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the journal of the professional helicopter pilot

The Bell 407—a "Pilot's Helicopter"

By Tony Fonze

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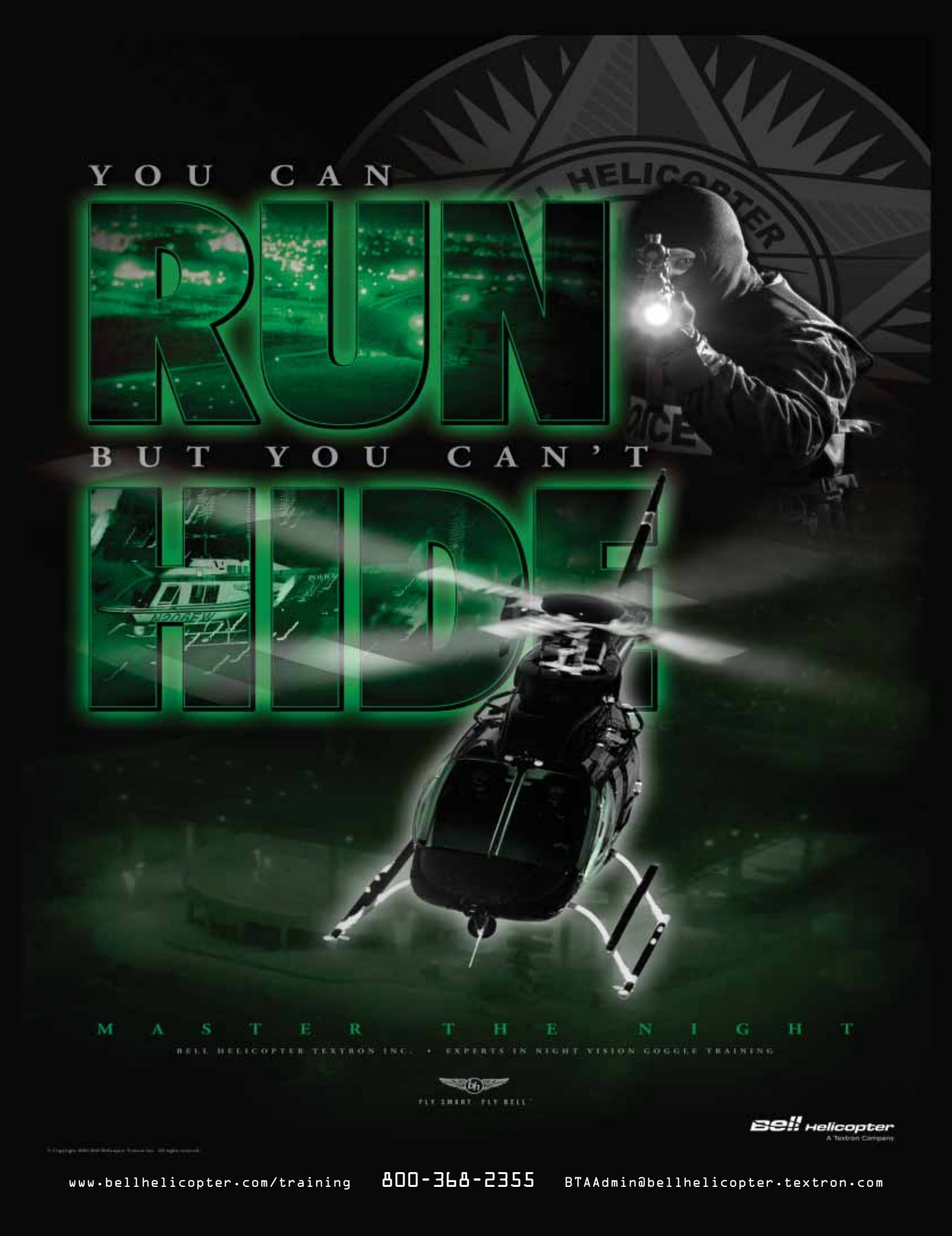
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FROM THE PRESIDENT: NOW'S OUR CHANCE!

There is a lot of movement going on in the area of accident prevention in our profession today and PHPA is making sure we are involved in as much of this process as possible. After all, we, the pilots, are closer to the accident than anyone else and our input must be an integral part of any solutions being developed. With that in mind, PHPA will be holding our second "Human Factors Safety Conference" October 26th – 29th in Tunica, MS, just minutes from the Memphis International Airport. Currently, we are in talks with a couple of hotels in an effort to find a suitable venue for the conference which is also affordable for the working line pilot. We will post the details at www.autorotate.org and email them to every PHPA member as soon as we finalize plans.

As many of you know, PHPA has a seat on the newly formed IHST (International Helicopter Safety Team). The IHST was officially launched at HAI and has representatives from the owner/operators, government, manufacturers, and pilot organizations. Its primary goal is to reduce the accident rate by eighty percent over the next ten years. This is no small task, but it is one that is going to create major changes in the way things are currently being done. If you want to have any say at all in these changes then it is important that you help us provide input to this committee and the rest of the industry. You can do that by participating in this safety conference.

I cannot emphasize enough how important it is for us to participate in what the industry is about to do in the area of safety. We really have only two choices here. We can sit back and let everyone else participate in making safety-related decisions in the coming months and years, or we can participate, as a pilots' organization, and help steer these changes in the direction we feel is most appropriate for the guys and gals doing the job day after day. The only way we can accomplish the second choice is by getting as much input from our membership as possible and this safety conference is going to be the best way to do this. Not only will you be able to help PHPA, your organization, but you will have direct face to face contact with many of the industry professionals who will be guiding this worldwide effort to curb the high accident rate we are currently experiencing.

I would also like to say that the International Federation of Airline Pilots Associations-Helicopter Committee will be holding their annual conference in conjunction with our safety conference. This will give all attending the safety conference the opportunity to meet and talk with an extremely talented group of pilots from many nations. PHPA is hosting the conference this year and is honored to have been given the opportunity to do so.

Look for more information on the conference soon, but in the meantime, please mark your calendars for 26-29 Oct 2006.

For information on making a presentation at this conference or presenting papers please contact Jeffery Smith at jefferysmith@autorotate.org.

Stay Safe!

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Cover: Bell Helicopters

The Bell 407—a "Pilot's Helicopter"

While working in the Grand Canyon flying the EC-130B4, there were two ships that routinely passed us day in and day out. They were both 407s. It appeared to be all the pilots of those aircraft could do to keep from turning what was supposed to be a 50 minute Grand Kingdom Tour into a 15 minute "Cliff Notes" rendition of this Natural Wonder of the World.

And then there was the sound when they passed overhead. I'm not kidding. There is something about the sound of the 407's rotor system at full RPM that just gets my motor going. So, when I called Marty Wright, Chief Flight Instructor at Bell Helicopter Textron's Customer Training Academy, and asked if I could possibly come out and spend some time with the helicopter, and he said, "Let me see what I can do," I was excited. When he called again a few days later and said, "Yes, what about the week of Dec. 12," I was already packing.

The "New" Bell Helicopter Customer Training Academy

If you haven't driven around the Dallas-Ft. Worth area in a while, let me remind you of a few of the nuances of the metro-Dallas driving experience. First, Texans are confident drivers and they don't really have a lot of tolerance

By Tony Fonze *Photography by Bell Helicopter*

for those who seem less than self-assured out on the open road. Second, this is a land where highways have two names, your directions from Hertz only use one of them, and the signs use the other one. Third, when your directions say "North on I-35," the two options you find yourself confronting are I-35 East and I-35 West—and me, without my compass! Still, after several reverse courses, a little swearing, and a millimeter shortening of key fingernails, I found myself at my destination—the Alliance Airport, new home to the Bell Training Academy. And the Alliance Airport also happens to be smack dab in The Middle of Nowhere, just in case you really weren't sure where that was.

While many things about this facility were new: new training facilities, new hangar, new FTDs (Flight Training Devices), and new management; one thing was the same—that very genuine sense of welcome and warmth that has always been part of the Bell training experience. They really do make you feel as though you are important to them and that they are happy to see you. A trip to the Bell Training Academy has always been and remains a week to look forward to.

I was registered for the 407 Ground and Flight Procedures Training Course along with 6 other handsome guys from a range of industries: law enforcement, forestry, ENG, and corporate. As our ground instructor David Fox collected us and walked us over to the cafeteria to do our initial paper work, we couldn't help but notice that we were part of a large group of customers with diverse nationalities. In a later conversation with Launa Barboza, the Director of the Customer Training Academy, she confirmed that there were in fact 17 different countries represented at the academy that week including students from such exotic locals as Egypt, Nigeria, Australia, Botswana, Brazil, China, Cypress, India, Malaysia, Pakistan, Singapore and the Ukraine. She assured me that this was not an exception—it is the norm.

Since 1947, 95,000 graduates representing 123 different countries have received Bell Factory training. No, Launa hasn't been there that long, though she has been with Bell for more than 20 years and previously served as the Director of Military Aircraft Support and Director of Logistics.

