Flight For Life,
EMS in the Colorado Rockies

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Long’s Peak is a cornerstone of Colorado’s Front Range, anchoring Rocky Mountain National Park to the skyline northwest of Denver. One of Colorado’s celebrated “Fourteeners,” fifty-six peaks with summits above fourteen thousand feet, the mountain’s picturesque flanks are immensely popular with tourists and experienced mountaineers alike. A hiker in reasonable physical condition, modestly burdened with gear, can expect to bag the summit and return to the car in about 12 hours, provided the weather cooperates. It frequently does not.

Long’s Peak, in fact, is infamous for its weather: early afternoon thunderstorms, lightning strikes, fierce winds and major snowfall any time of the year. Woe to the hiker who gets caught on the exposed, treeless summit when the weather kicks up. Novices have no choice but to scamper down the precipitous, rocky trail from whence they came to reach the relative shelter of the forest, thousands of feet below. Experienced mountainers, on the other hand, have another choice—Lamb’s Slide.

‘Helicopter Rock’

Veteran Flight For Life pilot Gary Drotar took the first call from dispatch just before noon. Rocky Mountain National Park rangers were requesting an air insertion of a technical rescue team at the base of Lamb’s Slide. The slide is a steep, narrow, 1000 foot high snow and ice filled chute providing a shortcut for the brave down the monstrous east face of Long’s peak. On this windy summer day, a lone climber, hoping to avoid the longer trip back down the trail, saw his adventuresome slide turn into a nightmare as he tumbled down the icy slope, jabbing his ice ax into a large blood vessel deep within his chest in the process. He finally came to rest against the rocks at the bottom of the chute, not far from the western shore of tiny Chasm Lake, still well above the tree line at over 12,000’ MSL. Bleeding internally and many miles from the nearest road, the climber’s predicament was extreme.

Flight For Life is a civilian-hospital based air medical transport program. However, it is not unusual for the pilots to provide air support of this type for backcountry rescue operations due, in part, to Colorado’s relative lack of public use SAR (Search and Rescue) aviation assets. The plan was to pick up a fully outfitted climbing ranger from a prepared landing site near park headquarters and fly him, along with the flight nurse, to ‘Helicopter Rock’, a huge, flat-topped boulder near the base of Lamb’s Slide. ‘Helicopter Rock’ is so named because of its extreme.

The initial plan, as they so often do, evaporated in the 35-knot upslope winds. Chasm Lake, appropriately enough, lies at the narrow end of a deep, V-shaped chasm. Long’s Peak itself looms above the western, uphill end of the ‘V’, while the canyon’s walls are formed by the precipitous slopes of two shoulders of Long’s Peak, Mount Lady Washington and Mount Meeker. Both are formidable mountains in their own right. A downwind approach to ‘Helicopter Rock’ at that altitude and gross weight, even in the high altitude workhorse Eurocopter AS350B2, was unthinkable. An upwind approach, necessitating
a flight over the summit from the west followed by
a steep descent to the canyon bottom below was
attempted. But two tries later, it was clear to
Drotar that the rate of descent required to
make the LZ was too great, especially if
the 35 knot headwind suddenly van-
ished, or worse, became a tailwind.
The ranger was dropped off at the
closest available site, an LZ on the
trail to Mount Lady Washington
several miles northeast of the
victim’s location. He was faced
with a long, steep, but fortunately
downhill, hike with his gear.

Park Service officials requested
additional personnel insertions at
the same location, but the winds
were continuing to pick up and
Drotar felt it was not appropriate
to do so. The rest of the rescuers
would have to trek in by ground—the
safest option at the time. The crew flew
back to base, leaving the rangers with the
promise they would return later if conditions
improved.

Backing into the spot
The rangers called back later that afternoon. The
winds had died down a bit and the rangers were request-
ing another attempt. The victim, in critical condition,
had been moved to the eastern shore of Chasm Lake.
This was an epic undertaking in its own right, requiring
a park ranger to run up to the lake with an eighty pound
inflatable boat on his back, used to ferry the victim across
the water to a more open LZ.

Returning to the area, Drotar once again found the
direct approach, even to the lake’s eastern edge with
somewhat diminished winds, still too hazardous. Available
fuel left little time to sqander and the sky wasn’t
getting any lighter. With typical aplomb, Drotar devised
an ingenious solution to the problem. He positioned the
aircraft in a high hover down canyon yet still above the
victim, along the southern face of Mount Lady Washing-
ton, nose into the now-steady 30 knot wind with an air-
speed well above translational lift. With the flight nurse
helping to assure terrain clearance, Drotar sideslipped
the aircraft to the right, downward and rearward to the
southwest, keeping the nose into the wind the entire
time. He guided the aircraft to a rocky but suitable land-
ing spot and the victim, who would soon undergo emer-
gency surgery, was loaded without delay. The climber
eventually made a full recovery.

St. Anthony’s Flight For Life
Emergency Medical Service (EMS) missions such as
this, though not always as dramatic, are commonplace in
the U.S. today and, indeed, around the world. It wasn’t
always so. In 1972, the Dow was inching past 1000. The
Godfather won best picture and a group of people in
Denver were about to embark on a journey that would,
for the first time in the U.S., unite helicopters and reg-
istered nurses specially trained for prehospital advanced
life support. Challenging numerous critics, including a
group of airline pilots who asserted that helicopters would
be unable to fly in the rarefied mile-high air, the men
and women of St. Anthony Hospital launched Flight For
Life on little more than the proverbial (rotary) wing and
a prayer. The world of civilian helicopter EMS flying
was born, with the Flight For Life program serving as the
initial template for over 200 programs now scattered all
over the globe. Thirty years later, those critics would be
astounded to know that Flight For Life is not only still
flying, but, the program now has a helicopter based at a
clinic in the central Rockies whose helipad is over 9,000
ft. above sea level.

I traveled to Colorado recently for the Flight For Life
30th anniversary celebration. It was a homecoming for
me, in more ways than one. I was born along Colorado’s
Front Range and grew up literally just down the street from St. Anthony Hospital North, where Flight For Life based a second helicopter in the late 1970s. The major road intersection 100 yards from our back door was a frequent landing zone for the familiar orange and yellow Alouette III that Flight For Life flew in those days. I can still remember hearing the screams from one car crash victim, and feeling a visceral revulsion at the thought of flying in a helicopter with a mangled, broken victim so close at hand. I wondered how and why those pilots and nurses could do what they do.

Strangely enough, for reasons not yet fully understood, I found myself years later coming full circle and applying for a job with Flight For Life. Not as a pilot, but as a flight nurse. Over the next several years, I guess I more or less figured out the “how and why” from the flight nurse standpoint, but the pilot side remained a conundrum. But, a seed was planted.

In more recent years, hours of flight training, studying, checkrides and, lately, working as a fledgling commercial pilot and flight instructor—I have begun to attain an understanding of “how” EMS pilots do what they do. To find out more, and to finally understand why a pilot without any background in emergency medical care would want to climb into a cramped aircraft cabin with all manner of human misery, I went to the source—the pilots of Flight For Life.

**Pilots—part of the team**

What does it take to become a Flight For Life pilot? Applicants must have 3000 hours in helicopters as PIC, 500 hours mountain time and 400-500 hours unaided night time, says Rod Balak, Aviation Site Manager. Equally and perhaps even more important is having the “right attitude,” he adds. If you are interviewing for an EMS pilot position, come prepared to display your professionalism as a pilot along with some excellent interpersonal skills. Humility is crucial, says Balak. Whether you have a military background or are civilian-trained, all the hours and experience in the world mean little without the ability to work as part of a team.

Regardless of your background, you may or may not be accustomed to flying with non-pilot crewmembers on board. While not considered “crew” by the FAA in terms of regulatory compliance (i.e. crew rest, oxygen requirements, etc.) the medical folks you will carry from place to place will be much more than “self-loading baggage!”

Balak is the pilot ultimately responsible for aviation operations at the two Flight For Life helicopter bases, one at a suburban hospital north of Denver and the other based high in the central Rocky Mountains. In addition to his flying and supervisory responsibilities, he has the critical and occasionally unenviable task of interfacing with non-aviator medical crew and hospital administration regarding aviation safety issues. Helicopter medical crews, like their pilot counterparts, are generally highly intelligent, motivated individuals. As such, it is possible to occasionally focus too narrowly on the patient care aspect of the mission, at the potential expense of the aviation safety side. For a mission to be successful, both perspectives must be maintained.

As an Air Rescue paramedic and former flight nurse, I confess, I have occasionally displayed the philosophy that, if one is good, three or four or fifteen have got to be better! While that might not be such a big deal when you’re talking about needles, the pounds start adding up when you’re squirreling away a few extra bags of intravenous solutions or an extra patient blood oxygen monitor, “just in case.” A gentle reminder from the pilot that it’s not just ‘a’ pound, it’s ‘another’ pound usually does the trick.

