures see above, however…

If the propeller fails to feather in conjunction with an engine fire indication, only the first four items of the Propeller Fails to Feather procedure, paragraph 15.12.6, shall be completed. If the propeller does not feather, complete the remaining items of the Emergency Shutdown Checklist, paragraph 15.5.1, then complete the remaining items of the Propeller Fails to Feather procedure.

**B5. Feather button light remains on after shutdown-**If light remains on following engine shutdown, pull respective propeller feather control circuit breaker, and execute the Emergency Shutdown procedure. Possible leak or incomplete cutout, pump is still running.

**B6. Autofeather**- Get safely airborne (altitude), check indications and perform the Emergency engine shutdown checklist. We do not arm the autofeather with high bird activity because if it feathers for the bird strike we lose the ability to feather for an additional problem, perhaps more serious.

**B7. Prop rotates backward on loiter shutdown versus emergency shutdown**- Failed prop brake, If the propeller rotates backwards, momentarily pull the feather button to UNFEATHER position. When rotation stops, place the feather button to neutral position. If the feather button is held in the UNFX position too long, the propeller will start to rotate forward. If this occurs, push the feather button to FEATHER and repeat the procedure as often as necessary. Continued loiter operations are permissible. Ensure the feather button is pushed in prior to conducting an in flight restart

**B8. Minimizing buffet of feathered prop following loiter shutdown or emergency shutdown-** To minimize buffet of a feathered propeller during two or three engine loiter, position the propeller blades so they do not parallel the wing leading edge. The positioning should be accomplished by means of the feathering button. Depress pressure cutout override switch for 10 seconds prior to positioning. Besides finish the checklist first, then worry about the buffet, same with the Emerg S/D checklist.

**B9. Feather pump failure-** ON shutdown this will lead to Mechanical feather and no light in the button, perform the fails to feather check list. You will get to alt and C/Bs check the C/Bs and see if that’s your problem but if it is the actual aux pump you will not get a full feather, and you will not be able to restart no fluid pressure, run the Emergency engine shut down checklist.

**B10. NTS INOP light on restart-**Continue holding out on the feather button (this is protecting you from blade angle slamming to 0), E-handle, push in the feather button, execute emergency shutdown checklist. Probably have a misadjusted NTS bracket.

**B11. Pitchlock regulator failure-** Certain malfunctions of the pitchlock regulator can cause a propeller to pitchlock in the governing range without an overspeed condition. In this circumstance, retarding the power lever produces a decrease in rpm, but moving the power lever forward again causes rpm to increase only to 100 percent. Continued forward movement of the power lever will cause the SHP indication to increase. If this condition occurs, continued operation is permissible. When in the terminal area and at a sufficient distance from the field to allow for power and control changes prior to landing, execute the Emergency Shutdown procedure, paragraph 15.5.1.

**B12. Feather valve solenoid failure -**This gives you blade angle rotation on PCO. This is because the E-Handle is in and you energize the aux pump and feather valve by selecting the PCO button. However, in this instance the feather valve is inoperative so it does not position the feather valve to the feather position and instead of charging the dome you end up allowing the pump pressure to go to the decrease line because it senses a major underspeed. So you get the blade angle decreasing which catches the airflow in turn causes rotation. Now you E-handle the engine and execute the emergency shutdown checklist. Since you did the EMERGENCY SHUT DOWN CHECKLIST, it’s just that, an emergency. You will NOT restart this engine….unless a greater emergency arises.

**B13. RPM fluctuation-** What indications are fluxing, just rpm? Is it sustained oscillation that is audible? Could be a Pro malfunction if so, otherwise could be a malfunction of the TD. For the TD- In case TIT, fuel flow, and SHP begin fluctuating abnormally, move the temperature datum control switch of the affected engine to NULL. If this corrects the fluctuations, continue operation in NULL. TIT must be monitored, as no temperature limiting protection is provided with the temperature datum control switch in NULL. Otherwise go step by step through he prop malfunction, don’t skip ahead, read the Hazrep below for skipping….

**B14. Prop off-speed audible-** Prop procedures, see below Hazrep.

**B15. Pitchlocked prop procedures-** Be intimately familiar with these. The time to learn is not in the plane. Go through each step with the instructor. The basic concept is figuring out if you are pitchlocked, decoupled or both. Then getting the Aircraft in a safe position for the flight home and determining how to do that. Then preparing for landing. “I Scare my Granny to Death” then yes or no are we pitchlocked or do we need to intentionally pitchlock for controllability.

**B16. Decoupler failure or decouple due to flameout-**Recognize what you have. Then determine when to shutdown the engine. Pitchlock decoupled, but still running will keep oil in the RGB. Otherwise Flameout pitchlocked decoupled you are already scavenging, just run the Emergency engine shutdown checklist.

