

AIRCRAFT SHUTDOWN DONE RIGHT



I'M GLAD THIS MISSION IS OVER!

ME, TOO. LET'S GET GOING!

NOT SO FAST! THE MISSION'S NEVER OVER UNTIL YOU'VE DONE A **FULL AND COMPLETE SHUTDOWN** BY THE PILOT'S CHECKLIST!

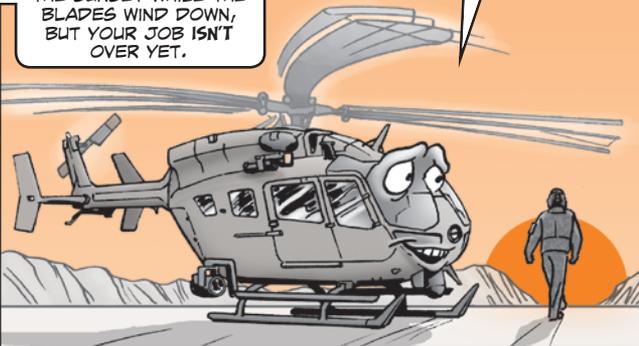
YOU WOULDN'T WANT YOUR ENGINE DAMAGED BY A TOT SPIKE, WOULD YOU?

CREWS, AFTER A LONG STRESSFUL MISSION, YOU CAN BREATHE A SIGH OF RELIEF WHEN YOU TOUCH DOWN SAFELY BACK AT HOME STATION.

IT MAY SOUND NICE TO ROLL THE THROTTLES OFF AND WALK INTO THE SUNSET WHILE THE BLADES WIND DOWN, BUT YOUR JOB ISN'T OVER YET.

THAT'S RIGHT!

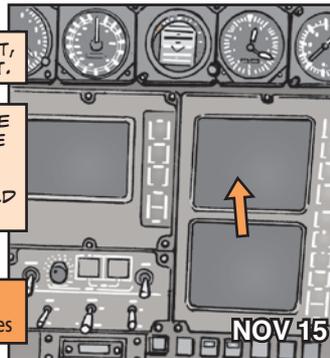
HEY, BUDDY! GET BACK HERE!



BEFORE LEAVING YOUR AIRCRAFT, FOLLOW THE PILOT'S CHECKLIST.

THAT INCLUDES MONITORING THE TURBINE OUTLET TEMPERATURE (TOT) DURING SHUTDOWN TO PROTECT THE ENGINE FROM A TEMPERATURE SPIKE THAT COULD CAUSE SERIOUS DAMAGE.

During aircraft shutdown, monitor panel for TOT spikes



NOV 15

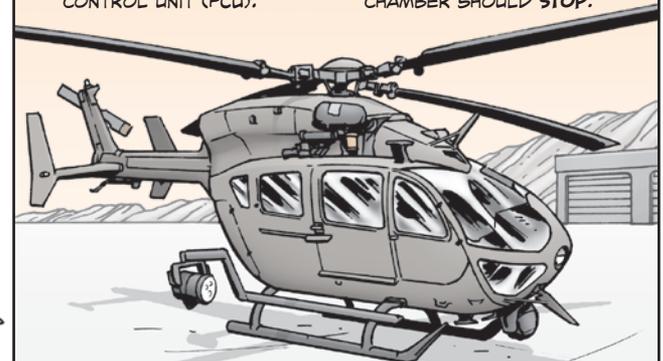
TOT Spike Causes

THE BIG QUESTION IS HOW DOES A TOT SPIKE HAPPEN? ACTUALLY, THERE ARE A FEW DIFFERENT POSSIBILITIES.



DURING OPERATION, THE ENGINES ARE SUPPLIED WITH HIGH PRESSURE FUEL FROM THE PUMP INSIDE THE FUEL CONTROL UNIT (FCU).

THE PUMP IS DRIVEN BY THE GAS GENERATOR SECTION OF THE ENGINE. WHEN THE TWIST GRIPS ARE CLOSED, THE FUEL SUPPLY TO THE COMBUSTION CHAMBER SHOULD STOP.