Launa has responsibility for a staff that includes 25 pilots, 21 technical instructors and 11 aircraft mechanics. The Training Academy's course catalog lists more than 140 different classes and they graduate more than 3,000 students every year. It is an impressive facility with 18 multi-media classrooms, a 33,000 sq.

Photography: (from left page 4) 407; Bell's maintenance lab; Fairfax County 407; the complete round-up of the academy's training aircraft; Bell Helicopter

foot training hangar and 3 advanced flight training devices. In fact, all of the FTDs are being migrated to new FRASCA platforms with 220º field of view. Later they will be upgraded to Level 7 devices, that include vibration.

The FTD upgrades and changes underway to the pilot training curriculum are part of a strategy to upgrade the training program from a Part 141 Pilot School to the higher standards of a Part 142 Aviation Training Center. One of the directions that will be taken with the curriculum is the addition of more scenario-based learning modules, tailored to a customer's unique operations and requirements. But, it isn't the facility, the FTDs or the training materials that make this place stand out in your mind—it is the people. I love these guys.

But, if there's one thing I know about Bell factory training—there's not a lot of time to chew the fat. The week's program includes 2.5 days of intense classroom training, 2 hours in the simulator and 4 hours of flight training. So, let's get going.

What makes this thing tick

Dave walked us over to our classroom and we got down to business, a business he knows very well. He should, having experienced it for over 35 years from the military and civilian sides; mechanic and pilot experiences; and employee and owner/operator perspectives. Don't worry, I'm not going to repeat 2.5 days of intense ground instruction—you're not interested, and I couldn't do it justice. But I would like to point out the major differences between the 407 and other aircraft, especially the 206, that I managed to glean from Dave's fire hose of information, which came close to drowning me more than once.

Airframe

There's nothing too strange to report, but here and there the 407 has sprouted small appendages to affect air flow for one reason or another. The horizontal stabilizer (not a new appendage in and of itself), mounted through the tailboom, provides downward lift on the tailboom to help maintain a nearly level cabin throughout all cruise airspeeds. But, since the 206, it has also sprouted a leading edge slat installed to improve pitch stability during climbs (eliminate porpoising) and it has grown small flaps on the trailing edge known as Gurney Flaps. The Gurney Flaps serve to disrupt air flow, making the stabilizer a little less effective at high speed, and were necessary to get the Vne up to 140 knots. You can also find Gurney Flaps on the trailing edge of the vertical fin.

Mounted to each end of the horizontal stabilizer are a set of auxiliary fins. The leading edges of these fins are both offset 5º to improve dihedral (roll) stability in forward flight.

The landing gear also has something new—the "Weight on Gear" switch. Mounted to the lower fuselage and activated by the flexing of the cross tube, the switch "knows" if the helicopter is on the ground or not. The switch communicates this information to three systems: cyclic centering, the hour meter and flight time. Both the hour meter and flight time are disabled when the aircraft is on the ground, which is when cyclic centering is enabled.

Cyclic centering is a caution light on the CWAP (Caution Warning Advisory Panel) that illuminates when the cyclic is off center while the aircraft is on the ground. This is intended to eliminate unnecessary stress on the mast and rotor hub.

You'd be surprised how often your cyclic is NOT centered once you have a little light to constantly remind you.

Instrumentation

One of the things I like about Eurocopters (sorry, I won't say it again) is that the power utilization instruments give you a warning when you are approaching your exceedances. I'm happy to report that the 407 does something similar. The TRQ, MGT (Measured Gas Temperature, TOT), and the NG (Gas Producer, N1) gauges contain a microprocessor that alerts you to an impending exceedance and then, if you don't back-off, records up to 50 exceedance events (seems a bit excessive, I know) including date, duration and peak value. It does not record the pilot's name—but we know who you are.

How do you know you're perilously close to screwing up? The CHECK INSTR caution light on the CWAP illuminates and the offended gage's LCD trend arc begins flashing at you. Back-off in time and everything returns to normal. But if you don't, or can't, and the

Photography: The new Bell Training Academy and Alliance Airport Tower; Bell Helicopter

limit is exceeded, the gauge displays an "E" along with the exceedance value and the CHECK INSTR caution light continues to glare at you until you disable it by pushing the INSTR CHK button. But don't worry. Though the system stops reminding you, it hasn't forgotten. Every time you power-up the helicopter the gauge, with the "E" and the exceedance, will display until the data is captured and the gauge reset by a mechanic. Checking these instruments at start-up has been added to the check list.

There are no less than 4 warning lights added to the CWAP to tell you probably a little more than you want to know about the FADEC system: FADEC FAIL, FADEC DEGRADED, FADEC MANUAL, and FADEC FAULT. More on those later. But, while we're on the subject of Caution and Warning Lights, the Warning Panel, which sits just above the instrument panel has grown an extra row and now sports 36 lights full of information compared to the 20 lights (including spares) displayed on the 206. The pilot of the 407 is very well informed.

One piece of information that I am particularly attracted to is the AUTO RELIGHT advisory light. This thing illuminates whenever the engine igniter is operating. This happens, of course, during the start sequence, but, it also happens automatically, whenever the FADEC is operating in the Manual mode above 55% NG, or the FADEC detects an engine out condition with NG above 50%. In other words, if the fire goes out, it automatically attempts to re-light it.

Fuel System

The basic Bell 407 has two fuel cells with a combined capacity of 130 U.S. gallons. The aft cell is located underneath and behind the aft passenger seats and is the larger of the two at 92 gallons. Fuel is pumped to the engine from the aft tank. The forward cell is located underneath and between the middle passenger seats and has a capacity of 38 gallons. An optional auxiliary fuel cell is available and adds another 20 gallons.

The forward fuel tank contains two transfer pumps, located on the floor of the tank, whose purpose is to transfer all usable fuel to the aft cell. Two fuel boost pumps are located in the aft tank. During the 2 minute cool down, get into the habit of turning off the left fuel boost/xfer switch. Here's why. During normal ground run and in-flight conditions, the aircraft battery switch is in the ON position and DC power is connected to the single aircraft bus, powering all things wired to the bus, including the left boost and transfer pumps. But, in the event the battery switch is positioned to OFF during aircraft operations and the fuel valve is on, an alternate circuit provides electrical power directly from the battery to the left boost and left transfer pumps. This was a certification requirement. In the event of a short circuit or a hot battery and all DC bus power (battery and generator) is shut off, the alternate circuit keeps the left transfer and boost pumps in operation. This is good. But, if at the end of a flight, you fail to turn the pump and fuel valve off, even after turning off the battery; when you come back from the "little boy's or girl's room" you may come back to a dead battery.

The two fuel cell approach also has an effect on the longitudinal center of gravity that can be a little hard to grasp in the beginning. The tanks are connected by a hose along the bottom. But, due to the location of the conjoining hose opening in the aft tank and the different sizes of the tanks, they neither fill nor drain in unison causing related shifts, forward and aft, in the Center of Gravity as fuel is burned.

In a single-bladder ship the CG normally moves in one direction only (i.e. increasingly forward) as fuel is burned. And, even in the 407 as fuel is initially burned, the CG moves forward as the rear tank begins to drain. But, this is where things are a little unique. For a time, once the remaining fuel has reached about 508 lbs the two tanks burn down together and the CG remains more or less in the same forward vicinity. But then (between 335 lbs and 195 lbs) the CG moves significantly aft as the forward tank drains completely. And finally (at about 193 lbs), the CG moves slightly forward again until the aft tank empties. Hopefully, you're on the ground somewhere before this last step is completed—otherwise, you will be.

Powerplant-FADEC

The 407 is powered by the Rolls Royce 250/C47B engine. This engine is rated to 813 shp (shaft horsepower), but is derat-

Photography: The training hangar with real aircraft where pilots and mechanics can poke, point, question and disassemble to their heart's content; Bell Helicopter

ed through the HMU (Hydro-Mechanical Unit) to 674 shp for takeoff power and 630 shp for continuous operation.

The compressor on the 250/C47B is a single centrifugal titanium impeller with the vanes transitioning from axial to centrifugal, eliminating the need for stators. At 100% NG the compressor is rotating at 51,000 RPM. This rapid compression will increase the temperature of the compressed air approximately 555º F. Hot!

We could spend a lot of time talking about the various aspects of the 250/C47B; but I want to reserve most of the attention for the FADEC system. The FADEC (Full Authority Digital Electronic Control) provides a number of benefits to the pilot: reduced workload, automatic engine starts, precise control of main rotor speed, continuous engine monitoring and self-diagnostics. The FADEC is an important part of this helicopter and its sudden, unanticipated removal from the process, no matter how unlikely, requires that the pilot acquire a relatively significant understanding of its workings and modes of failure.

The FADEC has two main components: The airframe-mounted Electronic Control Unit (ECU) and the engine-mounted Hydro Mechanical Unit (HMU). The ECU is the brains of the outfit. It continuously monitors numerous internal and external inputs: MGT, NG, NP (Power Turbine speed), NR, Engine Torque Meter Oil Pressure, Collective Pitch, Compressor Inlet Temperature, Ambient Pressure, and Throttle (PLA, Power Lever Angle). It looks at all of these things primarily so that it can do one thing—modulate fuel flow via the HMU. When the FADEC is engaged with the throttle in FLY detent position (PLA 70º) the FADEC has complete control over engine operation to maintain NR within limits.