Working with flight nurses and paramedics with strong personalities doesn’t seem to pose a problem for Balak. In fact, it’s something he clearly relishes. “They are a wonderful bunch of people, and working with them has allowed me to witness some marvelous things,” he reflects. A retired U.S. Army Warrant Officer with 23 years of service, Balak played an instrumental role in the development of the Apache attack helicopter. Perhaps those years working with persnickety engineers, impatient project managers and worried bean-counters cemented in him the knowledge that it takes more than just a helicopter and a pilot to get the job done. An affable, no-nonsense professional, he considers everyone involved in the completion of the mission: pilots, medical team,
mecanics, administration and dispatchers to be part of the crew. “Together,” he says, “you can do great things that will put a smile on your face when you are driving home, reflecting on the day’s activities.”

**Experience and respect**

Patrick Mahaney has been a pilot with Flight For Life for 15 years, and wouldn’t trade the experience for anything. As a U.S. Army scout pilot in Viet Nam, he cut his teeth as part of a hunter/killer team. Upon reassignment back in the States, Mahaney found himself on the other end of the spectrum as a medevac Huey pilot with a MAST unit (Military Assistance to Safety and Traffic) out of Fort Campbell, KY. Sandwiched between the military and Flight For Life were years of flying all types of missions: seismic, external load, corporate, firefighting and medium and heavy lift work. He feels his varied experience has been critical to his success at Flight For Life.

Mahaney wears a larger-than-life, hard chargin’ Irishman veneer thinly draped over a big, soft, heart of gold. He is a talented pilot, comfortable with his machine. His respect for the medical crews and maintenance personnel, the people who make his job possible, is always apparent. Mahaney describes his med crew coworkers as dedicated, consummate professionals. According to Mahaney, there are three people more important to an EMS operation than the flight crew. First, there’s the mechanic. Second, there’s the mechanic. And last, but not least, is the mechanic. Keeping high tech machines running smoothly is a demanding and literally life-saving job. He reminds us that maintenance personnel are the unsung heroes of EMS flying, and any other area of aviation for that matter. He recommends that all pilots develop and maintain a respectful, professional relationship with those that support their aircraft. Mahaney concludes, “Their professionalism is what keeps me and the crew alive.”

The ‘crew’ consists of much more than the pilot and medical team. Communication specialists, maintenance personnel, hospital staff and aviation vendor administration all have a role in successful mission completion at Flight For Life, from fielding the initial flight request in the communication center to the post-flight debriefing after every mission. “Tabletop exercises” are performed on a recurring basis, bringing the entire group together to discuss and refine strategies for handling significant events, such as the activation of the program’s accident/incident plan. Everyone in the crew is considered a de facto safety officer, and is expected to speak up, without reprisal, if a safety issue needs addressing.

**Getting there from here**

Like most of the Vietnam era helicopter pilots out there still flying, Balak, Mahaney, Drotar and the other Flight For Life pilots: Ed Lockwood, Dave Denham and Glenn Uchiyama, have a vast base of knowledge and experience earned in thousands of hours in the cockpit. That experience level may seem virtually unattainable to those of us still working on our first thousand or two. Tom Davis, a former Flight For Life pilot now living on the East Coast, asserts that mastery of the actual physical act of flying a helicopter is pretty much sewn up in the first several hundred hours. After that, he feels, it is the development and refinement of the aeronautical decision-making process that is most critical. As the seasoned veterans begin to retire, how does the new crop of pilots gain the necessary experience?

Although plans are in the works for transitioning to night vision systems, the program’s pilots have safely negotiated the Rockies unaided at night for three decades. This includes not only traditional highway auto crash scenes, but backcountry missions as well. Unaided night operations in the mountains present a challenge for even the most seasoned EMS pilot, and can be downright intimidating for a new one. To mitigate this, Mahaney suggests getting as much unaided night time as you can.

How to accomplish this is a matter of some debate. With the continuing development of more sophisticated military oriented night vision systems, armed forces trained pilots are becoming increasingly the night owl. The problem, some say, is that, while a contemporary military-trained pilot transitioning to the civilian flying world may have hundreds of hours of night ‘time’, the bulk of it probably involved night vision systems in complex aircraft rather than unaided night cross country in light singles.

An enigma also exists for civilian-trained pilots. Where do they go to get the night ‘time’ when many civilian sectors such as flight instruction, offshore, tours and firefighting have only limited, if any, night applications? Two potential arenas where a pilot could accumulate night experience in the civilian world are electronic news gathering (ENG) and law enforcement support.

Mountain experience is also essential if you’re thinking about flying for any program that operates in high altitude environments. A “Catch 22” exists in this area as well. How do you get the mountain time if nobody will hire you unless you have it? Why do you need all that mountain time anyway? Reread the story at the beginning of this article again to answer that question!

Although it is not exactly the same as living and breathing it for hundreds of hours, Mahaney recommends checking out the various flight schools in the U.S., Canada and New Zealand who offer specialized courses in mountain flying. Keep in mind that one man’s mountain is another’s molehill. I’ve been searching for a consistent, “official” definition of mountain flight time without
success. While the actual terrain and flight altitudes will differ depending on where you get your mountain training, the concepts, such as learning to recognize, predict and work with the various wind patterns, should be relatively consistent. A younger pilot looking to accrue valuable mountain time should also consider looking into the various tour operators in Alaska and Arizona’s Grand Canyon.

If you fly in an area like the southwestern U.S. that is blessed with beautiful clear weather almost every day of the year, think about getting some experience where there actually is weather. It goes without saying that the ability to make a prudent “go/no-go” weather decision is essential for an EMS pilot. Lack of weather reporting facilities in many areas of Colorado, as with many other areas, can be the Achilles’ heel when trying to decide whether or not to accept a medevac mission request. Real time weather information for your exact destination may be limited to the satellite feed from subscription services and a report from people on the ground at the scene, who are probably not aviators. You will need enough weather savvy to pool all your resources and make the initial decision, and the maturity to terminate the mission enroute if conditions are not as advertised. Keep in mind that while you, as the pilot, may feel comfortable with the weather on a particular mission and assume ultimate responsibility, most EMS programs mandate that accepting and/or continuing a mission in marginal weather requires unanimous agreement from the entire crew. Plenty of EMS crews afflicted with “get-there-itis” and “get-home-itis” have suffered fatal consequences. “Never be afraid or embarrassed to put the aircraft on the ground when things get ugly,” says Balak. “Then you can sort things out to your crew’s satisfaction.”

Although Flight For Life is not an IFR program, your helicopter instrument rating is important, as well. The training sharpens your piloting skills in general, and gives you the tools to effectively deal with the worst-case scenario: punching into the clouds inadvertently while on a VFR mission.

**It’s good to be needed**

OK, so you have the right amount and type of flight time. You have the ratings. You have the right attitude. So why in the world would you, of your own free will, climb into an aircraft in which some poor soul will probably be bleeding, vomiting or worse? It is a question especially relevant to the Flight for Life pilots, who fly the Eurocopter AS350B3 A-star, where the only thing separating the pilot station from the patient stretcher is a low bulkhead topped by a flimsy-looking piece of clear Plexiglas.

Contrary to what I expected, proximity to the patient generally isn’t a big issue. “I feel the patient really needs me at that point, so it’s not real hard to tune out the closeness,” says Mahaney. “I just concentrate on the job at hand and hope not to get ‘puked on’!”

It is not always easy, according to Balak. Since pilot workload is highest during takeoff and landing, flying the aircraft takes precedence over anything else going on. Enroute, however, when pilot workload lessens, the patient situation and condition tend to creep into your awareness a little more. “Young children who have been injured due to abuse or neglect from adults are the really tough ones,” he says.

Overall, it’s the challenge and the opportunity to contribute to something meaningful that drew these pilots to Flight For Life. Mahaney sums it up well, “We can be the best part of your worst day.” Enough said!

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Troy Hayes is a paramedic, police officer with the Arizona Department of Public Safety Aviation Unit and is a helicopter flight instructor.
From the President—PHPA?

Not long ago, I was told that a DAC (Dept. of the Army Civilian) pilot was telling other DAC pilots, they were not allowed to join PHPA. Soon after that bit of news, I was informed that some military pilots were under the same assumption. Last week I traveled to Memphis, TN to see some old friends and the first question I heard from one of them was, “Isn’t PHPA just for union pilots?” Another pilot thought we only dealt with international issues. Upon returning home and checking my email, I found I had two messages asking the same questions.

Apparently, I have not done a good job of explaining just what PHPA does and how it does it. I will try and rectify some of that in this column.

What is PHPA?

PHPA is a non-profit organization founded with the intent of providing helicopter pilots a voice in every aspect of their chosen profession. Our charter begins with the following statement, “This Association declares as its objectives and aspirations the following: To protect the interests of professional helicopter pilots and to promote professionalism, safety, regulatory representation, education, standards and training for the continued growth of the industry and to organize and represent all helicopter pilots.” Now, what that means is we are dedicated to improving every aspect of our profession. No small task by any stretch of the imagination.