BUT SINCE THE ENGINE IS STILL TURNING AT A RELATIVELY HIGH RATE OF SPEED, THE PUMP IN THE FCU KEEPS MOVING FUEL.

VALVES BUILT IN TO THE SYSTEM SHOULD REDIRECT THE FUEL WHEN THE THROTTLE TWIST GRIPS ARE CLOSED, BUT A THROTTLE MALFUNCTION COULD ALLOW FUEL TO CONTINUE FLOWING INTO THE COMBUSTION CHAMBER.

IF THAT HAPPENS, FUEL INSIDE THE ENGINE WILL CONTINUE TO BURN, THOUGH IT'S LIKELY NOT ENOUGH TO KEEP THE ENGINE RUNNING.

THE MOST COMMON CAUSE FOR THIS SITUATION IS THE RIGGING OF THE FCU.

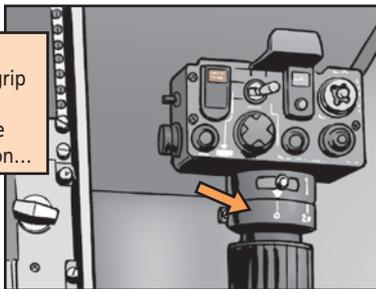
THE PILOT MAY ROLL THE TWIST GRIP ALL THE WAY TO THE OFF POSITION, BUT IF THE RIGGING ISN'T CORRECT, THE INPUT TO THE FCU MAY STILL KEEP THE MAIN FUEL VALVE SLIGHTLY OPEN.

UNWANTED FUEL FLOW CONTINUES AND CAUSES A TOT RISE.

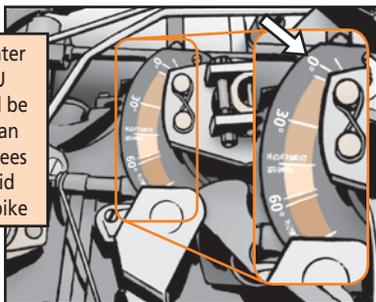
THE TWIST GRIPS ARE CONNECTED TO THE FCU BY FLEX BALL CABLES. IT'S NOT UNCOMMON FOR THE CABLES TO **STRETCH** SLIGHTLY OVER TIME, CAUSING THIS OUT OF RIG CONDITION.

THE AIRFRAME'S MAINTENANCE MANUAL STATES THAT WHEN THE TWIST GRIP IS AT THE 0 DEGREE POSITION, THE POINTER ON THE FCU SHOULD BE "AT OR LESS THAN 0."

When twist grip is at 0 degree position...



...pointer on FCU should be less than 0 degrees to avoid TOT spike



THERE IS ABOUT 5 DEGREES OF TRAVEL AVAILABLE BELOW THE 0 MARK ON THE FCU.

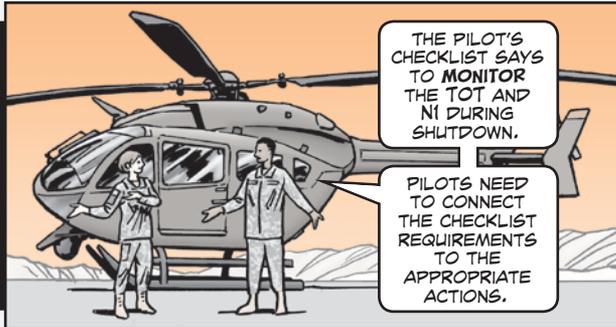
RIGGING THE SYSTEM TO HAVE A -2 OR -3 DEGREE FCU SETTING WHEN THE TWIST GRIP IS COMPLETELY CLOSED IS A GOOD IDEA AS LONG AS THE OTHER RIGGING POINTS CAN BE MAINTAINED LIKE THE MAINTENANCE MANUAL SAYS.

What to Do?