1. If decoupling is due to fuel cutoff to the engine:

 a. SHP should indicate near zero initially and then may wander randomly.

 b. Rpm will initially surge but should stabilize at 100 percent.

 c. TIT will decrease toward ambient.

 d. Fuel flow will read zero.

 e. Power section oil pressure will be at or near zero psi.

2. If decoupling occurs due to a decoupler failure, the engine will continue to run on its fuel topping governor:

 a. SHP should read near zero initially and then may wander randomly.

 b. Rpm should stabilize at 100 percent.

 c. TIT will be approximately 550 \_C.

 d. Fuel flow will be approximately 600 pounds per hour.

In each of the above cases, execute the Emergency Shutdown procedure, paragraph 15.5.1.

**B17. Pitchlock reset failure-** If the C/B is out, or you suspect pitchlock reset will not work (ie complete loss of electrical power), then you must wait until you are below 125Kts before you go into reverse.

**B18. Pitchlock decoupled prop-**Prop procedures, see below Hazrep.

**Part C**

**C1. VP-47 Ditch (DTG 302101Z Sep 95).** Included below, It’s the worst situation you could imagine. This is why we now have the warning in Natops to E-handle with vibrations.

**C2. Pitchlocked high blade angle with weather a factor at the field-**You have to fuel chop before you descend because of the high blade angle. The problem with that is the weather. In the event you cannot get in to land, you will have to waive off and if you proceed to your alternate there is the chance now that you will starve the RGB of oil and an ensuing fire for the S/D engine.

**C3. Prop overspeeds to 105% during low altitude operations at loiter airspeed-**Fuel, plain and simple. You will be limited on transit speed and depending at what point you are in the mission you may not have enough fuel to get home. Limited on altitude and airspeed because of the low blade angle. Loiter is usually about 20-25kts above 1.52 speed, so you have that to play with for the climb out at 1.52. you could also try and fly max endurance (12 units AOA). Once you get to 0 SHP at 1.52 check the GPS vs ETE and Fuel Flow, will you make it? If not, now you are in the “try this” section of the fuel planning with a pitchlocked prop. Shutting down a good engine rechecking if you can make it, and then finally trying to E-handle the pitchlocked engine.

**C4. Fuel governor, pitchlock, and reverse SHP check-** completed in the order of the name of the check. So here it goes and why…

1. Position aircraft into wind. (make the engine as efficient as you can for the check, we don’t fly backwards do we)

2. Rpm switches — NORMAL. (need it to be in norm for the checks, plus you need the other two in case of emergency)

3. TEMPERATURE DATUM CONTROL switches — NULL. (taking the TDs out of the equation, otherwise they try and set TIT based on coordinator position and you wouldn’t check fuel topping)

4. Propeller SYNC SERVO switches — NORMAL. (needed to pitchlock the prop for the test)

5. Propeller SYNC MASTER switch — OFF. (remove syncrophasing and synchronizing)

**Note**

Perform steps 6 through 13 on two engines at a time (1 and 4, 2 and 3).

6. Power levers — FLIGHT IDLE.

7. Fuel governor check switches for engines being checked — TEST (resetting on speed to 106 so the speed bias motor is at full decrease and will not try to increase pitch until 106% rpm)

8. Power levers — Advance to maximum power position and observe fuel governor rpm (104.2 to 106.7 percent). (pitchlock is still cammed out until beta follow up reaches above 17° blade angle about 78° coordinator but fuel topping takes over around 55°)

**CAUTION**

Limit the time at the fuel governor setting for any one check to a maximum of 1 minute.

**Note**

If rpm is between 105.5 and 106 percent, investigate to determine that propeller governor is not controlling rpm. Possible indications of the prop controlling rpm vice the fuel governor are high SHP and high fuel flow.

9. Power levers — Retard to 100 percent rpm; SHP should be 1,500 minimum if Beta follow‐up is set correctly. (this ensures you were at 22.5° blade angle checks the pitchlock and beta follow up).

**Warning**

Do not permit the rpm to drop below 95 percent or the engine bleed valves may open and an over temperature may occur.

10. Fuel governor check switches — NORMAL. (clean up from pitchlock test)

**Note**

In the event of a malfunction requiring engine shutdown, excluding an actual engine fire, secure the respective engine with the fuel/ignition switch.

11. Power levers — Advance and observe a SHP increase and stable rpm. (clean up from pitchlock test)

12. Power levers — MAX REVERSE (check SHP). (just checking the minimum required SHP)

 The following nominal values are for sea level, standard day 15°C (59°F) conditions.

 a. Engine Nos. 2 and 3 should be 1,250 +/-150 SHP.

 b. Engine Nos. 1 and 4 should be 1,150 +/-150 SHP.

