PILOT OR PASSENGER?

STORY BY **GLEN WHITE**

The vocation of pilot involves obtaining and retaining a vast amount of knowledge and skill sets in order to safely operate an aircraft in a secure and controlled manner. These attributes define the role of pilot in command and is the main difference between an aircrafts passengers and pilot. Ask yourself "do you posses the necessary skills and knowledge to safely operate your airframe?"

An inflight airframe component failure or emergency situation can materialize as a mundane nuisance or it can quickly become a dramatic test of the skills and mindset of a pilot. The profound realization that the environment you understood and controlled only moments before has spiraled into a rapid loss of comprehension is a situation that we strive and train to avoid.

The moment that a pilot starts to loose understanding of what is or has occurred within the aircraft he begins the transition from pilot to passenger. This sick feeling of helplessness has the potential of accelerating that metamorphosis and is the first sign that action needs to be taken.

The variations and combinations of potential inflight "situations" is countless and can seem to be a mind boggling effort at times to become the master of our domain. We strive as pilots to understand the workings of the various systems within our airframe, we practice the onset of numerous component failures and we study the parameters in which we are allowed to operate within. All in the hope that when the day comes, and it will, that our world is falling apart we arise to the challenge and come out the other side safe and secure.

Dramatic events such an engine failure in a single-engine helicopter requires a quick and competent reaction to the situation. A less than perfect outcome after this type of failure, with the survival of the aircraft's occupants, is more often considered a "win" (as it should be).

The situations that we try to avoid is creating dramatic events out of what should be a mundane nuisance. To enter an autorotation after the illumination of a generator caution light would be illogical at best, but it has occurred. This type of example is easy to discount as a probability within your aircraft with any basic level of airframe understanding.

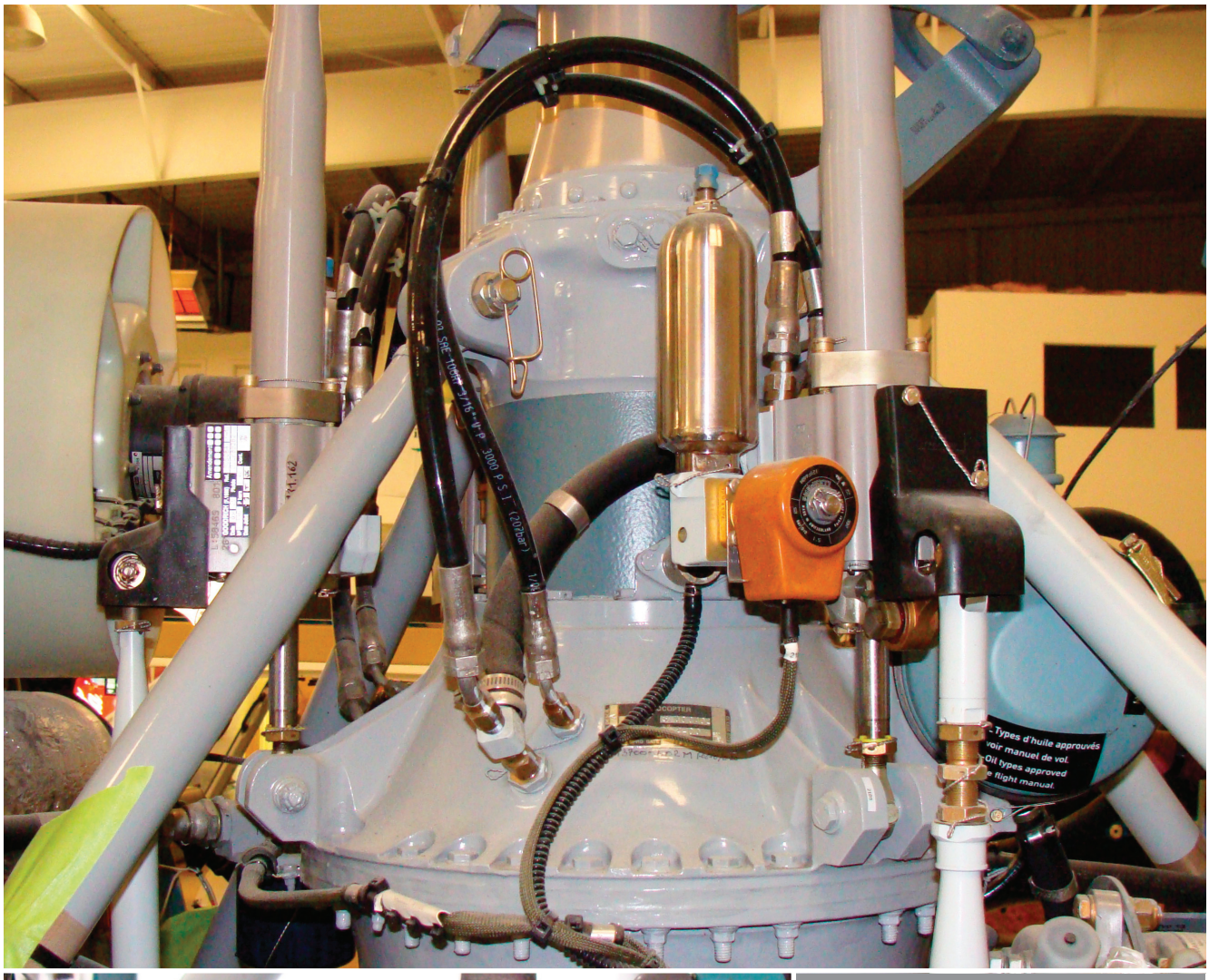
The more difficult situations to prognosticate our reaction to are the emergencies that are often referred to as second tier emergencies (such as hydraulic failures). With a thorough knowledge of the system and a trained skill set of the emergency procedure they are a non-event. But without these core blocks of competency they can be an extremely dangerous occurrence.