The HMU provides fuel modulation via a stepper motor in AUTO mode and a hydro mechanical actuator in MANUAL mode. For those of you with a reciprocal engine driven helicopter somewhere in your past, flying in MANUAL mode is like flying with the governor off (but maybe just a touch more sensitive).

FADEC Start

One of the great advantages of the FADEC is its ability to start the helicopter. From the check list: Check the voltage (24v minimum), verify collective full down, cyclic centered, pedals neutral, throttle at idle, and hit the start switch. The FADEC takes it from there.

The FADEC monitors the MGT for a hot start, up to 50% Ng. If the FADEC detects excessive MGT (843º C < 10,000' PA or 912º C > 10,000' PA) the ECU will cut off fuel flow and engage the starter for up to 60 seconds. Still, a hot start is a hot start and it's going to be your fault, even with the FADEC at the helm, so you will still need to closely monitor the MGT during start and initiate a manual termination (throttle to cutoff) if you see things getting out of control. If the FTD (Flight Training Device/Simulator) hot start is anything like the real thing—it happens very quickly so be on your toes.

FADEC Failure in Flight

FADEC failures, though almost unheard of in real life, logically come in several flavors, all of them entirely manageable if you remain calm and follow your training. The least threatening is FADEC DEGRADED, indicated by the light of the same name rapidly demanding your attention from the CWAP. This fault is indicative of a partial degradation of FADEC performance which may result in NR droop, NR lag or reduced max power capability. If this happens you should continue to operate in AUTO mode and fly the helicopter smoothly and non-aggressively and Land As Soon As Practical. The RESTART FAULT light may also come on in some instances.

A FADEC FAULT indicates that the PMA (Permanent Magnet Alternator) and/or MGT, NP, or NG automatic limiting circuits may not be functional. Again, the RESTART FAULT light may make an appearance at the same time. The pilot should continue to operate in AUTO mode, fly the helicopter smoothly and non-aggressively and Land As Soon As Practical.

Then there's the Biggee—FADEC FAIL. When the FADEC FAIL light comes on so will the FADEC MANUAL light, indicating that the system is now operating in manual mode. While we're at it, let's also throw in the RESTART FAULT light. The FADEC FAIL horn (a not unpleasant chime) will also sound. Believe me, with all this commotion, you definitely know something just happened.

So, what do you do when all the lights come on and the chime starts singing? FLY THE AIRCRAFT! Oh, and you can silence the horn by hitting the FADEC AUTO/MANUAL button once. The cute little chime becomes annoying rather quickly it turns out. In truth, depending upon your flight configuration: cruise, high power setting (hover, takeoff), or low power setting (approach) there are some further precautionary actions that may be required of you, but it is nothing to get your knickers in a knot over. We'll go over these procedures in more detail when we finally get to fly the thing. Don't worry, it's coming up soon.

Rotor System

The 407 main rotor hub contains a glass/epoxy composite yoke that acts as a flapping flexure. That's right, no flapping bearings and no lubrication to speak of. Blade flapping is accomplished by a virtual hinge in the yoke (flapping flex-

ure). A flapping stop and a droop stop inboard of each spindle protect and limit the composite yoke from excessive flexing. The addition of cyclic centering when on the ground is also there to help reduce stress on the yoke and mast. The feathering bearings and lead-lag dampers are elastomeric elements that require no scheduled maintenance and have benign failure modes.

Sitting on top of the whole thing is the Frahm Damper, a formed steel block housing 8 heavy gage springs. As the main rotor blade encounters inflight convective turbulence the Frahm damper steel block begins to vibrate at a similar frequency, canceling the vibrations before they can descend into the main rotor shaft and the fuselage. This accounts, at least in part, for the 407s extremely smooth ride.

The 4 blades themselves are asymmetrical and include a pronounced -13º twist from hub to tip to provide more equal distribution of lift. The blades are composite design consisting of three structural members: a fiberglass/epoxy spar, a Nomex honeycomb core and a fiberglass/epoxy skin. The leading edge is a nickel plated stainless steel strip. And, the blades are dynamically balanced and interchangeable.

At the end of a flight, good procedure calls for the blades to be rotated so that they form an X, when viewed from above over the vertical center line of the fuselage. In this configuration the blades extend over open air, rather than over elements of the fuselage. It looks cooler this way too.

An odd thing with the pedals

In every aircraft design a series of compromises and trade-offs have to be made. For the 407 they come in the form of the pedal stops, known officially as the Pedal Restrictor Control Unit (PRCU). The PRCU restricts full travel of the left

pedal when the airspeed increases to 55 knots and above. It releases the restrictor when the aircraft slows below 50 knots. There is an emergency release cable in the cockpit, just in case. Why does the PRCU exist?

In the early production days of the aircraft, two accidents occurred that were attributed, by the NTSB, to the tail rotor hitting the tail boom. Under normal conditions, at 100% RPM, this just doesn't happen and the problem could not be recreated. It is thought, however, that under certain extreme conditions: low RPM, serious cross-wind causing max flapping, full left pedal, it might be possible. So, in order to satisfy the powers that be and remove any possibility of a potential problem, Bell arrived at this innovative solution. It is a little strange and adds a step or two to the pre-flight cockpit procedure, but other than the notable "klunk" on takeoff when the restrictor engages, you really don't notice it.

I am not a toy guy

I don't have a motorcycle or a sports car. In fact my daughters often remind me that I'm driving a soccer mom's car (Volvo V70 T5) and that I should be appropriately embarrassed. I did have a boat once, but it wasn't a fast boat. It was, big surprise, a sail boat.

I used to take my wife sailing. There we were, off the coast of Southern California, the boat heeled way over, the teak railing buried beneath the blue green water. The cold Pacific sea spray washed over us while the apparent wind ripped through our hair and tore at our clothes. We were hauling butt! Or so I fancied until Becky rudely pointed out, in what I perceived to be unnecessarily condescending tones (she is a toy guy), that we were only going 15 knots—a lousy 17 miles an hour.

Like I said, I am not a toy guy.

But, take it from me, you'd have to be DEAD not to get a rush out of flying the 407. And who better to introduce you to this aircraft than Bell's Chief Flight Instructor, Marty Wright.

Photography: 407; Bell's Chief Instructor Pilot, Marty Wright; Bell Helicopter, Autorotate Staff

Two and a half days of intense ground school behind me topped-off with an hour in the FTD where I was besieged with more hot starts and FADEC failures than the 407 has caution lights (that would be 'a lot') and the requisite "hard" written test passed—and I was looking to fly. I walked through the huge hangar heading towards the pilot lounge area, searching for Marty. He was right where he was supposed to be and we took a little time to talk before going outside.

Marty came to Bell after spending 22 years in the Marines, much of that time flying H-53s. In fact, at the time of his retirement, he had more H-53 time than any other pilot. His initial appointment at Bell involved V-22 training systems, which leveraged his 15 years as a marine instructor pilot (IP). But, in 2002, when the V-22 training product was delivered, he transferred to the Training Academy as a flight instructor. Two years later, upon the retirement of his boss and my friend Gary Young, Marty was promoted to the position of Chief Flight Instructor with responsibility for Bell's pilot instruction program. Today, and for the remainder of this week, he would be my CFI.

The "Wright" Way of Doing Things
or
(don't MAKE me slap your hand)

The sun was shining as we stepped outside, but the 15 knot breeze and the 55ºF temperature added up to "cold" to a guy from Tucson. We walked around N407BP on a quick pre-flight before climbing aboard. I was happy to note the helicopter's midnight blue exterior had succeeded in absorbing just the right amount of radiant energy so that the inside was comfortable. Marty's unique style as an instructor first makes itself known in the pre-flight.

Now, I should begin by saying that neither Marty nor I are particularly "long of leg" so I'm usually in the habit of adjusting the pedals forward a little to make pedal control a little more comfortable in flight. He strongly encouraged me not to do so in the 407. "The hydraulically boosted pedals take a very gentle touch and I think you'll feel like you have great control with them fully recessed." I left them where they were. He was right.

The 407 Checklist is relatively straight forward with the exception that it contained some elements that were new to me, pertaining to some of the unique features of the 407: the Trend Arc LCDs, the FADEC, and the Pedal Stop.

Shortly after the BATT ON sequence, the helicopter will tell you if the last pilot left you with any uncleared exceedances (Torque, MGT, or NG). It does so by illuminating the CHK INSTR light while displaying an E at the gauge.

The Pedal Stop has two checks. The first is merely a quick check of the red emergency release lever, to make sure it is still in the safety wired "closed" position. This lever would be used if, for some reason, the Pedal Stop did not automatically retract when it was supposed to and we were compelled to manually disengage the pedal stops. The second check is just a quick test of the annunciator switch on the right side of the instrument panel. With pedals neutral, push the button. Depress the left pedal until it stops. It will not go all the way to the bottom, its full movement prevented by the PEDAL STOP function. You'll then release the pressure on your foot and the stop should retract and allow the pedal to go all the way down. That's it, you're done.