WHAT DO I DO IF THIS HAPPENS TO MY AIRCRAFT?



THE PILOT'S CHECKLIST SAYS TO **MONITOR** THE TOT AND NI DURING SHUTDOWN.



PILOTS NEED TO CONNECT THE CHECKLIST REQUIREMENTS TO THE APPROPRIATE ACTIONS.

THE **ROTORCRAFT FLIGHT MANUAL** (PG 4-25, SEC 4.12) AND **PILOT'S CHECKLIST** (PG N-29) BOTH DESCRIBE HOW TO VENT THE ENGINES.

SO FLIGHT CREWS NEED TO BECOME FAMILIAR WITH THESE PROCEDURES AND HOW TO STOP TEMPERATURE SPIKES AND THE POSSIBILITY OF A FIRE SHOULD THEY OCCUR.

THE KEY TO EXTINGUISHING THE FIRE INSIDE THE ENGINE IS **AIR FLOW**.

IF THE STARTER IS ENGAGED, THE ENGINE SPINS FASTER AND SHOULD CREATE ENOUGH **AIR FLOW** TO "BLOW OUT" THE FIRE AND COOL DOWN THE ENGINE.



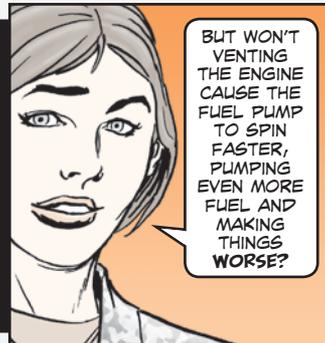
THE LAKOTA IS EQUIPPED WITH **TWO** ENG VENT SWITCHES ON THE OVERHEAD PANEL, ONE FOR EACH ENGINE, THAT WERE DESIGNED PRECISELY FOR THIS PURPOSE.

CREWS NEED TO BE VERY FAMILIAR WITH THE LOCATION OF THE VENT SWITCHES SINCE THEY'RE NOT OFTEN USED. THAT'LL HELP AVOID DELAYS IN VENTING THE ENGINE SHOULD A TOT SPIKE OCCUR.

DEPENDING ON THE REASON FOR THE TOT SPIKE AND THE SEVERITY OF THE CONDITION, THE TEMPERATURE CAN RISE VERY FAST.

VENTING THE ENGINE **QUICKLY** TO PUT THE FIRE OUT COULD MEAN THE DIFFERENCE BETWEEN A **SIMPLE** RIGGING ADJUSTMENT AND AN **EXPENSIVE** ENGINE REPLACEMENT.

BUT WON'T VENTING THE ENGINE CAUSE THE FUEL PUMP TO SPIN FASTER, PUMPING MORE FUEL AND MAKING THINGS WORSE?



THAT'S SOUND LOGIC! IT'S **POSSIBLE** THAT VENTING THE ENGINE **WON'T** EXTINGUISH THE FIRE, SO CREWS NEED TO BE READY TO VENT THE ENGINE AGAIN OR TAKE OTHER ACTIONS IF NEEDED.



IF IT **DOESN'T**, YOU'LL NEED TO STOP THE FUEL FROM FLOWING INTO THE COMBUSTION CHAMBER.

FIRST, ENSURE THAT **BOTH** THE PILOT AND COPILOT TWIST GRIPS ARE ACTUALLY **CLOSED** ALL THE WAY.

THERE IS USUALLY SOME SLACK BETWEEN THE PILOT AND COPILOT CONTROLS, SO FULLY CLOSED ON ONE SIDE MAY CAUSE THE PROBLEM, WHILE FULLY CLOSED ON THE OTHER SIDE COULD BE JUST ENOUGH ADDITIONAL TRAVEL TO STOP FUEL FLOW.

IN A VERY FEW CASES, THE ACTIONS ABOVE MAY STILL **NOT** SOLVE THE PROBLEM.

IN THOSE CASES, USE THE APPROPRIATE "EMERG OFF" BUTTON ON THE WARNING UNIT.