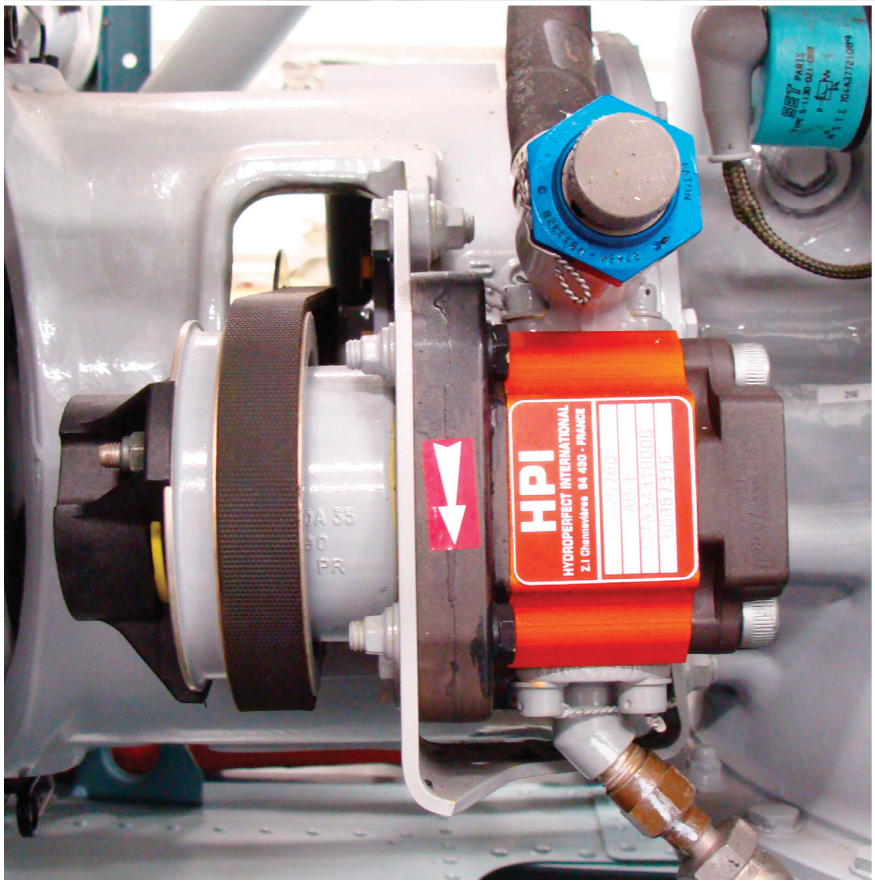
A common exercise in gauging our own reaction to inflight situations is to create a hypothetical scenario. For example, today you are an ENG (Electronic News Gathering) pilot flying an AS350BA in the northeastern portion of the United States.