How does PHPA intend to accomplish these goals?

PHPA has been recognized as the voice of the helicopter pilot by the Airline Pilots Association (ALPA). We are also members of the International Federation of Airline Pilots Associations (IFALPA). Both these organizations are supporting our goals in ways we never dreamed of just a few years ago. We currently have pilots meeting with ALPA’s Director of Safety, who is helping us with structuring our own Safety Committee. This help alone will save us years of trial and error work. ALPA is committed to helping us in a number of other areas that will also save us years of work. IFALPA has obtained seats for our pilots on a number of international committees that are working on a myriad of rules and regulations governing our profession in the U.S. and beyond. We are also members of the Transportation Trades Department (TTD) which is a three and one half million member legislative lobbying group dedicated to transportation issues. We now have a strong voice with which to lobby your unique issues. PHPA has been recognized as the voice of the helicopter pilot not only nationally but in the international arena as well. I might add that all this has been accomplished in under a year. We are young, but we are growing fast and for the first time in the history of our profession, people are listening to what the pilots are saying. It is a remarkable feeling.

PHPA benefits

PHPA is currently working on being able to offer loss of license, medical, dental and long-term disability insurance to our members. We recently bargained for and received excellent pay and benefit increases for the pilots at LSSI. PHPA is working hard to increase pay and benefits for every working helicopter pilot. We are accomplishing that goal directly, through assistance with contract negotiations, and indirectly, by raising awareness of the skills and training required and the the demands and expectations placed upon the professional pilot.

PHPA is also working diligently on the overtime issue that has been brewing for over a year now. We have the best labor lawyers in the country researching all aspects of the situation and hope to soon be able to answer all of our member’s questions in detail about this.

Who can join PHPA?

The short answer is “Any helicopter pilot may join PHPA.” PHPA has two sides. We represent the union pilots: AirLog, PHI, LSSI, CareFlite, etc. on one side and the non-union pilots through “associate” membership, on the other side. Military pilots may join. Police pilots may join. Any helicopter pilot, from the student looking to learn about his or her chosen profession, to the retired pilot who still wishes to keep tabs on what is happening. All may join PHPA. In other words, there is nothing restricting any helicopter pilot from becoming a member of this professional organization, dedicated to improving every aspect of your day to day life on the job.

Why should I join PHPA?

PHPA is working to establish a strong presence in all aspects of our profession—from safety to cockpit design. From wages and benefits, to professional standards. PHPA is dedicated to improving every aspect of the helicopter pilot profession and, in order to do that we must have the support of the pilots themselves. Without you, PHPA will simply fade away. It is the membership that gives us direction, support, expertise and all the other things needed to make something like this worthwhile. So, to put it simply, you should join PHPA if you wish to help make your profession better than it has ever been.

Butch Grafton
President, Professional Helicopter Pilots’ Association
We all know that one of the outstanding abilities of the helicopter is to get into and out of places that no other aircraft or vehicle can. However, just because the helicopter has this ability doesn’t mean it is always the most prudent or safest thing to do! It should go without saying that slope operations should be conducted (other than for training) only if a suitable, flat landing area is not readily available. It is also imperative to know the limitations and capabilities of both yourself and the particular helicopter you are flying.

Different helicopters possess vastly different slope limitations. For example, in the helicopter that I fly, certain transmission pressure fluctuations and readings are common during slope operations due to the location of the oil pumps and mounting location of the transmission. Knowing the types of limitations and operating characteristics demonstrated by your helicopter will keep you from being ‘surprised’ or from damaging equipment. If it’s been a while since you’ve performed a slope takeoff or landing, consider being more conservative on the maximum angle you are willing to accept until proficiency is regained. Typically, helicopters with semi-rigid or stiff, hinge-less rotor designs, and narrow skid bases have the most conservative slope landing limitations. Operator’s manuals typically relay maximum slope ranges of between 5° and 15°. As Clint Eastwood said, “A man’s got to know his limitations.”

Dynamic rollover

Before discussing the finer points of negotiating slope landings and takeoffs, a review of dynamic rollover is prudent. For dynamic rollover to occur, three things must be present. First, there must be a pivot point such as a tire or skid. Second, there must be a roll rate. And third, the critical bank angle must be exceeded. The FAA’s Rotorcraft Flying Handbook defines dynamic rollover as, “the tendency of a helicopter to continue rolling when the critical angle is exceeded, if one gear is on the ground, and the helicopter is pivoting around that point.” The FAA’s definition covers all three points.

Although not well defined, the critical bank angle should be considered that angle of bank beyond which the pilot’s control authority cannot arrest the rate of motion that develops laterally about a pivot point. Do not confuse the critical angle with the static rollover angle. The static rollover angle results when the helicopter’s lateral center of gravity (c.g.) is directly over the pivot point (skid or tire). The static rollover angle would be the point at which the helicopter rolled over if a group of people were to pick up one side of the helicopter by the skid or fuselage and tip it over on its opposite side. It is important to note that the faster the roll rate, the shallower the critical bank angle. A good example of this situation is when someone trips. In order to trip someone standing still it takes a great deal of force to get them to fall over. The faster the person runs or walks, the less force it takes to cause them to trip and fall. Their foot becomes the pivot point, the external force and body weight cause the roll rate, and once the critical angle is exceeded, the person falls to the ground despite any attempt to try to maintain balance. The critical angle is normally much less than the static rollover angle. This angle can be as little as 7° and varies with the following: roll rate, crosswind component, lateral offsets in CG, pedal inputs for torque correction, gross weight, main rotor thrust, and which skid or wheel is acting as a pivot point (translating tendency).

The key factor is inertia. Remember that inertia is the tendency of a body to remain at rest or in motion in the same direction unless acted upon by an external force. When a pivot point of the helicopter is in contact with the ground or a surface, the moment of inertia in the roll axis increases greatly due to the pivot point. At the same time, control power is decreased due to the pivot point. The main thing to remember is that cyclic control power is reduced when a pivot point is in contact with the ground or a surface. Collective control power, however, is not reduced and is the most important control in stop-
ping excessive rolling motion as long as it is done slowly. Although the helicopter does not need to be on a slope for dynamic rollover to occur, rollover is one of the most likely hazards encountered during slope operations.

Site suitability and conditions

Prior to conducting slope operations, a suitable surface must be located. What is suitable for one type of helicopter may not be suitable for another type. Surface conditions are of primary importance. The safest types of surfaces are hard packed and stable. Avoid unstable areas such as mud, sand, rocks, snow, and loose dirt. The biggest hazard presented by unstable areas is that they have a tendency to shift and settle. This situation is especially hazardous if the helicopter is shut down and settles into the surface. The slope limits of the aircraft could be exceeded and insufficient control power available to attempt a takeoff. The only recourse would be to have the helicopter 'dug out'. Embarrassing and expensive! Another hazard of operating on an unstable surface is inadvertent movement of the helicopter during takeoff or landing. The danger lies in overcontrolling the helicopter while trying to stop the movement. This situation could easily lead to a dynamic rollover accident. It is preferable to reposition the helicopter to a more suitable area than to try to push a bad situation. Don’t let pride get in the way.

Avoid areas where objects or debris can become caught in the skids or wheels thereby preventing a safe takeoff. Select an area that is large enough for the helicopter to maneuver around in comfortably. You may end up having to reposition the helicopter due to an excessive slope or unsuitable surface area. Since the rotor system can come into closer proximity of the surface during slope areas, ensure that there are no objects protruding from the surface that can be struck by the rotor system.

Determining slope angles in helicopters not equipped with an attitude indicator is a difficult task. The best advice is that if it looks too steep, it probably is! A U.S. Army Aircrew Training Manual states: “When conducting slope operations, select reference points to determine slope angles. References probably will be limited and difficult to ascertain.” That about says it all! In helicopters equipped with an attitude indicator, the bank angle index is used to keep the operation within the slope limitations of the aircraft operator's manual.

Take advantage of the wind, if any. In U.S. manufactured helicopters, a crosswind from the right is most advantageous. This decreases the amount of cyclic roll control necessary to compensate for translating tendency. Since translating tendency would add to the rollover force in a right side skid/wheel down, a left side skid/wheel down is preferred in U.S. manufactured helicopters. In helicopters with the main rotor turning clockwise, the opposite would be true.

Ensure that you have a safe plan for offloading passengers, if any. Although it is preferable and safer to on load and off load passengers with the rotor system static, often this is not practical. In these situations, ensure that a thorough safety briefing is conducted and that if at all possible, remain at a normal flight rotor RPM to keep the rotor tip path higher due to centrifugal force. There have been far too many accidents where people have been struck by either the main or tail rotor and severely injured or killed. It is highly inadvisable for the pilot to exit the helicopter to assist passengers unless the helicopter is shut down.