The FADEC test is performed after successful engine start, with the throttle at idle. You reach up with your left hand and hit the FADEC AUTO/MANUAL switch to put it into MANUAL Mode. You should see a small droop in NG and the FADEC MANUAL caution light and AUTO RELIGHT advisory lights should illuminate. With your left hand, slowly roll on a little throttle to ensure the engine responds, then return to idle position. Return the switch to AUTO.

The first time I attempted to perform the above maneuver I got my hand slapped by Marty when I reached for the button with my right hand. I had to laugh, because when I'm in the CFI seat, I've been known to slap a hand or two when a pre-flight operation is about to be conducted with the "wrong" hand. "OK-got it. Right-hand stays on cyclic, left hand does the button pushing."

It sounds like we're spending a lifetime in the engine start procedure, but so far, we've been in here for about 2 minutes. I'm still good. Things in the 407 cockpit are a little bit different and I want to learn the correct way to do them. Not surprisingly, there is also a "Wright" way of doing the hydraulics check: (1) HYD SYS Switch off (Caution Light Should Come On); (2) Cyclic Centered (3) Cyclic Control Check…here comes the Marty way. In a fluid series of relatively quick movements, rock the cyclic for-

Photography: One of the Training Academy's 18 multi-media classrooms; The new practice lanes, just minutes from the Academy, with the Texas Motor Speedway in the background; Bell Helicopter

ward out of center, then back through center continuing until it is an inch or so out of center coming aft. Then forward to center and right until out of center. Then back through center until out of center to the left. The whole exercise should look like only 4 smooth motions: forward, aft, right, left. Done properly the helicopter gently leans in the direction of the cyclic. The whole thing's over in about 2 seconds.

The Texas Motor Speedway

All the checks are done, I hand the check list over to Marty for stowage, and I take a moment just to experience the helicopter on the ground at 100% RPM. First thing I notice—it is quiet. The next thing I notice—it is talking to me. What's it saying? "Let's go, let's go, let's go…" OK, it could be my writer's imagination. And it could have something to do with the fact that we were pretty close to sea level with two smaller guys on board and about 1.5 hours of fuel, but this thing was literally raring to go. Not in an undisciplined, I'm going to jump off the ground kind of way, but more like an excited kid. It was ready to fly, and so was I.

But, let me first set the stage a little.

For the last 8 months, I'd been driving a helicopter that felt a lot like a big rig lugging a load of coal: High DA, Max Gross Weight, Fenestron. It wasn't a bad helicopter, but it was nothing like this. Now, I was sitting in a Lamborghini—lots of extra power, takes a gentle touch, the pedals were backwards…I was thinking that it might take me an hour or so to get the hang of things. It didn't!

As I gently raised the collective for my initial pick up it didn't take long before the helicopter started to come up. I was finally letting it do what it wanted. But, still it behaved with discipline and control. Straight up to a two-foot hover. "Tail clear right," and a left pedal turn to head towards the taxiway. We glided out to the taxiway, Marty made the call and we were cleared for takeoff.

"Head down the taxiway, then climb and turn right before you get to that building," he pointed. We were off.

When I said that the new Bell Training Academy was "smack dab in the Middle of Nowhere" I may have been a little unkind. It is, after all, just an exit away from the Texas Motor Speedway, the home of NASCAR to all in the Dallas-Ft. Worth area. And, as it turns out, the speedway is on the base leg of the new practice lanes located just a short hop from the airport.

"Just make a normal approach to the beginning of that 2nd lane over there," Marty directed. The Texas Motor Speedway slowly disappeared behind us as I descended and brought the helicopter to a hover over the spot. I took-off into the wind, executing a normal take-off, leveling off at 1,200 ft. making right traffic to bring it in for a steep approach. Marty was just having me get a feel for the helicopter.

Have you ever noticed that some helicopters take a little work to get used to? The pedals don't feel quite right or the collective seems a little jumpy. This just wasn't the case in the 407. The pedals had a very delicate touch, but that was not unlike the R22 or R44 and I felt at home on them. The collective has a very large vertical "throw". In other words, at the end of a full down auto, fully cushioned, the collective is WAY up in your arm pit. Consequently, all that travel gives you a very high degree of control and finesse over your collective inputs. Pick-ups and set downs are very smooth. In 20 minutes I felt comfortable in the cockpit. By my next lesson, I felt like I was home.

Marty had me do a hovering auto. Again, very smooth with all that collective to work with. The only difficulty I had was on a quickstop, executed diagonally across the field containing the practice lanes. Take-off, get to 40 knots about 50 feet up, smoothly lower the collective while putting in aft cyclic, a little left pedal. OOPS! I mean right! Damn European helicopters. Oh well, just thinking a little too hard. When left alone to their own devices, my feet knew exactly what to do.

We set up for a straight-in auto with a power recovery and I don't notice anything too different there, except our glide is steeper than that seen in a 206 and Marty had me flare a little higher—75'. There was something a little odd with the profile of our approach, but we didn't have too much time to get into that right then.

Marty had me take-off and head out on a short cross-country run. I climbed to 2,000' and took it to 140 knots–Vne. I noticed a few things right away. Given our weight, and DA and the nature of the beast, this thing wanted to climb. In fact, there is a 2,000 fpm climb limitation on the 407 and it would have been VERY easy to exceed it. Another thing—in my experience, some aircraft really don't want to get to their Vne and they tell you so. They start shaking and quaking and the noise level really increases. They'll get there, but they don't like it and both you and the helicopter know it. Not so with the 407. It slides smoothly up to Vne without any balking of any kind. Still quiet. still smooth—140 knots feels just like 100 knots. In fact, it wouldn't take anything more than a slight lapse in attention to blast right on by 140. Trust me, I know.

As we leveled-off Marty reached up and punched the FADEC AUTO/MANUAL button, instantly putting us in MANUAL mode. I'm not sure what I expected, but what I got were a few lights and a chime, and not much more. We just kept on flying. I paid a little more attention to my NR, gently adding a little throttle when I noticed a couple of percent drop. Marty re-engaged the FADEC to AUTO—again, nothing noticeable and we headed back towards Alliance. On the way, he had me climb to 3000' and enter an OGE Hover. We intentionally entered a Settling with Power condition and then he talked me through the recovery: lower the collective slightly, forward cyclic to fly out of it, we have some forward speed, bring the power back in, return to normal flight profile. Everything by the book. We returned home.

A different style of autorotation

Prior to commencing my second flight, I was discussing the different feel of the autos in the 407 with Wayne Brown, Sr. Instructor Pilot Specialist. Wayne has been an instructor at the academy for a long time and he was sent out to get the first Training Academy 407 years ago. "When a new helicopter is brought out from the factory, it becomes our responsibility to fly it, learn all of the nuances, and determine the best way to perform the maneuvers in that aircraft. Our technique then forms the basis of the training syllabus and the way we teach our customers to fly this aircraft," Wayne explained. "The 407 has a lower inertia rotor system than the 206 but its tremendous responsiveness to the control inputs delivers a great auto. But, as we gained experience with the aircraft, we discovered that a more "fluid" auto seemed the best technique with the 407." I was looking forward to understanding this better from a personal perspective during the next flight.

Marty and I returned to the practice area with a long list of emergency procedures to review: full down autos, 180 autos, hovering autos, hydraulic failure, quick stops, and flight in manual mode. I'm happy to say that my quick stops returned to normal state (thank you, feet) and hovering autos continued to be a pleasure in this aircraft. My first simulated hydraulic failure, however, was not exactly a thing of beauty, though it was entirely of my own doing. We were downwind in the pattern when Marty reached up and turned off the hydraulics. I began to slow down a little and started a gradual descent as we turned right into the base leg. So far so good. The aircraft felt much like other aircraft operating with hydraulics disabled—no better, no worse. I was relieved to note that the absence of the hydraulics on the pedals did not significantly add to the increased work load. I was setting up to do a running landing to the lane in front of me and was still looking good when I stopped following my own advice.

When I'm teaching hydraulics off landings, the mantra I usually repeat over and over to my students is, "Make smaller movements sooner." Making small corrections as soon as you see a deviation you don't like makes it easier to keep things pointing the right way, rather than waiting too long and having to make large corrections that, without fail, turn into over-corrections, that then turn into over-corrections the other way, etc.

Somewhere in there I got too slow and began chasing my tail. Visions of a nice smooth running landing rapidly disintegrated as the runway, which was supposed to be in front of me, began making its way off to my left. With some help from Marty we brought the helicopter into a hover and set it down. "Well, the good news is that you can see that it is possible to hover the 407 without hydraulics and land," Marty said in an attempt to look for a positive note. "Let's try that again, and this time, keep your speed up a little more and get on those course adjustments a little sooner." We took off for another pattern and this

time I did one of the better hydraulics-off running landings of my career. OK, that wasn't so bad.