**Note**

Increase nominal values 5 SHP for each 1°C decrease in temperatures from 15°C.

Decrease nominal values 4 SHP for each 1°C increase in temperature from 15°C.

Decrease nominal values 40 SHP for each 1,000‐foot increase in pressure altitude from sea level.

13. Power levers — START. (clean up from test)

14. Repeat steps 6 through 13 with the remaining two engines.

15. TEMPERATURE DATUM CONTROL switches — NORMAL. (clean up from test)

**C5. Fuel planning with a pitchlocked prop assuming furthest distance from home-**Similar to the low blade angle problem except we assume you pitchlock on the climb out where we would normally restart, then you would have a higher blade angle and start by climbing out at climb scheduled airspeed then to max range at 0 SHP.

**C6. Gauge limit overspeed-** What’s your speed and can you effect the RPM by slowing down? If an immediate, uncontrolled overspeed above 115 percent occurs, reduce airspeed as rapidly as practical to the speed at which safe control of the aircraft and propeller can be maintained, but initially not less than 150 KIAS. Subsequent airspeed selection should be based on aircraft gross weight, controllability, and rpm. Perform Operation with a Pitchlocked Propeller procedure in paragraph 15.12.2. This procedure will help to try and bring RPM down by pitchlock being reinforced and then pulling the power lever back to 100%. Try and descend to get RPM down if you are already at 150 an rpm is still high. If unable, and you couple what’s happened with the possible vibrations in the E-handle and Power lever and you have the Natops other warning, Significant airframe vibration combined with external propeller fluid leaks and/or propeller pump lights may be indicative of impending propeller blade failure. This vibrations may be accompanied by noticeable/profound vibration of the power lever and/or E-handle. Continued operation may result in blade separation and subsequent loss of propeller and/or reduction gearbox from the aircraft. If significant airframe vibration occurs in conjunction with visible propeller fluid leaks and/or propeller pump lights, consider completing the Emergency Shutdown procedure, paragraph 15.5.1, this is your last resort. Try to get rpm under control!

**C7. Required engine restart after blade angle rotation on Pressure cutout override (PCO)** The problem is a failed feather solenoid valve, this gives you blade angle rotation on PCO. This is because the E-Handle is in and you energize the aux pump and feather valve by selecting the PCO button. However, in this instance the feather valve is inoperative so it does not position the feather valve to the feather position and instead of charging the dome you end up allowing the pump pressure to go to the decrease line because it senses a major underspeed. So you get the blade angle decreasing which catches the airflow in turn causes rotation. Now you E-handle the engine and execute the emergency shutdown checklist. Since you did the EMERGENCY SHUT DOWN CHECKLIST, it’s just that, an emergency. You will NOT restart this engine….unless a greater emergency arises. That means a catastrophic failure of another engine, that type of greater emergency. So if that happens, lets say oh I don’t know an idler gear malfunction associated with all the secondaires. Then you could restart this previous failed engine. Here is what you can base this on and what to be aware of. You can assume if the engine was already shutdown (why else would you PCO) that you already had completed and NTS check and it was good. So you can expect that to work for you. Keep in mind if NTS fails you have NO back up, NO 45 airstart. So what you do is, with the E-handle out, you PCO. This will keep the feather valve in the feather position mechanically while you charge the dome. Then you push the E-handle in and have aft check in for the restart. Make sure the FE is ready to E-handle the engine if rotation is at an abnormally high rate. NTS should walk it out but if it doesn’t it will slam to ward zero and you may decouple the propeller. Now you are stuck with a wind milling decoupled prop that the RGB might catch on fire from oil starvation.



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Speed Set and Beta set cam set the pilot valve to the requested blade angle based on power lever position and then the blade angle, once reached at the desired setting, is recognized by the Beta follow up cam which makes input to put the pilot valve back to neutral increase pitch vs CTM for no additional blade angle changes.