Landing technique

In my opinion, the easiest slope landings are either nose-up or right skid/wheel up (assuming the pilot is sitting in the right seat). Nose down slope operations are not overly difficult. However, they seem slightly 'uncomfortable' due to the amount of aft cyclic normally required to maintain position. Additionally, there is the anxiety of the proximity of the unseen tail rotor to the slope.

The most challenging slope landings occur when the right skid/wheel is down (once again assuming that the pilot is sitting in the right seat). This is due to the distance (arm) of the seated pilot from the pivot point (left skid/wheel). At 15° of slope, this view provides a dramatic visual and physical perspective.

It is normally preferred to conduct slope operations with the helicopter parallel to the slope rather than upslope or downslope. When landing parallel to the slope there is less of a possibility of the helicopter sliding then there is when landing upslope or downslope. If the helicopter is equipped with wheels, ensure the brakes are set prior to takeoff or landing.

The following description and techniques apply regardless of whether the slope landing is conducted nose up, nose down, or left side/right side up/down. Often, a combination of different slopes exists simultaneously. In these circumstances, it is necessary to utilize the same techniques, however, the cyclic will have to be positioned to maintain aircraft position for the combination of slopes experienced. In other words, if a combination left skid/wheel down and nose up slope were encountered, the cyclic would need to be positioned somewhere in the front right quadrant. The correct position of the cyclic would be the point that holds the helicopter in position during the maneuver.

Once a suitable area is located, position the helicopter correctly for the wind conditions and assume a higher than normal hover height when conducting pedal turns due to the proximity of the tail to the slope. When the
desired landing spot is determined, begin the landing by very slowly reducing collective pitch. Maintain a precise position over the surface with cyclic and alternate looking both near and far in front of the helicopter. A common error while conducting slope landings is to drift excessively. The excessive drift is normally caused by either over-controlling or looking too far out in front of the helicopter. Make sure that you visually scan out the side of the helicopter as well. This is an important cue for determining fore and aft drift. Keep your head moving slowly from front to side and back to front again and don’t fixate straight ahead. Continue slowly lowering the collective and correcting for drift with cyclic until the upslope skid/wheel contacts the surface. Ensure that the heading is maintained precisely with the anti-torque pedals throughout the maneuver (± 10° Private PTS, ± 5° Commercial PTS). Maintain rotor RPM within normal limits.

Once the upslope skid/wheel makes contact with the surface STOP and hold position before continuing the landing. This is a critical point in the maneuver where most pilots end up rushing and consequently either touching down on the surface roughly or allowing the upslope skid/wheel to drift excessively. By stopping the maneuver when the upslope skid/wheel contacts the ground, the maneuver is broken up into two parts, thereby both simplifying and ‘smoothing’ out the maneuver significantly. Don’t continue the maneuver until you are ready. It may end up being just a slight pause or it may end up being ten seconds. The length of delay is up to you.

The halting of the maneuver also allows for a surface suitability check to be made with the upslope skid/wheel. You should ‘feel’ an unsuitable surface through the controls by sensing drift or settling. Continue to maintain heading with anti-torque pedals, upslope skid/wheel position with cyclic, and rate of descent with collective pitch. Drift is very undesirable after the upslope skid/wheel contacts the surface. Ensure that you are not looking too far in front of the helicopter during this portion of the maneuver. Make very small cyclic inputs. As the collective pitch is slowly lowered, position the cyclic pitch into the slope only enough to prevent the skid/wheel from drifting. In other words, don’t just arbitrarily position the cyclic to the ‘stops’. This can lead to mast bumping or undesirable stress being placed on the rotor system components.

If insufficient cyclic pitch is applied into the slope, the helicopter will drift downslope. If excess cyclic pitch is applied into the slope, one of three things will occur: the helicopter will drift upslope, an upslope rolling motion will begin, or excessive stress will be placed upon the rotor system components. The amount of main rotor thrust produced at the time is the primary determining factor as to which one of these situations occurs. If, while the downslope skid/wheel is being lowered the slope angle limit is reached or it is apparent that the control stop limit will be reached, abort the maneuver. Either reposition to an area with a slope that has a more shallow angle or find another area altogether.

There are three different techniques or methods for displacing the cyclic during slope takeoffs and landings. Some references advocate displacing the cyclic into the slope enough to prevent the skid/wheel from drifting and ‘holding’ it there during the entire maneuver. Other references advocate centering the cyclic once the collective pitch is fully reduced. The third method is taught to all aviators in the United States military and is the one I advise. Once the downslope skid/wheel contacts the surface, continue to slowly lower the collective pitch fully down while simultaneously repositioning the cyclic stick to the center or neutral position. The timing should coincide simultaneously with the collective reaching the fully lowered position and the cyclic reaching the centered or neutral position. The latter method reduces stress on the main rotor system. If either the first or second technique were to be used in the helicopter I fly, the rotor droop stoops would ‘pound’ and damage could result. Once again, I encourage knowing the limitations and unique systems found in the particular helicopter that you are operating.

I cannot overemphasize the importance of slowly lowering the collective pitch during slope operations. If the collective is lowered too rapidly, it is possible for the opposite skid/wheel, nose wheel/skid toe or tail wheel/skid heel to contact the surface abruptly, thereby creating another pivot point and an unwanted rolling moment. Remember, the faster the roll rate, the less the critical bank angle required to encounter dynamic rollover. If this occurs during a nose up slope landing, the tail rotor could possibly strike the surface as the helicopter would then pivot about the skid heels.

Unless you are flying a helicopter with a high mounted tail rotor such as a BK-117, BO-105, S-76, etc.,
a downslope landing should be avoided due to the danger of striking the tail rotor with the surface. Fenestron (ducted fan) or NOTAR™ equipped helicopters obviously have no such limitations.

**Takeoff technique**

As you probably know, flight control inputs during a slope takeoff are conducted in the reverse sequence of the landing. Ensure that heading is maintained precisely throughout the maneuver with the anti-torque pedals. Maintain rotor RPM within normal limits. Position the cyclic pitch into the slope only enough to prevent the upslope skid/wheel from drifting as the collective pitch is slowly increased. Continue to increase the collective pitch slowly as the downslope skid/wheel lifts off from the surface. Maintain heading with anti-torque pedals, and upslope skid/wheel position and prevent drift with the cyclic. As the downslope skid/wheel approximates a normal, level, hovering attitude, adjust the cyclic position toward the center, while maintaining the position of the upslope skid/wheel. This is the point again where you STOP the maneuver. This is a critical point where most pilots will end up rushing and consequently drift excessively or begin an upslope roll rate. Again, the length of the delay is up to you. When ready, continue to increase the collective pitch while simultaneously maintaining heading with the anti-torque pedals, and position with the cyclic. As the upslope skid/wheel lifts off from the surface, assume a normal hover or takeoff as necessary. Once again, if conducting pedal turns, assume a higher hovering altitude due to the proximity of the slope and tail rotor.

I hope this article has provided a good review of slope operations. My intention was to try to bridge the gap between flight instruction and the often highly generalized information found in helicopter flight manuals. Just remember, although the helicopter is the ultimate off-road vehicle, it does have its limitations, and so do we!

Kent Sapp holds Helicopter CFI, CFII, and ATP ratings as well as Airplane Commercial/Instrument/Multi-engine, CFI and CFII ratings. He is an active duty Army Instructor Pilot, Instrument Flight Examiner, and Aviation Safety Officer currently stationed in Japan.

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**PHPA member profile**

Scott Chase, student pilot. Scott is shown here in his 1st solo flight in a Robinson R22 at Glacier Northwest Flight School. Scott works for Helicopter Parts International and Aviation Component Services. Congratulations Scott!

Russell Shearer, Aerial Suppression Pilot. Russell is shown here, ‘taking a dip’ out of Silverwood Lake, in a Rogers 212, fighting the “Blue Cut” fire in Cajon Pass.

Rosemary Arnold, Whirlygirl #99 (A number to be proud of) and the 1st woman helicopter pilot in Australia (and the only one for 12 years). Rosemary is shown here with her beloved Bell47J2A, ‘Triple Happy Helicopter’.

Autorotate would like to profile YOU in one of our next issues. To qualify, 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. We apologize, in advance, if we are unable to use your photo, and photos will not be returned.
Just follow the Lights—
The history of aviation in the U.S. (Part Two)  by Tony Fonze

Part One of this two part series, “FARS, can’t live with ‘em, can’t live without ‘em,” reviewed the origin and GROWTH of the FARS and civil aviation regulation. We learned that the post office almost single-handedly launched civil aviation in the U.S. and we saw that the rules were largely a by-product of a huge volume of accidents. In Part Two, we’ll learn how technology evolved to solve many of the problems of the expanding aviation industry. VORs, airport beacons, airspace, and air traffic control did not just leap into existence overnight. They evolved from simpler solutions—the artifacts of which can still be seen all around us today. Let’s pick it up by ‘following the lights.’