Today, and from this point on, all of our autos were full-downs. We started off with a straight-in auto, Marty giving me verbal guidance as we went. He initiated the auto by rolling the throttle to IDLE. Entry was standard: lower collective, aft cyclic to maintain attitude and a little RIGHT pedal. The glide was steeper than the 206, looking more like the glide of the EC130B4. At 75 feet, Marty had me begin a flare—not too much, watch the RPM. "Now start bringing in a little collective," Marty encouraged. At this point we were neither in a "standard" glide, nor in a "standard" flare, paralleling the ground, We were somewhere in between. But, though different than what I'm used to, it felt somehow right. As we were coming up on the spot, I continued to slow down with the cyclic while beginning a long, continuous cushioning raise of the collective. My target disappeared behind the instrument panel and I switched my visuals to down through the floor panels as I continued to raise the collective adding a touch of forward cyclic to level the aircraft. And then we were gently touching down, just forward of the target, with only a short glide. The collective was in my armpit when I began lowering it back down.

"So, what do you think?" asked Marty. "That was fun!" And I meant it. "Different, but fun. Let's go do that again." And off we went. As we did auto after auto, now moving to 180s from both the left and the right, a few patterns began to clarify for me. You have to get on 180s in the 407 a little faster than you do in the 206s. The higher descent rate warrants a rapid entry and immediate initial turn back towards the target and it is imperative to keep your eyes outside on the intended touch down point from the very beginning. Other than that, straight-ins and 180s all assumed that same

"fluid" approach path rather than the Glide-Flare-Cushion-Run On rigid stepped approach more typical in the industry. I liked it. The autos became smoother and it was easier to maintain your focus on the spot when you were approaching it from a higher perspective than in a typical, horizontally moving flare. But for me, though fun, this was still "work" and after a half a dozen 180s, I was ready to head towards the barn.

3 FADEC Failure Profiles: High, Low and Cruise Power

The FADEC has gone through a lot of modifications over the years since the 407 was introduced, in fact it is now in its 5th generation. Dual inputs, potentiometers for control positions on the throttle and the addition of a FLY position, somewhere just short of full open, all serve to temper the dramatics. The net result is that a FADEC failure is nothing to be intimidated by. However, good technique is emphasized to help the pilot avoid two situations residing at opposite ends of the spectrum: low RPM and overspeed.

We started off with a FADEC Failure to MANUAL while in the downwind leg of the pattern. Marty reached up and switched to MANUAL mode, we got the chime, I hit the button once to silence it. We were cruising at about 100 knots which took about 90% NG under current conditions. Nothing dramatic happened. I continued to fly the helicopter using manual throttle corrections as we descended and slowed down. This required a slight reduction in throttle to keep NR/NP in the green on the way down. Marty had me come to a 10' hover over my spot. "All I want you to do from here is gently roll off a little throttle until we get a very slow descent started. That's it," he added as I followed his instructions and we gently began settling toward the ground. Once we touched down he cautioned me to roll the throttle to idle, then slowly lower the collective all the way down.

He explained what just happened.

"We teach this style of landing with a FADEC Failure to MANUAL to help the protect the pilot from an overspeed condition. Get it into a high hover, roll off a little throttle, and you'll gently come down to the ground. At that point, you want to remember not to slam down the collective or you'll likely get an overspeed. Just roll off the throttle, and slowly lower the collective. Keep everything slow and controlled and you won't have any problems," Marty concluded.

"In flight, when we switched to MANUAL, did you notice any dramatic

Photography: 407; Bell Helicopter

change in NG or NR/NP," Marty asked? "No, it really wasn't any big deal," I recalled. "That's right, it wasn't," he confirmed. "That's because when the FADEC goes to MANUAL, the HMU hydro-mechanically adjusts the NG to 90%. If you're already close to 90%, then you don't observe anything significant. But, if you're in a very low power setting, then you'll see it rise towards 90% and you'll have to intervene to prevent an overspeed. Conversely, if you're using a lot of power when you get a failure, doing a max performance takeoff, attempting to clear some trees at High DA, you'll get a drop to 90% NG and you'll have to counter that with the throttle. This time, let's fly the pattern and switch to MANUAL on final approach. I'll step you through it." FADEC to AUTO, Throttle to FLY. Pick it up to a hover and away we go.

This time, while on final approach, with NG at about 83% Marty reached up and switched to MANUAL mode. "Now, raise the collective a couple of inches and roll off a little throttle." I did as I was instructed, and a few seconds later the NG began to rise, leveling off back around 83%. In effect, by raising the collective and rolling off a little throttle we were buffering the anticipated actions of the HMU against a potential overspeed condition. Worked like a charm. I completed my approach to a 10' hover and used the Factory standard approach for FADEC MANUAL landing. "Good work," Marty encouraged. "Now let's do a max performance take-off and see what happens when we FAIL to MANUAL."

We got back on AUTO and I executed a max performance take-off with NG at 93%. Marty pushed the FADEC and we went to MANUAL. There was about a 2 second delay and then the NG started to drop to 90%. I simply rolled on a little throttle, took NG back to about 93% and we resumed our takeoff profile without any issues. I continued to fly the pattern manually and again set up for the FADEC Fail to MANUAL approach. 10' hover, roll off throttle, gently get it on the ground, throttle to idle, lower collective. Ta-Da!

The Bell 407

Seating	7 (Including Pilot)
Airframe	41' 8.5" (Overall Length) 10' 3.8" Height
Main Rotor	4 (No. of blades) 35' diameter 10.75" chordline -13º twist
Tail Rotor	2 (No. of blades) 65" diameter 6.40" chordline
Powerplant	Rolls Royce 250-C47B 674 shp (takeoff) 630 shp (max. continuous) Full Authority Digital Electronic Control (FADEC)
Hydraulic Controls:	Cyclic, Collective, Tailrotor Controls

Limitations:

Airspeed

Vne	140 knots
Doors Off (Any)	100 knots
Autorotation	100 knots

Max. Operating Altitude
20,000' (density or pressure-whichever lower)

Weights

Min. GW	2,650 lbs.
Max.GW (internal)	5,000 lbs.
Max. GW(internal)	5,250 lbs. (FMS-28)
Max. GW (external)	6,000 lbs.
Cargo Hook Cap.	2,650 lbs.

Fuel

Standard config.	130 U.S. Gallons
W/ aux. tank	150 U.S. Gallons

Max rate of climb
2,000 fpm

Slope Landings

Side	10º
Nose up	10º
Nose down	5º

On my 4th and final flight of the week we reviewed everything one more time including another, most excellent, hydraulics-off landing, if I do say so myself, finally concluded with a 180 full down experience, that I don't expect to repeat any time soon.

Marty had given me some excellent pointers on my 180s this week, one of the most significant was, "Go ahead and use the pedals to help bring it around quickly after the initiation so you can get your eyes on the spot right away." Great advice. I was coming in on my spot, at 75' I initiated a flare, and then raised the collective slightly as I aimed the helicopter at my intended touch down point. As the spot was moving into position I gradually continued my collective raise, just a little, just a little, until I was 5' above the spot, I leveled with the cyclic and smoothly and continuously brought the collective in almost up to the stops. Right on the spot, we touched down with a short glide and came to a rest. The collective control on the 407 is so superior that neither one of us could even feel the moment of touchdown. One minute we were in the air, the next we were on the ground and you couldn't tell when exactly the transition had occurred.

Now that's a pilot's helicopter!

So why do an article on the Bell 407? Several reasons. In the scheme of things, the 407 is a relatively "new" helicopter. Many of us have never been fortunate enough to fly one and I thought that sharing my experience would be of interest to those readers. And, of those that have flown it, not all have had the opportunity to attend the factory course and I thought sharing Bell's techniques and perspectives would be of interest to you. Finally, it looked like it would be fun—and it was!

My appreciation to everyone at Bell who made this article possible and my genuine thanks to all my friends at Bell, old and new—Launa Barboza, Scott Baxter, Wayne Brown, Dave Fox, Alacia Lane, Larry Stone, Jim Szymanski, Marty Wright. You guys do good work!

END

Photography: An artistic, fish-eye lens view of one of the new FTDs; Bell Helicopter

Q & A,Courtesy Virtual Flight Surgeons

Question: I just received a letter from the FAA notifying me of a "slight variance or technical discrepancy" on my EKG. The FAA is now requesting additional information, how should I proceed?

Answer: Because EKG's (ECG's) are transmitted to the FAA electronically, often "technical discrepancies" can occur. There are also situations where the EKG may indicate a so-called "normal variant" without having heart disease. Often having your Aeromedical Examiner repeat the EKG will clear up this discrepancy. On occasion, additional evaluation will be needed. Unless specifically stated otherwise, your medical certificate is still valid while you are having the EKG or other evaluations performed.

Question: My doctor recently suggested I would benefit from treating my increased cholesterol level. What is current FAA policy?

Answer: Although an increased blood cholesterol level is not disqualifying, many diseases may occur secondary to having this condition for a long time. FAA allows most medications that are currently prescribed for treating high blood cholesterol levels. When starting medication, you should "ground test" for at least 48 hours to be sure there are no adverse reactions. You can then continue to fly on your current FAA medical certificate and report the medication use at the time of your next FAA exam.