You have over 6500 hours of flight experience, with over 350 hours in the AStar model of helicopter but you have never attended any formalized training for the AS350. But since most helicopters fly similarly, with a small amount of instruction you achieve the ability operate the airframe.

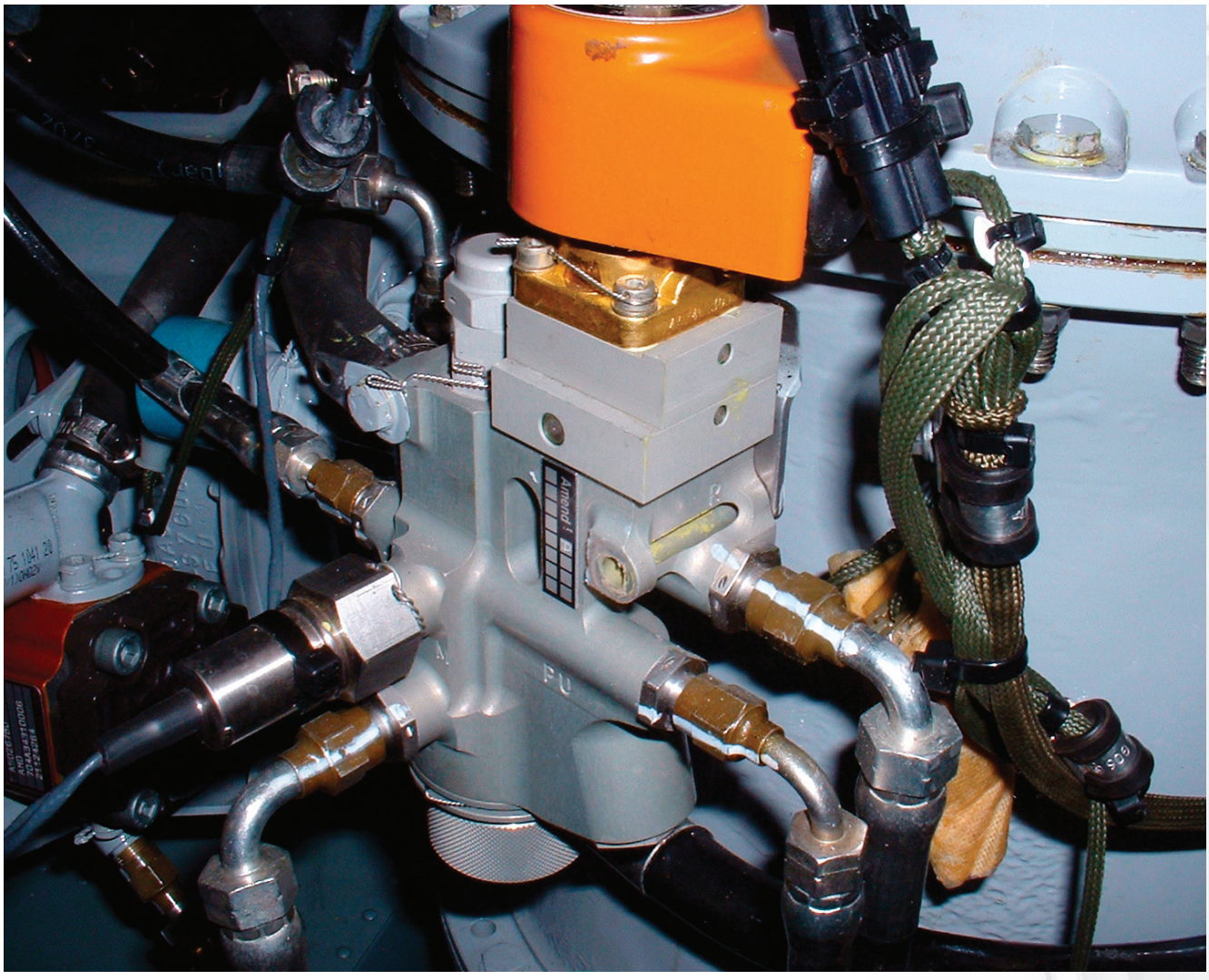
From the first time you take command of the aircraft as its sole pilot