Let there be light

Early aviation launched in a very big way, over a very short time and so did the press for day and night, all weather operations. By traveling through the night, airmail timetables could be cut in half. In fact, the transcontinental trip between New York and San Francisco could be completed in less than 36 hours. But, getting from one coast to the other during the day was hard enough.

All aerial navigation at this time was done using pilotage. Pilots flew from town to town, train station to train station, and hill to dale. They did so without topo maps and frequently, without any maps at all. Pilots developed their own enroute notes, sometimes recording them in little books that they carried with them like Bibles. Elrey B. Jeppesen, founder of what is now Jeppesen Sanderson, Inc., launched this vast enterprise by publishing his own airway notes in 1934. Jeppesen, an airmail pilot for both Varney Airlines and Boeing Air Transport, accumulated a wealth of information for the Federal Airways including field lengths, slopes, elevations, and locations and heights of obstacles. He sold his manuals for 10 dollars apiece.

The original concept of night flight involved setting up illumination points along the course taken by Federal Airways allowing a pilot to fly from one light to the next to the next, etc. Of course, trivial data like the presence and height of obstacles, airport elevations, and runway lengths were almost non-existent. Then again, many landing fields weren’t illuminated anyway. But hey, you’ve got to start somewhere.

The first “trial run” was set up along the 70 plus mile stretch between Dayton and Columbus. A complex of rotating beacons, flashing lights and field lights helped the pilots launch, locate their destination and land safely. But, the first, real, night operation was established along the route between Chicago and Cheyenne. This stretch had commercial significance because pilots leaving San Francisco could make it to Cheyenne in a day and similarly, passengers leaving New York could reach Chicago. Stations were established along the route to house and support lighting beacons. As necessary, airways were punctuated with runways, refueling and occasionally, rest stop facilities.

Station managers began to communicate weather information from station to station along the route.

The first lighting systems tended to resemble lighting you might see along the country’s coastlines, and with good reason. The Lighthouse Bureau originally held responsibility for the Airways Division. The most common design involved a rotating white beacon, flashing at 10 second intervals, that could be seen by a pilot 40 miles away. After zeroing in on the primary beacon, pilots would look for red and green 500 watt searchlights, also mounted on the beacon towers. These would tell them whether or not this next stop had an airfield. Green for yes, red for no. The red and green course lights also flashed, in Morse Code, the beacon’s sequential position along the course. Not long after, in an attempt to conserve resources and electricity, the design settled on two rotating beams, 180 degrees apart, with alternating white and colored lights. If the colored light was green—guess what? You could count on a landing field. The year was 1931.
Quick aside: I love this stuff. I love the fact that over 70 years ago the seeds were sown for the systems we depend on today: alternating green and white beacons, Morse Code identifiers, red for yes we have no bananas. Sorry, I digress.

Doolittle does a lot

Great, now we can fly at night! But, we still can’t fly safely in weather. Cockpit instrumentation was almost non-existent. Flights were completed with little more than a knotmeter and notoriously inaccurate compass and altimeter. Lieutenant Jimmy Doolittle, working with Elmer Sperry, founder of the Sperry Gyroscope Company, worked together to develop an artificial horizon and a directional gyro. At the same time, Doolittle found Paul Kollsman, who came up with a design for an altimeter accurate within a few feet.

Jimmy Doolittle put these tools to good use when he demonstrated the feasibility of flight by instruments on September 24, 1929. Equipped with a much-improved altimeter, primitive radio directional equipment, and the newly created directional gyro and artificial horizon, he took-off from Mitchell Field, New York, flew a pattern and landed, flying within the confines of a hooded cockpit. He did, however, bring along a check pilot, just in case. Less than three years later, Captain A. F. Hegenberger accomplished the first ‘blind’ solo flight, using instruments only.

Doolittle’s demonstration established the groundwork for instrument flight. He proved that equipment could be produced that provided sufficient information with enough accuracy for pilots to fly their aircraft without benefit of outside visual references. Consequently, inadvertent IMC and occasional cloud layer penetration might be beaten into submission by a properly trained pilot in an adequately equipped airplane. But, in order for instrument flight to actually impact the business of flight, the problem of finding your way in the clouds had to be solved.

“Can you hear me now?”

During the early days of aviation, the use of radio in the cockpit for either communications or navigation was essentially unheard of. Pilots received their weather briefings, airport updates, and schedule changes on the ground prior to departure. On clear days with no maintenance problems this worked well enough. But, just like today, weather, in-flight emergencies and carrier induced diversions just refused to cooperate. And don’t forget, civil aviation was developed as a branch of the Department of Commerce, and commerce was what it was all about. Buses, boats and trains functioned well at night and in all types of weather. For aviation to remain competitive, we needed the same advantage.

The original two-way radio communications trials between an aircraft and the ground were explored by the military during the First World War. But, it wasn’t until 1926 that the Bureau of Standards began in earnest to create an aviation capable radiotelephone system. By 1928, they began installing radio stations along Federal Airways. One of the most problematic aspects of the new system was the creation of an aircraft capable receiver. The requirements were intimidating: light-weight, of manageable size, receive both directional and communications inputs, avoid engine generated interference, and function properly with an aircraft appropriate antenna. Engineers Haraden Pratt and Harry Diamond completed the first receiving set, weighing in at a mere 30 pounds. This widely acclaimed unit was capable of receiving a single voice channel.

The ancestors of VOR

Early experimentation with radio navigation focused on the spark transmitter. A spark induced, non-directional homing beacon, generated by a ground station,
could be picked up by a loop antenna receiver in the aircraft. The pilot would then follow the loudest signal strength to the station. In Europe, a cumbersome reciprocal arrangement was being tested. A signal generated in the aircraft was received by two or more ground stations who then determined the aircraft’s line of position (LOP) or fix and then radioed that information back to the pilot. But, both systems were abandoned for a simple directional providing solution.

The four-course radio beacon used two single wire antenna loops. One antenna broadcast the Morse Code signal A (.–), while the other broadcast an N (.–). The antennas formed overlapping signals on each of four directions, 90 degrees apart. A solid tone was received at each of these 4 primary vectors while either an A or N would be received at directional points in between. Pilots could then either follow a solid tone to the transmitter or make appropriate course corrections to either the right or left, depending upon whether the letter A or N was being received.

Four-course beacons had a 100 mile range, with stations placed at 200 mile intervals. When a pilot lost one signal he would home in on the next. The concept of “To” and “From” was born. Deployment of the four-course radio navigation system began in earnest in 1931 and it remained the primary system in use until 1944. Technical advances, developed during World War II, were later incorporated into the civilian aviation environment to give pilots an instrument panel directional display capable of receiving signals broadcast on all compass points—VOR.


Terminal grid lock

Even before the advent and deployment of the tools of instrument flight, all of the issues associated with numerous aircraft arriving simultaneously from different directions began to emerge. Beleaguered terminal operators initially tried to control arriving and departing traffic with the use of flags. An inbound pilot would receive either a red flag, telling them to hold their position, or a green or checkered flag announcing, “clear to land.” Flags, however, did not work well in low visibility and, of course, were useless at night. It was also difficult for pilots to know whether they were the recipient of the recently administered red flag or the preferred checkered flag. Busy pilots, pressured to remain on schedule were all too quick to assume that the waving green flag was for them. Hence, the advent of light guns. The sighted light guns could deliver a red or green signal to a targeted aircraft up to one mile out. But, more was needed.

By 1936 the airlines themselves; United, American, TWA and Eastern initiated an experimental air traffic control system based in Newark. A similar operation was established in Chicago. The Newark and Chicago airports were handling peak loads of more than 50 arriving and departing aircraft each hour. The following year, the Bureau of Air Commerce assumed control of both facilities. Using blackboards, mammoth table maps, teletypes and toy aircraft, they manually plotted and managed the flight numbers, positions, altitudes and ETAs of all arriving aircraft.

The entire process quickly succumbed to additional regulation and control. Pilots flying with the use of instruments over civil airways were required to have instrument ratings. The aircraft they flew had to be equipped with two-way radios and a mandatory set of approved equipment. Pilots were required to file flight plans. Eastbound aircraft flew at odd thousand foot altitudes while westbound aircraft were restricted to even thousand foot altitudes.

Pilots, who just a few years earlier had complete freedom of the skies, initially resented the new conditions: refusing to enter holding patterns when instructed and failing to provide position reports. Many didn’t bother to enter their flight plans. A new wave of rule making was about to be launched, and this time, pilots wanted to participate.

Alphabet soup

The pilots of the early 30’s had to contend with an ever-changing work environment. Many of the changes were positive, representing improve-
ments in technology that ultimately would improve both safety and profitability. But, constant changes in equipment, procedures, airspace and licensing meant increased workload as well—all on top of a flight schedule that often involved more than 170 flight hours a month. Pilots, seeking to gain a say in their work lives, organized to give themselves a voice loud enough to be heard through the chaos. The Airline Pilots Association (ALPA) became the collective bargaining voice of the pilots as they voted for affiliation with the American Federation of Labor (AF of L) in 1931.