**SUMMARY:** DECOUPLED PROPELLER, GAUGE LIMIT OVERSPEED LEADS TO THREE ENGINE LANDING

**2. NARRATIVE:** AIRCREW WAS FLYING A FUNCTIONAL CHECK FLIGHT FOR A PROPELLER CHANGE ON NR3 ENGINE IN A 1500 FOOT DELTA PATTERN. AFTER COMPLETING A SUCCESSFUL NEGATIVE TORQUE SENSING CHECK ON NR3, THE FLIGHT ENGINEER NOTICED NO POSITIVE SHAFT HORSE POWER WITH POWER LEVER ADVANCEMENT AND AN AUDIBLE RPM OVERSPEED OF 105.8%. ONCE THE WING DEICE, ENGINE ANTI ICE AND BLEED AIR VALVES CLOSED, POSITIVE 150 SHP WAS NOTED. AT THE SAME TIME, NAVIGATOR CALLED LIGHT FLUID ON NR3 PROP. THERE WERE NO PROP PUMP LIGHTS. FLIGHT STATION PULLED OUT NATOPS AND READ THROUGH SECTION 15.12.1 PROPELLER MALFUNCTIONS. FLIGHT STATION AGREED THAT NR3 PROP WAS PITCHLOCKED AS PER NATOPS, AND EXECUTED 15.12.2 OPERATION WITH A PITCHLOCKED PROPELLER. FLIGHT STATION READ THROUGH NATOPS 16.1 EMERGENCY LANDING BRIEF AND COMPLETED THE APPROACH CHECKLIST. AIRSPEED PRIOR TO FUEL CHOPPING WAS 160KIAS, SHP 230 WITH RPM AT 105.8%. CREW DESCENDED TO PATTERN ALTITUDE OF 1000' MSL. AFTER A QUICK YET THOROUGH DISCUSSION AND EVALUATION OF THE SITUATION, THE PATROL PLANE COMMANDER ELECTED TO FUEL CHOP THE ENGINE APPROACHING THE 180 POSITION IN THE PATTERN. AS SOON AS THE FE TURNED OFF THE NR3 FUEL AND IGNITION SWITCH, RPM PASSED GAUGE LIMIT (120% RPM) AND THERE WAS A VIOLENT AND EXCESSIVE NOISE ACCOMPANIED BY VIBRATION ALL THROUGHOUT THE AIRCRAFT DUE TO PROPELLER OVERSPEED. PPC THEN CALLED FOR, AND THE FE PULLED NR3 EMERGENCY SHUTDOWN HANDLE, WITH NO CORRESPONDING CHANGE IN NOISE OR RPM INDICATION. POWER SECTION OIL PRESSURE DECREASED TOWARDS ZERO WITH A PRESS LOW LIGHT AFTER FUEL CHOPPING, INDICATING A PITCHLOCKED-DECOUPLED PROPELLER. FE INSTINCTIVELY TURNED OFF THE #3 GENERATOR AND THE #3 EDC WAS ALREADY DISCONNECTED PRIOR TO TAKEOFF DUE TO AN EXISTING GRIPE. NO CONTROLLABILITY ISSUES WERE NOTED, BUT THE NOISE WAS A BARRIER TO CRM. FLIGHT DECIDED THERE WAS NOT ENOUGH TIME TO DON HELMETS TO IMPROVE COMMUNICATION. FLIGHT STATION WAS ABLE TO SPEAK LOUDLY ENOUGH TO COMPLETE CHECKLISTS AND EVALUATE THE SITUATION. CREW DISCUSSED AN APPROACH FLAP LANDING TO PREVENT CONFIGURATION AND AIRSPEED CHANGES PRIOR TO LANDING. CREW THEN COMPLETED THE LANDING CHECKLIST AND CONDUCTED AN UNEVENTFUL APPROACH FLAP LANDING WITH A SPEED OF 145KIAS AT 102K LBS. TOUCH DOWN WAS 2000' DOWN AN 11,000? RUNWAY, AT 143KIAS. CO-PILOT CALLED 140KIAS AIRSPEED AND BELOW 135 AFTER THE AIRCRAFT TOUCHED DOWN, WHILE HOLDING YOKE INPUTS FOR THE PPC. THE PPC ACKNOWLEDGED THE 7 AND 5 BOARDS AS THE AIRCRAFT SLOWED TO A STOP JUST PAST THE 5 BOARD. THE EXCESSIVE NOISE DID NOT SUBSIDE UNTIL SLOWING BELOW 130KIAS ON THE RUNWAY.