The moment that a pilot starts to loose understanding of what is or has occurred within the aircraft he begins the transition from pilot to passenger.





As most aviators would attest to, the vocation of "pilot" has more to do with addressing the proper operation of the airframe than it does with "wiggling the stick."



at the controls how far apart are you from pilot to passenger? Though it is true that manipulating the controls of an airframe is a small hurdle to jump, it is the smallest part of the role as pilot in command. As most aviators would attest to, the vocation of "pilot" has more to do with addressing the proper operation of the airframe than it does with "wiggling the stick."

On this particular day you are dispatched on a news story over Brooklyn, NY with a reporter in the left seat and a newly hired company pilot in a middle aft seat. The aircraft is started and you get to the point of the start procedures where the hydraulic system checks are to be performed.

As stated in section 4.1, page 5 of the rotorcraft flight manual the AS350 requires two checks of its hydraulic system to ensure its proper operation. The first check ensures that the accumulators, which provide hydraulic pressure after a system failure to either land the helicopter if in a IGE hover or to adjust the airspeed between 40-60 kts if in a flight profile, are properly charged.

> The variations and combinations of potential inflight "situations" is countless and can seem to be a mind boggling effort at times to become the master of our domain.

This check is now performed at ground idle (previously conducted with the fuel flow control lever in the flight gate) with an NG setting of between 67 to 70%.

The first steps are to release the friction on the cyclic and to ensure the collective is locked down. The hydraulic test pushbutton (or switch if installed) is engaged which routes the pressurized hydraulic fluid entering the hydraulic distribution block back to the reservoir. Since the servos are no longer receiving pressurized fluid the main rotor servos are now powered by their accumulators. The tail rotor servo on the AS350BA does not have a yaw load compensator (if equipped provides pedal assist after a hydraulic failure), so it is no longer pressurized.

With the decrease in pressure in the system the hydraulic pressure switch on the hydraulic distribution block actives the red HYD light on the warning caution panel (with mod 07-3317

the HYD light flashes during test). The pilot then moves the cyclic 2-3 times, approximately 4 inches (10 cm), forward and aft and 4 inches (10 cm) left and right. During these movements the accumulators are powering the main rotor servos and no loss of pressure should occur. Since the tail rotor servo is no longer receiving pressurized fluid the pedals should be stiff.

The hydraulic test pushbutton is then reengaged and the HYD light should extinguish. The next test is the hydraulic isolation test which ensures that the system can be disabled after a hydraulic failure or slide valve seizure (hard over).