The Virtual Flight Surgeons aeromedical physician staff are available as a PHPA membership benefit for pilots with aeromedical concerns and questions regarding their FAA medical certificates. Please visit their site at www.AviaitonMedicine.com and click on "Corporate & Partnership Confidential Questionnaire". Select your Organization from the drop-down menu and complete the Confidential Questionnaire. VFS will address each question by telephone or email within two business days.

Dr. Snyder is a Distinguished Graduate of the United States Air Force Academy and Duke University School of Medicine. He has completed medical residencies in Family Practice and Aerospace Medicine. He is board certified in both specialties, as well as Occupational Medicine. Dr. Snyder received his Master's of Science Degree in Public Health from the University of Colorado Health Sciences Center. He holds commercial pilot and CFI ratings since 1975 and is a Designated Pilot Examiner. He oversees airline, ATC and business aeromedical services. He has flying experience in over 50 aircraft models and is a three-time Command Flight Surgeon of the Year and USAF Academy Instructor Pilot of the year.

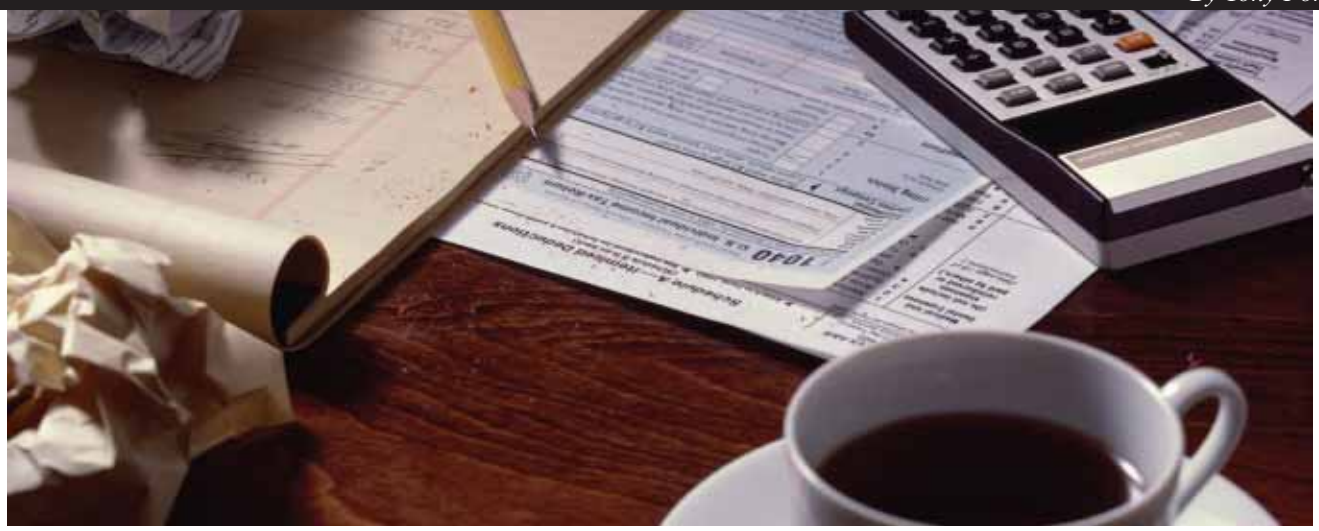
Quay Snyder, MD, MSPH
President & CEO, co-Founder

END

Photography: Virtual Flight Surgeons

I Love My Uncle Sam, But...

By Tony Fonze



Helicopter pilots, as a rule, are a patriotic bunch. But, we work hard for our money, and at the end of the year, it is our God-given responsibility to hang on to as much of it as possible when it comes time to make economic restitution with our good ole' Uncle. Sorry Uncle, but a pilot's gotta do what a pilot's gotta do.

And here's how to do it.

If you can't itemize, you've got a problem

In the simplest world of tax reconciliation, you take your W2, fill in the blanks on form 1040 EZ, claiming the standard, government granted deductions of $8,200 filing singly or $16,400 filing jointly (the standard deduction and personal exemption figures for 2005), fill in all the blanks, send it in with a check or wait anxiously for your refund and the long anticipated cruise to San Carlos. If this sounds like you, then put down this magazine and go figure out how to buy a house so that you can be one of those who CAN itemize their deductions, complete with a Schedule A (Itemized Deductions).

Yes, this means that your life will be more complicated, and you will spend at least one weekend a year staring blankly at your dining room table covered in receipts, statements, torn envelopes and W2s. But, you will also be positioned to keep more of your hard-earned money. I'll give you a second to decide.

If you're still here, I'm assuming that you DO itemize and that some helpful tidbits about places where helicopter pilots could claim some additional deductions may be of interest.

Looking for deductions

A deduction is an amount that the government allows you to subtract from your income to help reduce your tax burden. The deductible expenses relevant to this article will fall under the category of miscellaneous itemized deductions on your Schedule A. Unfortunately, you don't just get to write them down, total them up and claim the sum. Only the amount that exceeds 2% of your adjusted gross income is deductible.

Let's examine several flavors of potential expense categories: Work related expenses for which you were not reimbursed, relocation expenses, and additional training or membership fees you paid for to further your career. Rules and regulations apply to all these areas, but here are some trigger points that might help you identify some areas where you might save on your taxes.

Travel, Temporary Assignment Costs

It is the nature of the helicopter beast that many of us find ourselves away from home, sometimes for extended periods of time. If you are an employee of a company and fighting a fire in Idaho for 2 months, on assignment in South American for a year, or rescuing people off rooftops in New Orleans for two weeks, you may be incurring "duplicate" costs. If you are, and if you are not being reimbursed for those costs by your company, you can deduct them on Schedule A. The same logic applies if you are considered a contract employee or temporary employee (i.e. Doing seasonal work in the Grand Canyon or Alaska).

According to David Cohen, CPA. and partner in Beach, Fleischman, and Co. P.C., a prominent, Tucson based accounting firm, a duplicate cost is, "an expense that you are already paying for at home, that you are having to duplicate because you are working away from home." Examples of duplicate costs would be lodging (motel, trailer space rental, etc.), car rental, and telephone calls home. If you are required to wear a uniform, cleaning costs for your uniform or costs

Photography: Jupiter Images.

to acquire your uniform may also be deducted. The same thing applies to safety gear. (Uniform purchase and cleaning costs and safety gear acquisitions can be deducted even if you are working at home.)

Food is NOT a duplicate cost since you have to eat whether you are home or away, although it is true, we sometimes eat twice as much when we're away from home. There's comfort in food.

If your temporary assignment or contract work requires you to travel to your work site then airfares may be deducted as well as a mileage deduction for use of your personal vehicle. Allowable mileage deductions have been varying significantly over the last year or so with the rapid change in oil prices. If your travel was incurred from January 01, 2005-August 28,2005 you can deduct 40.5 cents a mile. Between August 29, 2005-December 31, 2005, 48.5 cents a mile. And, as of January 1, 2006, the rate has dropped to 44.5 cents a mile.

No "double-dipping" is permitted. If your company reimburses you for these costs, then you may not also claim them as deductions. However, if they only partially reimburse you (i.e. they give you $25.00/day for housing but housing costs $50.00/day), then you can claim the difference. Similarly, if you work in the Gulf, but live in Florida and make the drive to handle your shift every other week, those costs are not deductible. You don't get reimbursed for choosing to live in Florida. If they paid you to make that commute, then they'd have to pay everyone who drove from Redondo Beach to Van Nuys to get to their job in LA.

PHPA Membership is Deductible

The government allows you to deduct the costs associated with maintaining or enhancing your professional standing or training. This means that if you attend HAI, subscribe to PHPA, pay union dues, or pay other association fees or dues, these are deductible. Same thing applies to relevant magazine subscriptions.

And, since we need to get our annual Class 2 or Class 1 physical in order to maintain our employment, these costs, too, are deductible.

Under the right circumstances, you can even deduct the expenses associated with additional training that enhances your skills or professional standing. For example, you are a working pilot and decide to go back and get your instrument rating. The costs associated with obtaining that training, taking your check ride, driving to and from the school, etc. are all deductible. The same thing applies to getting your ATP. However, if you have your private and are working towards your commercial or CFI, those costs are not deductible, because you are not yet employable as a helicopter pilot.

Here's an interesting fact that may help some of you. There are more than a few pilots out there who are not currently working as helicopter pilots but technically they could be: they have their commercial and CFI ratings and they are still "active" in the industry. And, they decide to go get their instrument rating or ATP. Even though you're not being paid as a pilot at this time, you can still deduct these related educational expenses from your other income. This is intended for those who, at some point, actually intend to work as pilots.

Relocation Cost

Un-reimbursed relocation costs are also deductible. So, if you get a new job, and your employer doesn't cover your costs of relocation you can deduct for the transportation of your household goods, personal auto mileage, and lodging along the way. Unlike the past, you can no longer deduct for temporary housing at your new location or costs incurred related to the sale of your old home.

No, you cannot deduct the costs associated with interviewing for a new job.