**SUMMARY**: A LOSS OF PROP FLUID CAUSES PROPELLER TO PITCHLOCK RESULTING IN A THREE ENGINE LANDING.

NARRATIVE: AFTER A NORMAL PREFLIGHT AND POST MAINTENANCE TURNS, AIRCREW DEPARTED ON A FUNCTIONAL CHECKFLIGHT. AIRCRAFT WAS BEING CHECKED FOR A NEWLY INSTALLED FUEL CONTROL AND PROPELLER CONTROL ON THE NUMBER THREE ENGINE. CLIMBING TO 7000FT AT 185 KTS, NTS CHECKS WERE COMPLETED WITH ALL INDICATIONS NORMAL. AT 7000FT, NORMAL FEATHER CHECKS WERE CONDUCTED. THE ENGINE FEATHERED WITHIN SEVEN SECONDS FOLLOWED BY A NORMAL RESTART. WHILE SETTING UP FOR THE MECHANICAL FEATHER CHECK, PROP PUMP ONE LIGHT ILLUMINATED ON ENGINE NUMBER THREE. PPC SET 2000-2500SHP, REQUESTED VECTORS TO RTB, AND EXECUTED NATOPS PROCEDURES. ONE MINUTE LATER, PROP PUMP TWO LIGHT ILLUMINATED, RPM INCREASED TO 104 PERCENT AND A LARGE AMOUNT OF PROP FLUID COVERED THE NACELLE. THE OVERSPEED WAS DETECTED AUDIBLY AND AFTER INCREASING AIRSPEED AND NOTING A CORRESPONDING INCREASE IN PROP RPM, THE PROP WAS DETERMINED TO BE PITCHLOCKED. CREW EXECUTED OPERATION WITH A PITCHLOCKED PROP PROCEDURES. AFTER THE FUEL GOVERNOR PITCHLOCK CHECK SWITCH WAS PLACED TO TEST AND NUMBER THREE SYNC WAS TURNED ON, A LOUD "THUMP" WAS HEARD ACCOMPANIED BY A MINOR SWERVE. SHP DROPPED TO NEGATIVE 500 ON ENGINE #3 AND PPC DECLARED AN EMERGENCY. APPROXIMATELY 33NM FROM BASE AT 6000FT, NUMBER THREE ENGINE WAS FUEL CHOPPED WITH THE FOLLOWING INDICATIONS: SHP: INITIALLY NEGATIVE, THEN WANDERING; TIT: 90; RPM: 55-60. THERE WERE NO INDICATIONS OF NTS AND PROP REMAINED COUPLED WITH 40PSI OIL IN POWER SECTION AND 100PSI IN REDUCTION GEAR BOX SECTION. ALL BRIEFS AND CHECKLISTS WERE COMPLETED PRIOR TO A THREE ENGINE LANDING.

ANALYSIS:

 (A) EVIDENCE: POSTFLIGHT ANALYSIS REVEALED A MASSIVE LEAK IN THE REAR LIP SEAL OF THE GOVERNOR. THE PROP COULD NOT BE FEATHERED STATICALLY AND INITIAL EFFORTS TO SERVICE THE PROP RESULTED IN A FLUID LEAK NEARLY EQUAL TO THE RATE OF SERVICING. WHILE A LEAK OF THIS SIZE WOULD CERTAINLY LEAD TO EVENTUAL PITCHLOCK, IT WAS DETERMINED THAT THE CREW INADVERTENTLY PITCHLOCKED THE PROPELLER. WHILE PERFORMING THE EMERGENCY PROCEDURE TO DETERMINE IF THE PROPELLER WAS PITCHLOCKED, AN INCREASE IN AIRSPEED WAS ACCOMPANIED BY AN INCREASE IN RPM. THIS INCORRECTLY LED THE CREW TO BELIEVE THE PROP HAD BECOME PITCHLOCKED. WHEN THE OPERATION WITH A PITCHLOCKED PROP PROCEDURE WAS EXECUTED, THE MOVEMENT OF THE NUMBER THREE SYNC SWITCH TO THE ON POSITION CAUSED THE PITCHLOCK REGULATOR MANIFOLD TO DUMP. IN THE SHORT TIME IT TOOK FOR THE PITCHLOCK TEETH TO SLAM TOGETHER CAUSING THE "THUMP," CTM SIGNIFICANTLY REDUCED THE BLADE ANGLE RESULTING IN A LOSS OF APPROXIMATELY 2500 SHP. NATOPS WARNS THAT THIS WILL OCCUR WHEN A CREW INTENTIONALLY PITCHLOCKS A PROPELLER IN FLIGHT. POSTFLIGHT INSPECTION REVEALED THAT THE PITCHLOCK TEETH WERE UNDAMAGED AND SHOWED NO INDICATION OF SLIPPING ONCE THE PROPELLER WAS PITCHLOCKED.

CO'S ENDORSEMENT: A SERIOUS PROPELLER MALFUNCTION WILL TEST EVEN THE MOST EXPERIENCED FLIGHT STATION (PPC=O-4 with 2500hrs, FE=6000 hrs). WHILE THE BEGINNING OF THE FCF SEEMED COMPLETELY NORMAL, LESS THAN TWO MINUTES PASSED BETWEEN THE ILLUMINATION OF THE PROP PUMP ONE LIGHT AND THE ILLUMINATION OF THE PROP PUMP TWO LIGHT ACCOMPANIED BY AN AUDIBLE OVERSPEED. THE CREW ATTEMPTED TO FOLLOW THE NATOPS PROCEDURES, BUT IN THE CONFUSION OF THE SITUATION THEY MISDIAGNOSED THE CONDITION OF THE PROPELLER (keep going through the steps, next should have been, remains off speed… sync off/sync master as req). IN DOING SO, THEY MADE AN ALREADY COMPLEX SITUATION WORSE. THIS HAZREP REINFORCES THE NEED TO TAKE YOUR TIME AND THINK YOUR WAY THROUGH A PROPELLER EMERGENCY. THE PACE AT WHICH THE EMERGENCY DEVELOPS SHOULD NOT DICTATE THE PACE IN WHICH IT IS HANDLED. CAREFUL METHODICAL EVALUATION OF PROP MALFUNCTIONS AND GOOD CRM WILL GO A LONG WAY TOWARD HELPING A CREW REACH THE RIGHT DECISION