Again the pilot confirms that the collective is locked down and the hydraulic cutoff is activated by a switch or pushbutton on the collective. This opens the solenoid valves on the main servo's control manifold and on the hydraulic distribution block. Since the fluid will follow the path of least resistance, the fluid bypasses the pressure ports of the main servos and returns to the reservoir. This causes the cyclic and pedals to become stiff immediately and with the drop in pressure the HYD warning light illuminates. The pilot then checks that the cyclic can be moved forward and aft and left and right. This is followed by the reactivation of the system with the hydraulic cutoff switch.

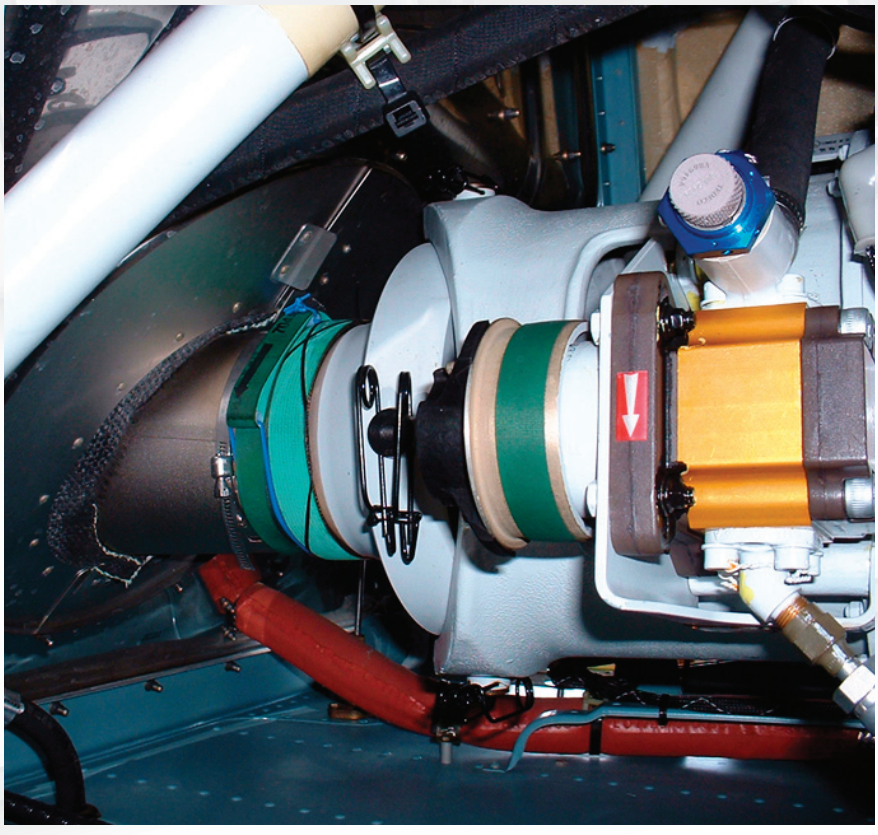
Immediately upon reactivation attention is focused on the HYD light which should take 3-4 seconds to extinguish. If the light stays on for more than 4 seconds the accumulators are under charged and if it stays illuminated for less than 3 seconds the accumulators are over charged.