Rules affecting flight and air commerce stem from numerous sources: federal legislation, FAA and industry proposed regulation, and internationally imposed rules. International aviation regulations emanate from the International Civil Aviation Organization (ICAO, pronounced eye-kay-oe). ICAO came into being in the mid 1940s when 52 countries (states) agreed to bind themselves to an internationally uniform set of regulations, standards and procedures governing aviation throughout the world. Member nations participate in the rule making process and are obliged to abide by the outcomes, notifying ICAO of any differences between national policy and ICAO standards.

Pilots are represented in the ICAO process by the International Federation of Airline Pilots Associations (IFALPA, pronounced eye-fal-pa). The fact that you can fly an aircraft from the United States to China, via Europe, using the same radio navigation equipment, speaking a common language (English), following recognizable charts along the entire route, with pilots of relatively equal training and caliber is due, in large measure to ICAO. Many of the mandated safety based regulations are due, in turn, to IFALPA’s influence in the process.

The FAA follows the rules of the Administrative Procedure ACT (APA) when adopting, amending or repealing regulations. APA requires that certain documents be created and published in the Federal Register as new regulation is proposed. Many of these documents can be found online in the Department of Transportation’s (DOT’s) electronic docket at http://dms.dot.gov. These docs include the ANPRM (Advance Notice of Proposed Rulemaking), an NPRM (Notice of Proposed Rulemaking), the SNPRM (Supplemental notice of proposed rulemaking) and, of course, the final rule.

So what?

When I began researching these articles I thought I would find that the FARs began as a pamphlet sized document that ultimately evolved into the “phone book” we have today. But, I was surprised to find otherwise. Regulations governing pilot licensing, aircraft certification, and flight operations were presented in serious volume from day one. From the beginning, there was a fundamental understanding of the scope of creating and managing the capability of flight. I was also surprised to see that the rule making process did not consider pilot input paramount, until pilots coalesced into a voice that insisted on being heard.

I am intrigued by the thread of cause and effect that ultimately led to today’s operational environment: radio navigation, lighting systems, air traffic control, etc. Much of what we take for granted in our daily flying lives was pioneered 70 or even 80 years ago. This explains why Morse Code identifiers are used to identify radio navigation facilities and why sometimes VORs are found in the most unlikely of places. It explains why we have light guns and green and white airport beacons.

And finally, I’ve found that in achieving a deeper understanding of our history as aviators, I’ve also found a deeper appreciation of my place in the aviation community as a pilot. I am a helicopter pilot, and proud of it. But, I’m also a pilot, and as such, part of something larger. I’m proud of that too.

References:
Bonfires to Beacons, Federal Civil Aviation Policy Under the Air Commerce Act, 1926-1938; Nick A. Komons; Reprinted 1989; Smithsonian Institution Press; Washington, D.C.
FAA Historical Chronology, Civil Aviation and the Federal Government, 1926-1996; Department of Transportation, FAA, Office of Public Affairs; 1998; Washington, D.C.
I know, watch out for the other guy is a saying usually associated with cars. But, in this case I would like to apply it to our work in the Gulf. No, this has nothing to do with looking for other aircraft while flying. It has to do with looking at your aircraft before and during flight. Let me explain.

Recently, I had the opportunity to fly several different aircraft. I found this to be a real eye-opener. Even though the pre-flight revealed nothing out of place, I found that the situation sometimes changes during run up or in flight. I have had throttles advance to 70% in the time it takes to reach up to turn on the generator. Doors have opened during flight. I’ve seen dual tachs with a ‘built-in’ split. Seatbelts have come off in my hand and engine oil bypass buttons have popped. None of this would be too strange if it were the first occurrence. Sometimes things break. My concern, however, peaks when our customer says, “Oh, that door has been like that for months. Sometimes it works and sometimes it doesn’t.”

The real kicker is that none of this stuff is too hard to repair. However, it is impossible to repair something if there is no write up in the log book attesting to the fact that it is broken. I hear pilots blame maintenance and maintenance blame pilots—all in a friendly manner. I’m going to have to side with the maintenance people with what I’ve seen lately. This brings me back to watching out for the other guy.

Just because you fly the same aircraft on the same job each week, don’t assume you ‘know’ the aircraft. The guy that flew just before you may think that a properly functioning door is important. He may not like it when the oil bypass button pops out on its own. And, he may not feel comfortable having to keep a constant eye on the throttle’s ability to advance autonomously. If you don’t want to write up something for yourself, so that you can fly a safe and comfortable aircraft, then do it for the guy that is going to fly it after you—the other guy. Don’t make the “other guy or girl” have to get accustomed to the 30% continuous split in the dual tach needles. We have the best maintenance in the world, but, being the best won’t matter if we, as aviators, don’t tell our maintenance people when something is not right. Remember the MEL (minimum equipment list)? It is the little blue book in the pouch by your front seat passenger’s leg. If something is not right, and I mean 100% right, then write it up. If you can take relief from it in the MEL make the write up and drive on. If you cannot get relief in the MEL then you are broke. Fear not though, we can fix it.

Think safe, be safe and go home safe. Watch out for the other guy.
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Bored with long days of VFR-only helicopter flight? Hate to spend the time doing IFR planning? Need a little excitement in your aviation career/hobby? If you haven’t yet, give this recipe a try, using these common ingredients that you can probably find around your own airfield.

- 1 or more intrepid aviators
- 1 flaky weather forecast
- 1 hot mission
- Beat well inside the aircraft (1 to 1 vertical beating works best), then add
- 1 unforeseen deviation

And you’ve got it! Serves as many aviators as you need!

I should mention, most of us think we’ll never taste this dish, but those of us who have, made the recipe up as they went along. Let me tell you how I cooked mine up.

- 1 or more intrepid aviators—We were an Army MEDEVAC crew flying a UH-1 on just another night. Rested and ready, we had flown an earlier mission and had noticed a cloud layer starting to form at 400’ AGL. After landing, we PIREP’d the condition to our weather observer at a nearby field.

In this particular geographic area, the evening clouds normally closed in over the rural range area first and the rising heat from the urban areas kept the skies clear over the city for a number of hours before the ceiling went solid everywhere.

- 1 flaky weather forecast—Two hours later, we called for a weather report and were told the “ceiling is unlimited, but we had a pilot report of a cloud layer starting to form at 400’ AGL.” Ya don’t say.

- 1 hot mission—And we’re off! Five minutes after the weather call, we launched into the blackness, about 20 miles north into the rural range area, now mighty dark and a solid overcast at 400’ AGL. Using our Night Vision Goggles (NVGs) we stayed safely below the cloud deck and shortly arrived at our location to pick up a severely wounded patient involved in a motorcycle wreck. A milk run, so far.

- 1 unforeseen deviation—On the return trip, with the patient loaded up and not doing well, the flight medic had some difficulty starting an IV under the blue NVG compatible lighting. He asked us if he could go to a (very) non NVG-compatible white light in the back of the helicopter to provide better lighting. Blackout curtains separating the two cabin areas were not in vogue at the time, unfortunately. “Sure,” we said, degoggling and making the transition to unaided flight. (I guess we were thinking of taking care of the patient, if thinking isn’t too strong a word for what we were doing.)

“Hmm,” I thought, as a strange red glow suddenly enveloped the left side of the aircraft. Could it be the red position light reflecting off the inside of a cloud? Yes, folks, this recipe had made us downright ill. But, just then, we remembered from training an old home remedy to get us out of it.

- Announce you are IMC
- 2 wings, level
- 1 power pull
- 1 friendly controller

Things started to happen pretty fast at this point, but we figured out quickly that we were in a cloud at around 400’ AGL and not coming out any time soon. In some instances, however, one pilot might still have visual reference even if one pilot announces they are IMC. In this case, there may still be time.

- 2 wings, level—Turning to avoid known obstacles at lower altitudes is an important consideration. But, in the flat terrain we found ourselves in, getting on the gauges and starting a climb was key.

- 1 power pull—A smooth application of power started us on a climb through the soup, where we happily broke out on top of a 1000-2000 foot thick deck of puffy clouds under the now visible moonlight. The immediate problem fixed, we didn’t feel a whole lot better. We now had both a critical patient and a pop-up IFR recovery to contend with.

- 1 friendly controller—Just the man to fix all of this, our friendly local radar controller gave us vectors to descend safely over the urban area.
where the clouds were thin. From there it was a short flight to the hospital where the patient was safely delivered. The whole ride from in the clouds to back out seemed to take maybe five minutes. We called the controller on the ground and thanked him for his support. We also paused to thank God and our instructor pilots. But, somehow, could not find it in our hearts to thank the weather observer.