VP-47 Ditch

P-3C Ditches with Four Engines Out, All Survive

While going through the P3 FRS, newly winged aviators have always asked the question: "Has a P-3 ever lost all four engines at the same time." The answer was always: "No, it will never happen." Well as Murphy's Law applies, it can - and we did. While on deployment and after performing an anti-submarine warfare mission with the USS Constellation (CV-64) battle group, which was located 200 miles east of Oman, VP-47 combat aircrew nine was returning to Masirah, Oman. The flight station crew was composed of LCDR Mark Radice, a lieutenant commander and a former P-3 FRS instructor who had just checked into the squadron 19 days earlier for his second tour; AE 1 Richard White, the flight engineer; and me, a senior lieutenant in the squadron with about 273 aircraft commander hours. Little did we know that we were about to experience the beginning of what would eventually be one of the worst P-3 mishaps ever. We had just restarted the number one engine, which was loitered on station to conserve fuel, and climbed up to an altitude of 16,000 feet for our transit home. At about 130 miles east of the island of Masirah, Oman, the flight engineer noticed that the number one prop pump warning light on the number four engine was illuminated. I directed the flight engineer to increase the number four power lever, which was the first step of our emergency procedure, and it also ensured that we have a good blade angle. We then pulled out our NATOPS flight manual commonly referred to as the "Big Blue Sleeping Pill," and read through the remaining steps of our procedure. Having a prop pump light in itself was not a big worry, but it could eventually lead to bigger problems. Approaching 80 miles east of Masirah, the situation worsened. The second prop pump light on the number four engine illuminated and the prop began to overspeed. The crew went through the overspeed procedures, and we determined that the prop was pitch locked. This malfunction does not occur on a regular basis in the P-3 Orion, so needless to say, the flight crew's concern and heart rate increased as to what would happen to the prop when we fuel chopped the engine during our descent to land. We flew back to the airfield at 16,000 feet and executed a slow, spiraling descent to maintain our number four engines rpm at 100 percent. Not knowing what would happen when we fuel chopped the number four engine, the flight station went through the descent, approach and three engine landing considerations checklists. Approaching 6,000 feet and nearing the engine's limit power setting, we decided to circle the field one last time, extend out for a good downwind leg and fuel chop the engine in anticipation for our landing. Unfortunately, we would not get to land at the airfield. Passing 5,600 feet, we heard and felt a tremendous explosion. My co-pilot, who was in the right seat, looked out and saw a huge cloud of black smoke. To his utter dismay, when the smoke cleared, he saw the number four prop missing and the reduction gear box on fire. LCDR Radice called out to shut down the number four engine and discharge the fire extinguisher. I was in the left seat, so I was unable to see what was going on. Trusting his judgment, I concurred with the decision to shut the engine down. The flight engineer shut down the engine and discharged the fire extinguisher. LCDR Radice looked out at the engine and the fire was still raging. AE1 White then discharged the second fire bottle. Unfortunately, the fire kept burning. AE 1 White then called out that the number three engine's rpm was winding down. LCDR Radice looked out at the number three prop and called out that the prop area looked bad. It made sense that during the explosion, the number four engine probably took out the number three engine. We then called out to shut down the number three engine. While the flight engineer was pulling the number three emergency shutdown handle, I simultaneously advanced the number one and number two engine power levers. Expecting to hear or feel a pitch change in the prop and not getting one, you can imagine my reaction when I looked out and saw both props barely rotating. Upon seeing this, I looked back inside the flight station to let the rest of the crew in on the secret, but AE1 White beat me to it and called flameout on number one and two engines. All of the sudden the flight station went dark due to a total electrical power loss. Shaking my head with dismay, "saying you've got to be kidding me," we directed AEI White to pull the hydraulic boost handles and start the auxiliary power unit in order to get electrical power back. At this time we were gust locked, which is the same as when your car's steering column locks up and you can't move it. To say the least, it was not a good feeling. After the boost handles were pulled, the flight engineer made several attempts to start the APU, but it kept flaming out. At this point things were really looking bad for VP-47's crew. When the boost handles were pulled, the aircraft should have switched from a hydraulic to a mechanical advantage. For some reason, this didn't occur and we were unable to control the aircraft. The aircraft rolled right into a 45-50 degree angle of bank and our airspeed bled off from 260 to 210 knots. On the flight station we thought that the aircraft was going to stall and roll inverted. What a horrible gut wrenching feeling it was to think that this was going to be the end for everyone. I was their aircraft commander and I was responsible for their well-being. I could not get control of the aircraft and we did not have time to put on our parachutes to bailout. Even if we would have had time to don our parachutes, the main cabin door was facing the sky, which made bailing out impossible. Up to this point, the entire evolution from engine explosion had taken about 45 seconds. With my heart pounding from being afraid and wanting to save the rest of the crew, I said a quick