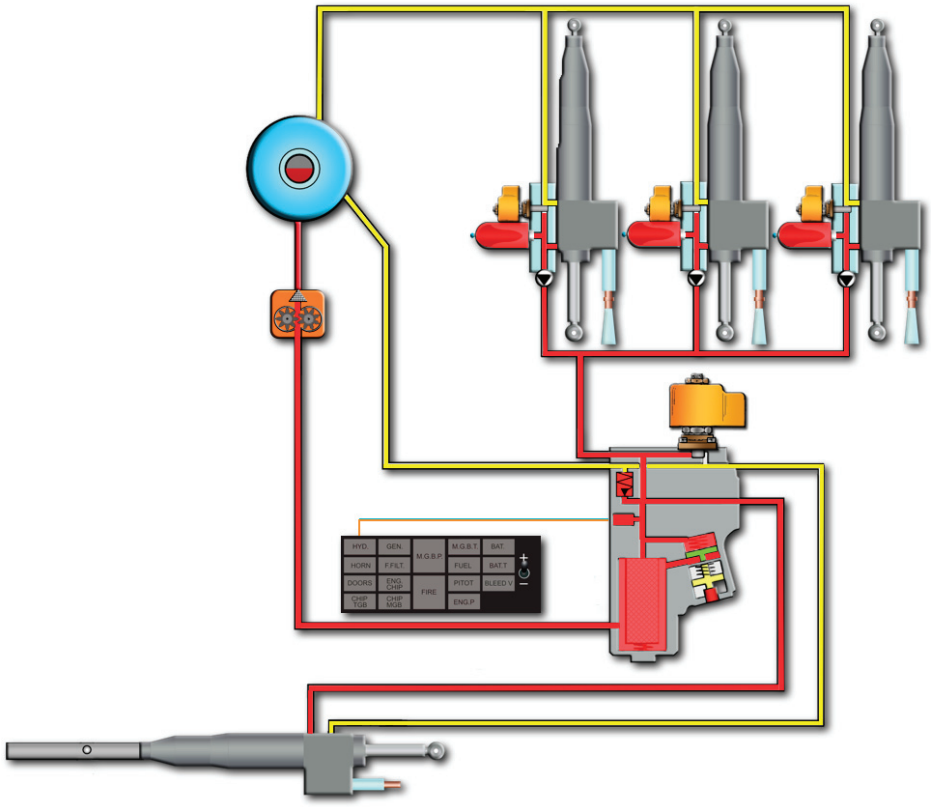
These two tests are conducted after every start to ensure a properly operating hydraulic system and should only take approximately 25 seconds to complete. Though not difficult to perform, without an understanding of the system the diagnosis during the checks would be difficult to ascertain. Since in this example we are presenting your knowledge level of the airframe as incomplete you forgo the checks and when asked if you performed them you state, "I do not want to fool around with the hydraulic system." At this point how much further have you moved from the pilot seat to the passenger seat?

Without a complete knowledge of the airframe system, and practice with the emergency procedure, even the best pilot would have a hard time diagnosing and performing the landing.

Without the system checks being performed you takeoff and fly to the news story scene and come to a hover approximately 1200 feet above the ground and into the wind. Unbeknownst to you the hydraulic belt that is driven off the engine to main gearbox drive shaft, and powers the hydraulic pump, is about to break. Perhaps its impending failure is because of the fact that it was installed inside out, which could have been found on preflight, or perhaps the belt was over its life limit. Either way the loss of this belt will cause the hydraulic pump to stop producing pressurized fluid to the servos.

With a loss of pressure in the system the pressure switch on the hydraulic distribution block will illuminate the HYD warning light and actives a constant horn in the cockpit. Since the flow of fluid to the tail rotor servo will cease the twist in the spar of the tail rotor will take the tail rotor pitch to a neutral pitch setting. This will cause the nose of the helicopter, when in a hover, to rotate to the left if force is not exerted on the right pedal.





Without a knowledge base on the aircrafts systems and practice in the maneuvering of the aircraft after system failures little of what is about to happen will make much sense. Then without warning the belt breaks, and faced with a rapid loss of comprehension you fall into the "fight or flight" response. Since you cannot physically remove yourself from the aircraft the initial "flight" response is a more mental departure from the situation with the initial control movements on an automated reaction process.

During the first several seconds of the emergency you do not have any specific recollection regarding the beginning of the accident sequence. Your first memory is of the helicopter in an extreme nose down position. You do not recall observing any warning lights, hearing any audible warnings, nor recall reporting any specific problems over the radio; however, review of the JFK Airport communication recordings revealed that you stated "I have a tail rotor failure."