So what did we learn during this crash cooking course? We learned how fast things could snowball when we made snap judgments and snap judgement errors. We learned why we practice inadvertent IMC procedures. And, we realized that we were fortunate. Over that same range, on just another night, two years before, one OH-58 in a flight of three went inadvertent IMC, started a climbout, and then crashed killing both aboard. That could have easily been us. Fly safe!

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The following information was extracted from the NTSB files. It has been edited for available space and is subject to change as investigations continue. Reports were selected based on the importance of the information to the broader helicopter industry.

**Schweizer 300C; Haleyville, AL, August 16, 2002; 1 Serious Injury**

On August 16, 2002, at 2215 CDT, a Schweizer 300C collided with terrain during an emergency landing following a loss of engine power.

After 40 minutes of flight, the pilot became aware of thunderstorms along the intended route and elected to land. Once the weather cleared, the pilot departed. After 40 minutes in cruise flight at 2,000 feet MSL, the pilot noticed the sound of the engine changed suddenly, and the helicopter began to descend. The engine and rotor tachometer needles fell below normal operating range, and the pilot’s attempts to restore power were unsuccessful. The pilot entered an autorotation and sought a suitable landing area. During flare, the pilot was unable to see the terrain in the darkness, and the helicopter hit the ground hard.

Examination of the engine revealed two lower screws of the No. 3 valve cover were missing. The attachment bolts of the intake pipes of both the No. 1 and No. 3 cylinder assemblies were found loose by three to four revolutions of each bolt. The No. 3 intake pipe was found rotated approximately 180 degrees from the normally installed position. The No. 1 and No. 3 intake pipes were removed for examination, and the gaskets normally installed under the intake pipe flanges were missing. The surfaces of the No. 1 and No. 3 intake pipe flanges and the cylinder intake ports showed signs of metal-to-metal chafing and showed no evidence of gasket material. The attachment bolts of the intake pipes of the No. 2 and No. 4 cylinder assemblies were found secure, and the No. 2 and No. 4 pipe flange gaskets were found installed. The No. 4 intake pipe flange gasket was found split in the inboard area between the attachment bolts.

A review of maintenance records revealed the engine received a 100-hour/annual inspection on July 2, 2002, and had operated 38.2 hours since inspection. A review of Title 14 CFR Part 43, Appendix D revealed, (d) “Each person performing an annual or 100-hour inspection shall inspect (where applicable) components of the engine and nacelle group as follows: (2) Studs and nuts - for improper torquing and obvious defects, and (10) All systems - for improper installation, poor general condition, defects, and insecure attachment.”

Editor’s Note: “Maybe a new mechanic is in order.”
**Eurocopter Deutschland GMBH MBB BK-117 A4; Bradenton, FL; August 26, 2002; No Injuries**

On August 26, 2002, about 2035 EDT, Eurocopter Deutschland GMBH MBB BK-117 A4 had an engine fire while in cruise flight, and the pilot executed a forced landing. The pilot stated that he was transporting a patient from Naples, Florida, to St. Petersburg, Florida. While at a cruise altitude of 1,000 feet, operating at about 130 knots and 60 percent torque, without any warning, he heard a loud explosion from the right side of the helicopter. At the same time he received a No. 2 fire light, with associated warning lights indicating an engine failure, and the helicopter yawed left to right several times. The No. 1 engine indications showed surging, with indications varying from full to almost idle power. He entered autorotation anticipating a dual engine failure, while executing a 180-degree turn to get from over the marshy bay area to a place where he could land, while proceeding to complete the emergency fire procedure. He communicated a “mayday” call on the radio transceiver to his company, and executed a forced landing to a freeway. After instructing his crew to evacuate the helicopter, he then used portable fire extinguishers to extinguish the fire.

**Editor’s Note:** “My hero!”

**Bell 222UT; Nipton, CA**

**September 07, 2002; 3 Fatal Injuries**

On September 7, 2002, at 0428 PDT, a Bell 222UT twin-engine helicopter was destroyed upon impact with terrain following a loss of control while maneuvering. The airline transport rated pilot, a flight nurse, and a paramedic on board the helicopter were fatally injured. Dark night visual meteorological conditions prevailed.

Witnesses near the accident site reported observing the helicopter flying from the northwest to the southeast across the interstate highway. One of the witnesses reported the helicopter was “flying low and very fast” as it flew across the highway prior to impacting terrain.

**Garlick OH-58AT; Rochester, MA**

**September 14, 2002; 1 Fatal Injury**

On September 14, 2002, at 1145 EDT, a Garlick OH-58AT helicopter was substantially damaged during take-off from a cranberry bog. The certificated commercial pilot was fatally injured.

According to the inspector, witnesses stated that the helicopter was hovering approximately 12 feet above the ground with a left quartering tailwind when the ground crew secured the 900 pound cargo basket filled with cranberries to a 15-foot long sling load line. When the cargo basket was being secured, the helicopter was positioned forward of the load. Once the load was secured and the ground crew was clear of the helicopter, the helicopter flew forward and dragged the cargo basket behind the helicopter. The cargo basket then collided with a ditch and the pilot jettisoned the load. After the pilot released the load the helicopter pitched up, the main rotor blades severed the tail boom, and the main rotor assembly separated from the helicopter. The helicopter fell about 15-feet to the ground, and rolled over on to its left side. The main rotor assembly came to rest about 58-feet from the main wreckage. The tail boom, which included the vertical fin, tail rotor gearbox and tail rotor assembly, came to rest approximately 105 feet from the main wreckage.

A postcrash examination was made a hard landing approximately 2 miles south of the North Las Vegas, Nevada, airport. According to the pilot, the destination was 5 miles away, and an estimated 40 minutes of fuel was on board the helicopter. This was enough fuel for him to fly to the destination, shutdown, and return within the minimums required. At the destination, the pilot reported, he left the engine and main rotor operating while having the pictures taken. To keep the rotor rpm warning light from activating he pulled the circuit breaker, which also disconnected the low fuel light. It was not until the return flight began that he noted the circuit breaker had not been replaced before departure. After doing so, he observed the low fuel light illuminate immediately, followed thereafter by a fuel pump light. The engine lost power and an autorotation was performed.

**AS350-B3; Bishop, CA**

**September 29, 2002; No Injuries**

On September 29, 2002, about 0854 PDT, a Eurocopter AS350-B3 collided with terrain during a premature liftoff while engaged in a pre-departure hydraulic flight control check. Forest Service officials reported that the helicopter was engaged in a hydraulic actuator check for the first flight of the day. The collective had been placed in the down and locked position and the rotor powered up to 100 percent flight idle. After depressing the hydraulic test switch, the pilot moved the cyclic fore and aft (pumped) to confirm there was remaining pressure for a few control movements. The collective rose uncommanded and the helicopter moved forward in a nose down attitude. The main rotor struck the ground and the helicopter made two revolutions before rolling over onto its side, destroying both the main and tail rotor systems. A small fire ensued in the exhaust area, but was quickly extinguished.

A postcrash examination was conducted, which revealed a deteriorated condition in the collective’s locking mechanism. The stud was worn and the collective would come...
loose during movement of the cyclic. The Forest Service investigators also found this condition on another of their helicopters of the same type.

**Hughes 369D; Oahu, HI**

**October 29, 2002; 3 Minor Injuries**

On October 29, 2002, about 1000 HST, a Hughes 369D rolled over and slid about 150 feet down a mountainside during an attempted takeoff from a ridge about 4 miles southwest of Kaaawa, Oahu, Hawaii. The pilot flew to a ridgeline and discharged one of (three) passengers. That passenger reported observing the pilot then attempt to takeoff. The helicopter’s right skid appeared to become stuck in a root, the helicopter rolled over, and it slid down the mountain.

**Westland Gazelle AH-MK1; E. Hampton, NY**

**November 08, 2002; 1 Fatal Injury**

On November 8, 2002, about 2325 EST, a Westland Helicopters Gazelle AH-MK1, N911XW, a former British military helicopter registered in the experimental category, was destroyed when it impacted the Atlantic Ocean. The certificated private pilot was lost at sea, and presumed fatally injured. Night visual meteorological conditions prevailed, and no flight plan was filed for the personal flight.

According to a report filed by the East Hampton Police Department, the pilot was expected home in Sag Harbor, New York on the evening of November 8, 2002. On the morning of November 9, 2002, the pilot’s automobile was discovered parked at Long Island-MacArthur Airport, and debris from the helicopter was recovered from the beaches of East Hampton. On November 18, 2002, a fishing vessel snagged and recovered a significant amount of wreckage identified as the accident helicopter.