THIS ACTIVATES THE FUEL SHUT OFF VALVE FOR THE AFFECTED ENGINE. THIS WON'T AUTOMATICALLY DISCHARGE THE FIRE EXTINGUISHING SYSTEM BECAUSE OTHER CRITERIA HAVE TO BE MET BEFORE THAT CAN HAPPEN.

IN THE RARE INSTANCE WHERE THOSE OTHER CONDITIONS ARE MET, YOU'LL DEFINITELY WANT THE SYSTEM TO DISCHARGE ANYWAY!



PS MORE

What's Next?



NOW THAT THE FIRE IS OUT AND DISASTER AVERTED, THERE'S STILL SOME WORK LEFT TO DO.

BEFORE THE LAKOTA MAINTAINERS CAN CORRECT THE PROBLEM, THEY NEED A GOOD DESCRIPTION OF WHAT HAPPENED.

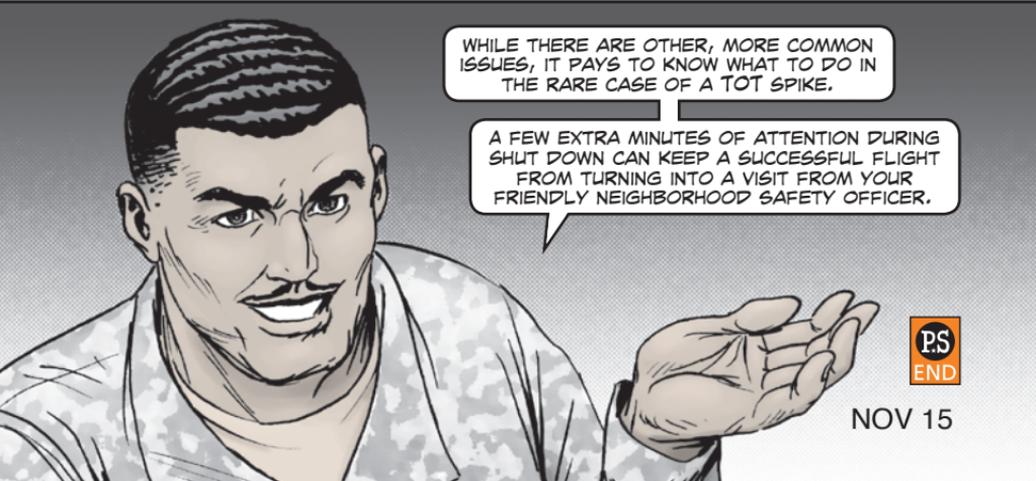
YOU NEED TO INCLUDE **ALL** THE STEPS TAKEN AS WELL AS THE MAXIMUM TOT REACHED AND ITS DURATION. ALL OF THIS INFORMATION IS NEEDED TO **DETERMINE** THE PROPER INSPECTIONS AND MAINTENANCE ACTIONS NEEDED TO RETURN THE AIRCRAFT TO SERVICE.



I WROTE A SHORT ENTRY IN MY LOGBOOK: "ENGINE OVERTEMP ON SHUTDOWN." HOW'S THAT SOUND?

NOPE. THAT'S **NOT** GOING TO CUT IT.

DON'T BE AFRAID TO DISCUSS THE ISSUE WITH YOUR MAINTENANCE STAFF BEFORE MAKING THE ENTRY. THAT CAN AVOID CONFUSION AND CORRECTIONS LATER.



WHILE THERE ARE OTHER, MORE COMMON ISSUES, IT PAYS TO KNOW WHAT TO DO IN THE RARE CASE OF A TOT SPIKE.

A FEW EXTRA MINUTES OF ATTENTION DURING SHUT DOWN CAN KEEP A SUCCESSFUL FLIGHT FROM TURNING INTO A VISIT FROM YOUR FRIENDLY NEIGHBORHOOD SAFETY OFFICER.

PS
END

NOV 15