prayer. My prayers were answered. The control column went boost out and unlocked. Finally at about 2,500 feet, we were able to control the aircraft. We leveled the wings, then continued in a left hand turn to acquire the airfield. When I saw the airfield 90 degrees off of our left wing, we were at 2,000 feet and 6-7 miles away from land. A harsh reality set in -- we were going to have to ditch the aircraft. Having never heard of or seen NATOPS procedures for a no engine, no-flap, boost-out ditch, we had to use gut instinct. We knew that if we flew too fast, it would be hard to pull the nose up upon water entry. If we flew to slow, the aircraft would stall soon after leveling off above the water. We maintained our airspeed between 175-180 knots, which gave us a 1,000 fpm rate of descent. At this time, as with all life threatening situations, each crew member's adrenaline system kicked in to its maximum. Fortunately, I had a great set of parents and a high school football coach who was a former Oakland Raider all-pro football player who taught me to never quit and find ways to win. At about 1,200 feet, we told the rest of the crew to prepare for immediate ditching. At 200 feet approaching water entry, both LCDR Radice and I started pulling back on the yoke. The nose came up nicely. The two biggest items necessary to perform a successful ditch is to maintain wings level and have a shallow rate of descent. At first, we were able to keep our wings level and get our rate of descent to about 300 feet per minute. At 80 feet, the right wing started rolling as we slowed down. LCDR Radice recognized the problem, called for left full yoke and the right wing came back up. Upon water entry, we were wings level, had a 200 feet per minute rate of descent and were right at 135 knots. After several skips across the water and fighting to keep the nose of the aircraft up, the plane finally came to rest. A P-3 ditch can best be described as being similar to a log ride at an amusement park, but with more of a kick in the pants. The amazement of still being alive with the Orion still afloat caught me off guard, but there was little time for celebration. The water traversed through the tube of the aircraft and shot into the flight station like someone pointing a fire hose at us. My co-pilot and flight engineer evacuated the aircraft through the overhead escape hatch. I evacuated the aircraft through the side escape hatch located immediately behind the pilot seat on the left side. After jumping into the water, I soon realized that the plane was still drifting like a boat does without power. To my chagrin, the number two prop was coming right for me and was going to plow right over me. All that I could do was to paddle backwards as fast as I could to avoid the prop, putting my hands on the prop to push me out of its way. Fortunately, the aircraft came to a stop and I was able to swim to the leading edge of the wing between the number one and number two engines. I called out to LCDR Radice to see if the whole crew made it out of the aircraft. I was covered from head to toe with aircraft fuel and my eyes were on fire. My flight gloves were slippery from the fuel and this made it difficult to climb on top of the wing. After three tries, I was finally able to climb on top of the wing and reach my TACCO and in-flight technician. The rest of the crew evacuated out the starboard side escape hatch and entered their life rafts. My inflight technician was pulling the ring to inflate the life raft, but the blasted thing would not inflate. A pilot friend of mine and his crew were waiting to take off to pick up an admiral in Bahrain when we hit the water. Shortly after we got into the life rafts, my buddy flew over and the crew let out a big yell. Once things finally settled down, the crew looked each other over and checked for injuries. To my surprise, not a single crew member was injured. The only person with a problem was me. Up to this point I had controlled my temper quite well, but this was too much. After a few choice words directed to the life raft, the only option left was to inflate our life vests and swim around to the other side. Realizing our predicament, the crew in the other life rafts began to paddle around the rear of the aircraft in order to meet us. The three of us joined the other crew members and climbed into the rafts. I had fuel in my eyes and they were burning like crazy. My sensor one operator carried a little water bottle in his life vest. He pulled out the water bottle and began to pour it in my eyes to flush out the fuel. While he was taking care of me, my TACCO and second pilot were trying to contact the other P-3 crew on our PRC-90 radios to let them know of our status. This day was true to form, because my TACCO went through three radios before he found one that worked. On the fourth radio, he was finally able to talk to the other crew to let them know that we were fine. We were in the rafts for only 10 minutes before the SAR helicopter arrived. The rescue was uneventful. The helicopter took seven crew members on the first trip and four crew members on the second trip. A month later, a barge and crane raised the aircraft and we discovered that the number four prop had thrown a blade. The imbalance of only three blades caused the engine to explode. The prop blade was thrown from right to left and cut through the body of the aircraft, severing 35 of 44 engine and flight control cables. Four of the cables cut went to the four engines. The cutting action caused a pulling action which shut down all four engine simultaneously. The hydraulic boost handle cables were cut and the APU fuel line was cut. The nine intact cables were two aileron cables, two elevator cables, two elevator trim tab cables and two rudder trim tab cables. The co-pilot's main flight control cable was cut. VP-47's crew nine flew under a lucky cloud that day. For so many things to go wrong and everything to work out perfectly was a total surprise to me.