Just because you say it is so, doesn't mean that our dear Uncle is going to take your word for it. So, if you are able to deduct some of the costs we've discussed try to make sure that you have receipts and evidence that those expenses were actually incurred, just like you said they were. This may require some advance planning for next year.

Tax evaluation and planning is best left to the professionals and this article is not meant as a definitive tax guide. So if you have some additional questions, don't ask me, ask a tax person. But, hopefully, this article may point out some things we can all do to hang on to a little more of our hard-earned cash.

END

More Collective Pitch, Scotty!

By Dorcey Wingo

Hydraulic Failures of the Rude Variety

It would be my hunch that the Huey is about the largest helicopter most of us could be expected to fly with no hydraulics. That's probably why just about every helicopter larger than a UH-1H has dual hydraulics, or some kinda stored-pressurization system that gives us pilots perhaps three movements of the controls before all that altitude, airspeed, and rotor energy comes back to haunt us.

The ease with which the stiff collective pitch control moves (hydraulics-off) depends largely upon the precise adjustment of a certain *acorn nut* on the rotor head. When a rebuilt rotor head is installed on the aircraft, it is standard procedure for the maintenance technician to install the main rotor blades, then track and balance everything to within point two IPS (inches per second) on the Chadwick balancer. Afterward, a flight check - with the hydraulics turned off - is necessary to determine if the acorn nut adjustment is set correctly.

Here's what happens when it ain't

It had been around ten days since my previous ride's turbine engine exploded amid great fanfare. The ringing in my ears had subsided somewhat and I was just beginning to feel comfortable with my replacement Huey. The load of partially burnt Idaho logs I had swinging along under me never did make it to the log landing, but at least they had my expensive Mechanical Specialties remote hook and long line for company when I punched them off from three hundred feet.

I had felt a sharp *lurch* in the controls and heard a frightful *shrieking* sound as the hydraulic pump cavitated, prompting me to reduce power and ditch the external load - as called for in the operator's manual. The customary *Master Caution* light was beaming back at me from its central place on the instrument panel, and the appropriate caution segment light announced *hyd press* - just in case I'd been napping.

Calling out my problem over the logging radio frequency, I stayed on my heading and went through the usual circuit-breaker *slash* control-switch checks and came up on the short end. The pungent odor of military hydraulic fluid reinforced my diagnosis: No fluid – no pressure! My helmet's sweaty earphones filled with choruses of concern from the ground-pounders as to my well being, then trailed off politely as the plot thickened.

Having force-landed a flaming Huey near the upcoming log landing a few days back, I knew for a fact that there was not a clear place around where I could shoot a running landing, as was called for. Control wise, anything below twenty knots wasn't going to fly. The steep terrain below me was heavily forested. There was a dirt access road that twisted and turned under tall scorched sugar pine and burned Douglas fir trees. Hover landing opportunities only – running landings were not an option!

Heading southwest down the hill toward Lake Payette, I eased the power back from eighty knots to make flying the big bird less of a strain. I noticed as I pushed down on the collective pitch lever, it went down about a half-inch - but it would not come back up! I had flown stiff-controlled Hueys before, and figured this was one of them. But, I soon discovered despite my greatest efforts that I could not increase the pitch; I could only lower it. The power I had dialed in now would not be enough to hover with. I was in a descent, like it or not.

Fortunately, we were logging 7000' above sea level, at the edge of a steep forested plateau. There was the lake below me, surrounded by roads - but it was heavily traveled and tree-lined. I thought seriously about ditching the ship along the rocky shoreline, but the lake was deep (and *cold*) and the ship would be lost.

Realizing McCall's airport was less than ten miles ahead - at a little over 5,000' - I swallowed hard and radioed Scotty, my trusty A&P field mechanic, that I was going to try and make the airport, and silently prayed that nothing else went south until I reached dry land. Scotty jumped into the company's panel truck and raced down the hill after me.

Owing to the prevailing *severe-clear* weather conditions, the central Idaho airport was already visible. I got busy on the local Unicom frequency, advising McCall traffic that I was inbound from the north with a hydraulics failure, planning on a run-on landing. A friendly fixed-winger's voice came back advising me that the local smokejumpers had a large, four-engined jump plane shut down on the active runway, a demonstration of some kind. Can you say *PB4Y*?

Okay, I can make out the giant, high-winged plane from here. That leaves half a runway in front of him and half behind him, but it wouldn't be prudent to slide onto the runway anywhere *near* the BUF (Big ugly…airplane). No more headlines for me, thanks!

Deciding I would vie for the parallel taxiway instead, I heard a tail-dragger

taxi out and radio for advisory. Before he got out his entire message, a loud squeal from a competing transmitter blotted him out. The pattern was heating up, and here I came.

I decided by then that I'd wasted too much time on the taxi-way and re-aimed my red helicopter for the two-ship heliport just east of the active runway and take my chances. The twin ***Hs*** were vacant - no airplanes were taxing by - and I'd be headed right into a ten-knot wind. There would be no go-around.

On a half-mile final, I couldn't have been happier with my glide slope. But since I couldn't pull any collective pitch at the bottom, I knew I was going to have to slam the big red toad down like a gyrocopter with a hernia.

I tried not to be too surprised by the pole-and-cable security fence that came into view at one-quarter mile final. The would-be-arresting-cable ran across my flight path left to right and cut back across at the far end, right to left. The Captain was boxed in!

With my dusty cowboy boots standing on the pedals, straining my abdominals like a ruptured duck behind the thick lap belt - pulling as hard as my weenie arm could possibly pull on the (slightly bent) collective pitch lever - it is indeed a wonder that I didn't bust a gut, right there in the saddle!

The skids weren't quite level when I contacted the pavement, but that's the way the cookie crumbles. My head bobbed as the ship's rear crosstube bottomed out and the ship bounced and pitched forward, sliding twelve more feet before I got the pitch down flat and slid to a smoky stop, parked right on the second H.

I'd have paid good money about then to hear the various glowing comments from the unawares smokejumpers off to my right, as a few of them craned their necks in my direction, arms folded. *"Chopper pilots! Probably his best landing of the day!"* Ha!

I was glad to get my feet back on the ground after that. No one came out to check on me, neither - I guess I made it look too uneventful. After shutting down, I checked for damage and made it to the pay phone, calling the home office. After explaining why I was calling from the airport, I asked my stressed-out boss in the most sincere way, "Would you blame me if I quit, right here and now?" And he was kind enough to say, "I wouldn't blame you in the least."

While walking back to the ship, Scotty (and the whole, wide-eyed logging crew) drove up in a big cloud of dust. After admiring my parking job, Scotty refilled the hydraulic reservoir and had me fire up the machine. As soon as the oil pressure came up, he started banging on the tranny housing with his flashlight - hollering over the noise, ***"I found it!"*** and ***"Shut 'er down!"***

The cause of my little crisis? A *tiny* little hole in an oil line just underneath the hydraulic pump - it was spurting a laser-like stream of cherry juice my direction as I turned to look.

"Well, don't just stand there, Scotty," I quipped. "Fix it! We've got loggin' to do!"

If you'd like to read more from Dorcey Wingo, the "Mark Twain of helicopter pilots," buy his new book, Wind Loggers, a wonderful collection of true short stories with that one-of-a-kind Wingo "voice". Send your check or money order for $25.00 to Smoking Hole Productions, 807 W. Lorraine Pl., Rialto, CA 92376-5635. If you're nice, he'll even autograph it for you. Editor

END

More on Wind

By Pete Gillies

To get this next chapter of Wind going, let me present this scenario: It's a relatively mild afternoon in the Sierra or Rocky Mountains. The wind is normal for that time of day. No storm fronts are moving through. No brush or forest fires are burning. There are no lakes nearby. No windsocks or flags or other types of wind indicators are within view.

Let the helicopter tell you

You are asked to land on a particular ridgeline and drop off some passengers. You make one or two of the obligatory recon turns over the intended landing spot, but you don't pick up on any significant wind when doing so. The question is, is there any wind right there where you intend to come to a hover? Is it important enough to know? Yes, it is!

The wind you might have detected at your recon altitude and airspeed may not be what is actually happening where you want to land, and that is what is really important when all is said and done. Not the wind at the recon altitude, but the wind that may be blowing at your intended landing spot.

So what do you do now? Shoot an approach! But, do it this way: Move well away from the intended landing spot and begin a very straight, smooth approach at whatever angle of descent (or ascent) you are comfortable with. The straight part refers to the ground track of the helicopter. Fly in a straight line towards the landing spot, but KEEP THE BALL IN THE MIDDLE. Smoothly decelerate all the way in, so that when you come to a hover, you do so without an obvious flare. If you have any doubt about the ability of the helicopter to hover at the intended landing spot, bring it to an OGE hover well before you arrive at the landing spot, to see if you have an adequate reserve of temp., torque and pedal to handle the landing, or to extract yourself from the site if it turns out you cannot land there for some reason (obstacles, etc.)

This is a simple but very powerful technique that lets the pilot quickly and easily pick up on the wind direction, if any. I cannot overemphasize the importance of using this technique.