According to the pilot’s father-in-law, the helicopter was recently purchased for the pilot’s personal use. The pilot had just received his private certificate. The accident flight was the second time the pilot had flown the helicopter solo. The pilot received about 1 hour of instruction in it from the previous owner, prior to taking delivery. After he took delivery, the pilot flew with a certificated flight instructor, who acted as a safety pilot. According to the operator, the pilot’s abilities were about average for a beginning helicopter pilot. He said that he counseled the pilot, as he did all of his students, that earning his pilot certificate “was a license to learn.” The operator further noted that there was a scud layer “running right down the island” on the night of the accident. Fog was also “moving in and out. Some places it was clear, but towards the ocean it wasn’t. That ocean gets awful black out there. He shouldn’t have been out there at night. He’s been told.”

When asked how much experience the pilot had flying at night, the operator said that the pilot had the minimum required for taking the practical examination for his pilot certificate. He added that he did not encourage beginning helicopter pilots to fly solo at night.

During a telephone interview, the certified flight instructor who acted as the safety pilot stated that he flew approximately 10 hours in the helicopter with the accident pilot, and that the helicopter performed and handled well. According to the safety pilot, the accident pilot was competent enough to take off from the airport on a good day, in good weather, in daylight, and come back.

**Aerospatiale AS350B; Kingman, AZ**

**November 10, 2002; 2 Minor Injuries**

On November 10, 2002, about 1155 hours MST, an Aerospatiale AS350B collided with a transmission line and impacted the terrain near Kingman, Arizona. The pilot reported that he was filming a motor home for the “Ripley’s Believe It or Not” television series.

**Bell 206L4; High Island 471, GM**

**December 31, 2002; No Injuries**

On December 31, 2002, approximately 0915 CST a Bell 206-L4 single-engine helicopter was substantially damaged following a loss of control during takeoff from offshore platform High Island 471, Gulf of Mexico. The pilot reported that after the wind had subsided, he attempted to reposition the helicopter on the platform for a subsequent passenger flight. After an uneventful engine start, the helicopter lifted off the platform, and the pilot turned the helicopter 180 degrees into the wind. After a sudden wind gust of approximately 30 knots, the pilot set the helicopter back down onto the platform. The pilot stated that the wind gusts subsided to 20 knots, and he attempted to takeoff the platform again. During the takeoff, the helicopter “immediately started to bounce uncontrollably and [slide] to the left (south).” The pilot then lowered the collective short off the throttle. The helicopter came to rest upright on the safety fence of the platform, and the tailboom was found fractured.

**Robinson R22 Beta; Dolan Springs, AZ (Kingman)**

**December 23, 2002; 2 Fatal Injuries**

On December 23, 2002, at 1137 MST, a Robinson R22 Beta collided with power lines and impacted desert terrain near Dolan Springs, Arizona. According to a witness who was driving southbound on I-93, at milepost 38.5, about 30 miles north of Kingman, Arizona, he saw the helicopter flying over his lane southbound along the highway when it struck power lines.

**Bell 206B; Kingman, AZ**

**November 15, 2002; 1 Fatal Injury**

On November 15, 2002, about 1630 mountain standard time, a Bell 206B helicopter sustained substantial damage during an in-flight collision with terrain after striking a power line about 15 miles northwest of Kingman, Arizona.
Test pilot

1. A flight review must consist of:
   a) (In order to exercise the privileges of your pilot certificate you must safely execute) those maneuvers specified by the Administrator.
   b) Minimum of 1 hour of flight and those maneuvers necessary to demonstrate the safe maneuvering of the aircraft during inadvertent IMC.
   c) Minimum of 1 hour of flight and 1 hour of ground training. Flight maneuvers are at the discretion of the person giving the review.
   d) Flight and ground training times are at the discretion of the person giving the review.

2. In order to carry passengers during the period of darkness several hours after sunset you must be night current. How must this currency be obtained?
   a) Three takeoffs and landings must be accomplished between sunset and sunrise within the preceding 90 days.
   b) Three takeoffs and landings must be accomplished between the end of evening civil twilight and the beginning of morning civil twilight within the preceding 90 days.
   c) Three takeoffs and landings must be accomplished between sunset and sunrise within the preceding 90 days including at least 1 flight with a landing at a second airport.
   d) Three takeoffs and landings must be accomplished during the period between 1 hour after sunset and 1 hour before sunrise within the preceding 90 days.

3. 60 days ago you moved to another state because of a job promotion. You left your aircraft hangared at your previous address until you were settled at your new address. Although you have not made any address change notifications you may legally fly your aircraft to your new location since the flight will be conducted under day VFR and you will not be carrying passengers.
   a) True
   b) False

4. The limitations section is the only section of the approved Rotorcraft Flight Manual that is mandatory to be complied with.
   a) True
   b) False

5. You are flying on a clearance obtained from ATC. During the flight you notice that your oil pressure is fluctuating and the temperature is increasing and you elect to deviate from that clearance and make an emergency landing at a smaller airport that you have just passed over. What must you do, if anything, because of the deviation?
   a) Send a written report to the administrator only if he requests it.
   b) Send a report to the administrator within 10 business days if it is requested.
   c) No action is necessary under the rules of Part 91.
   d) Immediately contact the Local Flight Standards District Office and follow up with a written report within 10 days not including Saturdays, Sundays and Federal holidays.

6. You are flying to an airport located within class C airspace at an altitude of 1500 ft. AGL. The following radio calls are made and received at a distance of 10 miles.
   Piper 23211: “Lafayette tower, Piper 23211, over.”
   Tower: “Piper 23211, standby.”
   a) You must not enter Class C airspace until you have been cleared to enter.
   b) You may descend under 1200 ft. AGL and continue to the 5-mile ring without a clearance.
   c) Since ATC has acknowledged you by call sign you may enter the Class C airspace at your present altitude.
   d) Hold at your present altitude until receiving a clearance.

7. Prior to entering special use airspace designated as a warning area, you must have a clearance to enter and the area must not be in use by the using agency?
   a) True
   b) False

8. You are flying outside of the class D airspace in the blue shaded area of the map at 1100 ft. AGL. Weather is being reported as a ceiling of 1200’ with a visibility of 2 miles. You determine that you will need a special VFR clearance to land. Tower has cleared you to enter class D airspace at or below 1500 ft. and remain clear of clouds.
   a) You must not enter Class C airspace until you have been cleared to enter.
   b) You may descend under 1200 ft. AGL and continue to the 5-mile ring without a clearance.
   c) Since ATC has acknowledged you by call sign you may enter the Class C airspace at your present altitude.
   d) Hold at your present altitude until receiving a clearance.
a) You may continue into the magenta shaded area surrounding the class D airspace at 1100 ft.
b) You must descend to 700 ft. AGL or below entering the magenta area prior to entering the class D airspace.
c) You must descend below 700 ft. AGL before entering the magenta area prior to the class D airspace.
d) A clearance is not needed since the ceiling is greater than 1000 ft.

9. What certificates are required to be on board the aircraft?
   a) Current airworthiness certificate, aircraft registration, and an FCC radio permit.
   b) Current airworthiness certificate, aircraft registration, and an FCC radio permit. The registration must be in a visible location.
   c) Current airworthiness certificate displayed at the cabin or cockpit entrance so that it is legible to passengers or crew, aircraft registration, and an FCC radio permit.
   d) Current airworthiness certificate displayed at the cabin or cockpit entrance so that it is legible to passengers or crew, and aircraft registration only.

10. Are both position lights and anticollision lights required at night?
   a) Between the end of evening civil twilight and the beginning of morning civil twilight the position lights and anticollision lights must both be on.
   b) Between sunset and sunrise the position lights and anticollision lights must both be on.
   c) Between sunset and sunrise the position lights and anticollision lights must both be on. However, under some circumstances the anticollision lights may be turned off.
   d) The position lights are only required at night but the anticollision lights are also required for day flights.

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Quiz answers

1. (c), 61.56 (a)(1)(2)
2. (d), 61.57 (b)(1) The rules for logging of time and currency are different. You may log time as night between evening civil twilight and morning civil twilight, Part 1. Currency must be maintained under Part 61.57.
3. (b), 61.60 The FAA Airman Certification Branch must be notified of a permanent address change in writing within 30 days of the change or you may not exercise the privileges of your certificate.
4. (a), 91.9 If you refer to the flight manual you will notice that the limitations section contains a statement similar to “Compliance with the limitation section is required by law” This is the only section of the manual that contains that statement. You will also notice that the aircraft required markings, performance standards, and placards are also located within this section.
5. (a), 91.3 (c) A written report of the deviation is only necessary if the administrator requests it.
6. (c), 91.130 (c)(1) & AIM 3-2-4 If the controller responds with the aircraft call sign than radio communications have been established and you may enter the class C airspace.
7. (b), AIM 3-4-1(c). Warning areas are non-regulatory special use airspace that contain activity that may be hazardous to non-participating aircraft.
8. (b), 91.157(a). Special VFR operations are authorized within the controlled airspace designated to the surface for an airport. The magenta area normally starts prior to the airport lateral limits.
9. (d), 91.203(a)(b).
10. (c), 91.209(a)(b) You may turn the anticollision lights off if you consider that it is in the interest of safety to do so.
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