The loss of hearing, memory and tunnel vision is a common attribute during the "flight" response. The brain does this in an attempt to protect itself from the inevitable pain or trauma it is about to endure.

With the helicopter in a dive toward the ground you regain some of your mental faculties enough to level the aircraft off at approximately 200 feet above the ground. Though you do not mentally hear it the horn is continuing to sound, and whether it is noticed or not the HYD warning light is illuminated, the cyclic and collective are hydraulic boosted and the helicopter is flying straight.

Without a complete understanding of the system a diagnosis of a hydraulic failure would not seem logical since the controls are fully boosted. With a complete understanding of the system you would determine that the accumulators on the servos are providing the current hydraulic boost to your controls. Further analysis would conclude that the nose no longer turning is the result of the efficiency of the vertical stabilizer through your newly gained airspeed.

The pressure produced by the accumulators is a finite resource and due to the excessive maneuvering they are being depleted rapidly. With 2 roll accumulators, 1 pitch accumulator and an initial pronounced downward pitch your pitch accumulator depletes first. This causes your controls to be pressurized left and right, but stiff forward and aft with the aerodynamic effects on the main rotor pushing the cyclic aft and to the right. Since the aft/right pressure is not compensated for

> The situations that we try to avoid is creating dramatic events out of what should be a mundane nuisance.

Bristow Academy

The Leader in Rotary Flight Training

Your Career Takes Off With Us

FAA • JAA • NVG • Military • Government • Specialist Courses

Bristow Academy has been training professional helicopter pilots for more than 20 years and has graduates working in nearly every sector of the helicopter industry including Oil and Gas Logistic Support, Heli-Tours, Search & Rescue, Military Drug Interdiction Missions, Heli-Logging, HEMS, Law Enforcement, and News Gathering. With four campuses and a training fleet of more than 75 helicopters, Bristow Academy can help you pursue your dreams.

VA and ELCAS Approved • M1 and F1 Visas • Accredited by ACCSC

Titusville Campus, USA

Contact Information:
Anisha Hopkinson,
Student Services Mgr
365 Golden Knights Blvd.
Titusville, FL 32780 USA
UK Freephone 0800 1698647
Toll Free 800/686-4080 ext. 392
Anisha.Hopkinson@bristowgroup.com

Courses Offered:
FAA PPL, IR, CPL, CFI, CFII, External Load, Turbine Transition, ATP, NVG; JAA PPL(H), CPL(H), CPL(H) Modular, FI, Type Ratings; Combined FAA/JAA CPL(H) Integrated Course, Maintenance Human Factors Training

New Iberia Campus, USA

Contact Information:
Christine Longtin
Executive Assistant
1113 Vortex Drive
New Iberia, LA 70560 USA
Toll Free 877/366-8909
Christine.Longtin@bristowgroup.com

Courses Offered:
FAA PPL, IR, CPL, CFI, CFII, Maintenance Human Factors Training

Concord Campus, USA

Contact Information:
Chuck Olson
General Manager
81 John Glenn Drive
Concord, CA 94520 USA
Toll Free 877/274-5090
Charles.Olson@bristowgroup.com

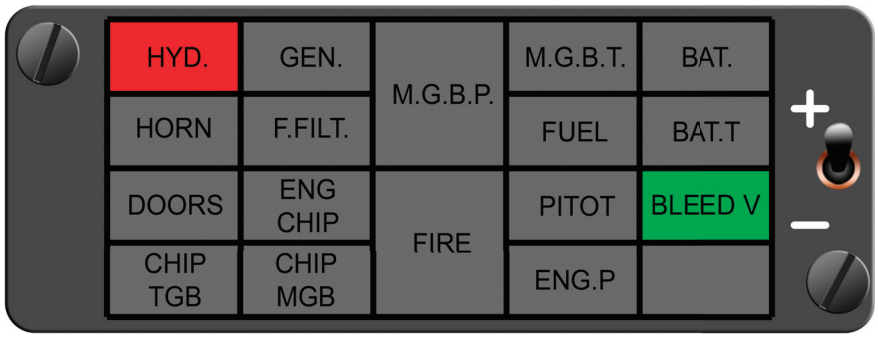
Courses Offered:
FAA PPL, IR, CPL, CFI, CFII, Mountain Flying Course