I have never questioned the reason we were spared, but I am glad that we were.

**SUMMARY:** PITCHLOCKED PROPELLER AND SUBSEQUENT DECOUPLE LED TO MISSION ABORT AND THREE ENGINE LANDING.

2. NARRATIVE: WHILE CLIMBING THROUGH 7000 FT MSL AFTER DEPARTURE FROM NAS JRB WILLOW GROVE, THE FLIGHT STATION OBSERVER CALLED OUT A PROP LEAK ON NUMBER ONE. THE PILOT CONFIRMED THE LEAK AND NOTIFIED THE FLIGHT ENGINEER WHO ANNOUNCED A PROP PUMP ONE LIGHT ON NUMBER ONE ENGINE. THE CREW REQUESTED IMMEDIATE CLEARANCE BACK TO WILLOW GROVE. NATOPS PROCEDURES WERE INITIATED FOR PROP PUMP LIGHT/FLUID LEAK AND THE NUMBER 1 POWER LEVER WAS SMOOTHLY ADVANCED FROM 950 TIT CLIMB POWER SETTING TO NORMAL RATED POWER. THE CREW DETERMINED THAT THE PROP WAS NOT PITCHLOCKED. DESCENT CLEARANCE WAS RECEIVED AND RPM REMAINED STEADY AT 100 PERCENT DURING THE DESCENT. THE NUMBER ONE POWER LEVER WAS SMOOTHLY RETARDED ALONG WITH THE OTHER POWER LEVERS IN PREPARATION FOR A FOUR ENGINE LANDING. DESCENT AND APPROACH CHECKLISTS WERE COMPLETED. APPROXIMATELY TWO MINUTES LATER THE PROP PUMP TWO LIGHT ON NUMBER ONE ENGINE ILLUMINATED AND THE RPM BEGAN MINOR FLUCTUATION OF LESS THAN ONE PERCENT WITHOUT ANY DIRECTIONAL CONTROL PROBLEMS. NUMBER ONE TD WAS NULLED DUE TO A MINOR MALFUNCTION HISTORY. WHILE CONTINUING THE STRAIGHT-IN APPROACH, AT 150 KIAS, APPROXIMATELY 4 MILES FROM LANDING, WITH THE LANDING CHECKLIST COMPLETE, NUMBER ONE RPM OVERSPED TO APPROXIMATELY 104 PERCENT. FLIGHT CHARACTERISTICS DID NOT CHANGE AND THE NOISE WAS NOT EXCESSIVELY LOUD BUT THE CREW SUSPECTED A PITCHLOCKED PROPELLER. THE CREW RAISED THE LANDING GEAR AND BEGAN A CLIMB TO PATTERN ALTITUDE OF 1400 FEET MSL. THE PROPELLER WAS DETERMINED TO BE PITCHLOCKED AND THE OPERATION WITH A PITCHLOCKED PROPELLER PROCEDURES WERE COMPLETED. RPM AND SHP WERE VERY SENSITIVE TO AIRSPEED AND POWER LEVER CHANGES DUE TO PITCHLOCK AT A LOW BLADE ANGLE. AT AN AIRSPEED OF 155 KIAS WITH RPM AT 104%, THE CREW WAS UNABLE TO MAINTAIN POSITIVE SHP AND FUEL CHOPPED THE ENGINE IAW NATOPS. THE AIRCRAFT YAWED TO THE LEFT, RPM FLUCTUATED INITIALLY AND THEN STABILIZED AT APPROXIMATELY 106 PERCENT. SHP WENT FURTHER NEGATIVE AND THEN WANDERED. THE POWER SECTION OIL PRESSURE WAS NOTED AT APPROXIMATELY 5 PSI AND RPM WAS EXTREMELY SENSITIVE TO CHANGES IN AIRSPEED. THE CREW DETERMINED THAT THE PROP HAD DECOUPLED. THE CREW BRIEFED THREE ENGINE LANDING CONTINGENCIES IAW NATOPS AND AN UNEVENTFUL THREE ENGINE LANDING ENSUED. THE TIME BETWEEN NOTICING THE PROP LEAK AND FUEL CHOPPING THE ENGINE WAS APPROXIMATELY 5 MINUTES.