By keeping the ball in the middle as you make the approach, you can tell if there is a wind component coming from either side of the flight path. When the helicopter is flying on a straight path over the ground, the slip/skid indicator becomes an inclinometer, or a level, if you wish. If there is a wind coming from the right side of the helicopter as you are making the approach, you will have to crab to the right to keep the ship level. The opposite is true if you have a wind blowing from the left side. You will have to crab left to keep the ship level. The helicopter thinks it is flying straight into the wind when it is level.

The "crab" may seem strange and awkward to you, but the helicopter is very happy! The only situation in which the helicopter will not need to be crabbed left or right to remain level is if the wind happens to be directly on the nose or the tail, or, in other words, you have 2 chances out of 360 chances to be in that situation! Zero degrees and 180 degrees! It does not happen very often, folks.

Using this technique is one of the most important things we teach in our advanced mountain course here at Western Helicopters. Once you've tried it, there is no going back. All the way to a hover, keeping the ship level tells you from which side, if any, the wind is blowing. It does not tell you if it is a headwind or tailwind, but it does tell you there is a wind. Couple this with the constantly slowing type of approach, and you will end up knowing all you need to know about the wind direction and velocity as you approach to a hover.

LTE? What about it?

And one more thing: We talk a lot about LTE, the loss of tail-rotor effectiveness. Guess what? LTE is a non-event if the wind is always blowing directly on the nose or tail of the helicopter! So, by keeping the helicopter level on the way to a hover, the wind vectors never favor the generation of LTE! For us here at Western, it has meant that during the many years of teaching advanced mountain flying in all sorts of wind conditions, we've never had a single case of LTE! What a nice side benefit that is from keeping the ball in the middle.

Again, keep slowing down on the approach with the intent of coming to a hover with no detectable flare. As you get closer and closer to the hover spot, you'll be able to see and feel if the wind has a headwind or tailwind component. If it acts like a tailwind, you can make a decision as to whether to continue to a hover or to make a go-around and approach from a different direction. If you do decide to go in with a tail wind,

Photography: Pete Gillies, by Tom Magill

make sure you follow the accepted Settling with Power avoidance procedure: Very slow descent rate (Less than 300 fpm, if airspeed less than 30 knots).

By the way, let me define "level." All single-rotor helicopters, some more than others, lean one way or another in a zero-wind hover. This is a result of translating tendency. As the helicopter slows down from cruise airspeed, any translating tendency becomes more pronounced, and you may be required to counter with opposing cyclic. When you come to a hover, the ship may have an obvious lean one way or the other. Any wind from either side can increase or decrease the amount of "lean" required to maintain a hover over the spot.

To find out what is "level" for your particular make and model of helicopter, observe the position of the pedals and the ball in normal flight at various power settings. How clearly I remember that our Lamas and Alouette 3s leaned to the right when flying in a straight line! So "level" for those aircraft meant that you were in a left turn! Ah, the good old yaw string technique!

In our mountain course, we teach many other techniques for determining the wind direction and velocity on short final. There is a lot of information outside the bubble, if the pilot will just take time to look and see. Yes, there is a difference between looking and seeing. All of us can "look." The question is, what do you "see"? By no means have I covered the subject in depth here. If any of you readers would like to see a more detailed article about this subject, let Tony the editor know at TonyFonze@autorotate.org and I'll do my best to expand on the nitty gritty of detecting and determining wind direction and velocity in off-road type operations.

I started to list down all of the types of helicopter flying going on each and every day somewhere in the world, where wind information for the flight crew was totally lacking; or, the wind components were well known to the flight crew, but the approach and landing had to be made in a particular way, regardless of wind direction or velocity. The list grew to be quite long, but it included the following: EMS and rescue flights to scenes and hospital pads; offshore flights to helipads on rigs; flights to pads on rooftops or lower parts of a building; tours landing to fixed-direction pads; high-production, high-pressure external-load flights such as logging; powerline construction; approaches and landings that must be made in a particular way because of ground obstructions or other factors such as military or law enforcement actions or mandated flight paths, and on and on. I've just listed the ones at the tip of the iceberg. Every day, thousands of helicopter pilots all over the world handle these sorts of non-standard, wind-related challenges without bending anything or over-stressing their helicopters or scaring their passengers.

But every one of us began our helicopter careers with zero hours in our rotorcraft logbook. Nothing. Zip. Many of us have had no formal training in these mostly unwritten techniques used so commonly throughout the world every day. Wind awareness is not all about finding the wind socks or listening to the ATIS or the control tower. It is about developing the knowledge and skills to be able to detect winds that may affect your flight, and to know how to fly the helicopter accordingly. Want to know more? ASK! Get some help! Every professional helicopter pilot that I know is more than willing to share his or her knowledge with you, if you will just ask. Fly with them, if you can, or ask them to fly with you. No one knows it all, but most of us will readily share what we do know and what has worked for us.

Pete Gillie is the Chief Flight Instructor of Western Helicopters, a different kind of flight school. Western's predominant clientele includes local, state and federal law enforcement and other professional pilot groups from around the country. Their claim to fame is precision autorotations—how to hit 'that spot right there' from different altitudes, airspeeds and wind directions. They also teach long-line and mountain flying. The Western folks provide primary instruction: private, commercial, CFI, and instrument as well.

Pete Gillies
WesternOps@aol.com

Editor's Note: We received some comments on Pete's last article, but we didn't have enough room to print them in this issue—we will in the next. One quick thing—in Pete's column we are attempting to present some flying wisdom and expertise that you don't readily get in 'flight school.' And, as in all publications, space is limited. So, if we don't repeat all of the well-known safety measures about settling with power, LTE, etc., it's not because we're discounting or ignoring those points. We assume you already know them and we're trying to give you something more…a new way of looking at things. It's a little bit of an editorial problem for me, but this kind of insight and expertise is important to gather and share and I'm committed to doing it.

Thanks, Tony

END

Test Pilot—A Return to Weather Basics

1. Up to about 2,000 feet AGL, surface winds do not exactly parallel the isobars, due to

A. Coriolis Effect

B. Uneven heating of the earth

C. Surface Friction

2. The average decrease in temperature with altitude is called the standard lapse rate and is 2º C or 3. 5º F.

A. True

B. False

3. The maximum amount of water vapor air can hold is dependent upon.

A. Altitude

B. Latitude

C. Temperature

4. Moisture can be added to the air via all of the following mechanisms except

A. Condensation

B. Sublimation

C. Evaporation

5. Relative humidity can be increased by

A. Lowering the air temperature

B. Raising the air temperature

C. Decreasing wind conditions

6. Frontal passage will be indicated by

A. A temperature change

B. A shift in the wind direction, speed, or both

C. Both A & B

7. Atmospheric stability is defined as

A. The resistance of the atmosphere to horizontal (frontal movement) motion

B. The resistance of the atmosphere to vertical motion

C. Relative humidity below 31%

8. The base of a cloud (AGL) that is formed by vertical currents can be roughly calculated by

A. Dividing the difference between the surface temperature and the dew point by 3.5 and dividing the remainder by 1000

B. Dividing the difference between the surface temperature and dew point by 4.4 and multiplying the remainder by 1000

C. Multiplying the surface temperature by 3.5, dividing the product by the dew point, adding the current wind speed, and taking the square root

9. The following conditions are necessary for thunderstorms to form

A. Warm temperatures, unstable air, lightning

B. A rapid change in temperature, passing cold front, high humidity

C. Sufficient water vapor, an unstable lapse rate, and an initial lifting action

10. A pilot can expect a wind shear zone in a temperature inversion whenever the

A. Wind speed at 10,000 ft above the surface is at least 50 knots

B. Wind speeds between 2,000 ft and 4,000 ft above the surface are at least 25 knots

C. Inversed lapse rate is greater than 5º F per 1000 ft.

Answers

1. C
2. A
3. C
4. A
5. A
6. C
7. B
8. B (The convergence of the temperature and dew point lapse rate is 4.4º F per 1,000 ft)
9. C
10. B

Autorotate

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Autorotate would like to profile YOU in one of our next issues. All we need is a good photograph of you and your helicopter; your name, e-mail address, and PHPA member ID; and a brief write up about you, your location, and your photo. Send the information via e-mail to Tony Fonze, the editor at TonyFonze@autorotate.org.

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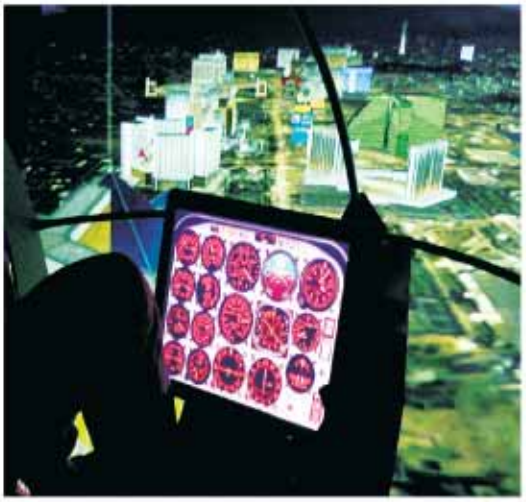

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