Gloucester Campus, UK

Contact Information:
Captain Mark Dennis,
Head of Pilot Training
Gloucestershire Airport,
Cheltenham GL51 6SR, UK
+44(0)1452 716866
Mark.Dennis@bristowgroup.com
Academy.training@bristowgroup.com

Courses Offered:
JAA Single Pilot Multi Engine IR(H), Twin Rating Courses

www.heli.com • www.bristowgroup.com



you allow the nose of the helicopter to pitch upward. This causes a decrease in forward airspeed until the vertical stabilizer loses efficiency.

Since the vertical stabilizer is no longer holding the nose of the helicopter straight, and the proper pressure is not being exerted on the right pedal, the aircraft once again starts to spin to the left. With pronounced pressure in the cyclic movements forward and aft, stiff tail rotor pedals and pressurized boost left and right on the cyclic the helicopter makes an unruly rotation at approximately 150 feet above the ground.

As the rotation continues to accelerate the remaining accumulators powering the roll servos now deplete which creates a situation with stiff controls in an uncontrolled flight profile. This uncommanded flight continues until the helicopter contacts one multi-story building's roof and crashing onto the next.

Examining this scenario the perceived likelihood of it happening seems far-fetched, but on May 04, 2004 in Brooklyn, NY this exact accident occurred. Luckily all three occupants of the helicopter survived the accident but with a complete destruction of the airframe.

By the dramatic outcome of this event it would be easy to conclude that hydraulic failures fall into the "dramatic failures" category. The reality is that a hydraulic failure in an AS350 is a mundane nuisance emergency that can easily be made into a dramatic situation.

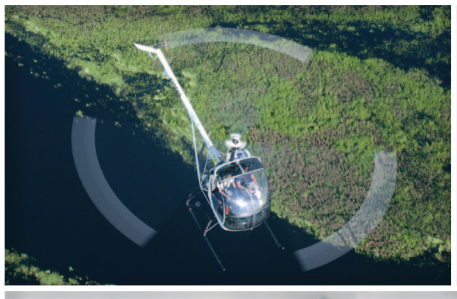
When the failure initially occurred the controls were completely boosted with the exception of the tail rotor servo. This is easily overcome by adding needed pressure on the right pedal. The helicopter is at this point under complete control and a small amount of forward cyclic is added to gain an airspeed of between 40 and 60 kts. After the proper airspeed is achieved engaging the hydraulic cutoff switch on the collective head disables the system and dumps the remaining accumulator pressure. The cyclic and collective immediately become stiff and the pressure required to move the cyclic is between approximately 5 and 27 pound-force and the collective is up to 45 pound-force at maximum upward pull. The aircraft is then flown to a smooth landing area and a slight run-on landing is performed.

When analyzing the proper procedures for a hydraulic failure in an AS350 they seem to be very straightforward, and they are. But without a complete knowledge of the airframe system, and practice with the emergency procedure, even the best pilot would have a hard time diagnosing and performing the landing.

When we gauge ourselves and our peers within the cockpit the immediate first perception is on the ability to manipulate the aircraft. We place tremendous value on the hand to eye coordination it takes to smoothly land the helicopter, sometimes in precarious locations. This skill is most visible of our piloting attributes, but we need to ask ourselves "is it the most important?"■

Sikorsky

Train with the *best*: S-300CBi™ helicopter



Lowest cost of ownership.

Preferred by instructors and pilots.

Designed for the flight training mission.

Simply stated, it's the best training helicopter.

Sikorsky Global Helicopters

A Sikorsky Company

www.sikorsky.com