

## Back to Basics: The Human Factor

I want to start by thanking AIRSURE, AIG, Enstrom and all of you for making this safety seminar possible. This seminar, *Back to Basics and The Human Factor*, is designed to elaborate on some of the reasons why we as human beings make the same mistakes over and over again. I sincerely hope that this will be a learning experience for everyone, every time I do one of these I learn a lot.

To the best of my knowledge, no one gets up in the morning and thinks to themselves “It’s a good day to wreck my car on the way to work!” The same applies to an aircraft accident. For the next 3 hours Bayard Dupont and I will try to provide some of the answers as to why we make mistakes and ways to avoid the “human factors” of common accidents. To try to keep this as interesting and fast paced as possible, Bayard and I will switch off with different points of view. To have a logical order, we will start with getting hired and end with post flight inspection. We will then try to answer any questions you may have if time permits.

First let me say that I don’t have all the answers or even half of them, but I have tried to learn from the mistakes of people who are a lot better than I ever will be. We should all try to be proactive instead of reactive. A few perfect examples of this are:

1. Subscribe to and read the HAI accident reports. Take these and get together with all the pilots in your organization. After everyone has had a chance to analyze a few of them, they will see themselves in many of them only they broke the chain before the accident happened. In this way pilots can discuss how and why the chain was broken before the disaster.
2. Have your insurance company do a safety audit. I believe that all of the major carriers offer this service to their customers. Do it now! Don’t wait for a problem or accident to make the call. Keep in mind that on renewal your insurance agent will go to the insurance company on your behalf and will work hard to paint the best possible picture of your operation to the underwriter. That is their job! Now put yourself in the underwriter’s shoes: Which company would you give the better rate to if all else were equal? Company “A” who attends safety seminars, uses all tools available to them, are always trying to better themselves and requests safety audits of their

operation or Company “B” who just sits back and is reactive to problems as they arise? If you picked Company “B” then you do not have an underwriting career to fall back on should you be laid off.

I realize that most people in the room are pilots. So for this example of human factors lets say that you run a midsize helicopter company.

You have a pilot position available with 3 applicants. Applicant #1 comes in for an interview and after an hour of questions and answers, you decide that his ability on a 1 to 10 scale is about a 9. But to listen to him talk, he thinks that he is a 10+. The same interview for applicant #2 reveals an ability level of about 8.5, he thinks he is a 9.5. Then applicant #3 comes in and his judgment appears sound “you can’t teach judgment”. However, he thinks his ability is a good strong 7 and you peg him at a strong 8.5. Which one would you hire and which one is least likely to have an accident? *Ask Crowd* (I would hire #3, hands down.)

Please try to be pilot #3 and not #1, even though #1 has greater ability. His attitude, ego and judgment will sooner or later get him into trouble. Please just stop and think, have you ever heard of an accident where everyone you talk to about it says that they knew it was coming it was just a matter of time? Do your own actions and attitudes sometimes project this impression?

### Attitude and Judgment Human Factors on Overdrive

I have been told and also said that you can’t teach judgment, but you can help with attitude, which in the end will have a positive impact on judgment. This next statement always raises what little hairs I have on the back of my neck! “I can fly a Robinson so I can fly any helicopter!” I would like to slap every Robinson instructor who tells their students this.

I do agree that stick and rudder will work but systems and mass will not. Believe me, only in the movies can the 152 pilot land a 747 unless it has auto land. The main reason for this is that they don’t have a clue where the wheels are.

There appear to be human factors here; this is not at all scientific but my own observations. They apply mostly to Robinson instructors but other piston instructors have done this as well with whatever brand they fly. I had

a very low time Bell 47 pilot in my facility a month ago; he was in because he wanted to rent an Enstrom. Upon seeing our 407 he said, and he was serious, that maybe he should rent the 407. His instructor told him it was the same as their 47 only they added a zero between the 4 and the 7 and it was a bit larger. What could I do but smile? A student has a special bond with their instructor, we must be careful not to let our egos or our judgment cloud what we tell them. Please remember that they take every word we say to heart. We are their heroes, because we've saved them from disaster many times! Keep in mind that positive reinforcement will win out. We, as human beings, form attitudes and opinions based on experience. Example:

Employee #1 has been caught in many lies. Employee #2 always tells the truth, even if it hurts. There is an accident and even though employee #1 is telling the truth this time, do you believe him? Would you go to bat for him?

### Fatigue

This is definitely a human factor that comes in too many forms to cover them all here, that would take days, so I will just touch on 3. Here also I do not have any hard numbers, so I will just give you some food for thought.

1. Two pilots are by far better than one – this will be discussed in detail later.
2. Night – whether we like it or not, most of us are not nocturnal. A lot of medivac accidents show this fact.
3. Lower workload – when in a high load environment, such as marginal weather, having all aircraft configured the same is a real lifesaver here.

Our company's single biggest job was looking for a lost Lear 35. For 17 days all available equipment was being used. Needless to say this large check coming in February was a real great start to the year. I learned two very valuable lessons from this.

1. All helicopters ordered or used by Sharkey's Helicopters will have a quality ELT installed. The Lear Jet did not have an ELT.
2. All new equipment ordered, and all that we use in our operation, will be configured the same. One of the main factors in the Lear accident

was that the pilot operated the King 90B GPS wrong. All GPS units do not operate the same.

We spent a fortune making all our 135 fleet the same. I am not that smart but I do learn from disasters, it's called "tombstone" mentality. I hope you are not this way and can come away from this seminar with some useful knowledge.

### Strive for Excellence

Sounds simple, now lets go to a real world example. You need open heart surgery. Do you want the doctor who graduated bottom of the class, or the one with 3 malpractice suits pending to do your operation! Or do you want the top of the class with many successful operations under his belt to do it? Do I need a show of hands on this?

The Executive Vice President for one of the major helicopter insurance companies said to me last year after a 480 seminar that it was too bad that the ones who really need it don't go! He also asked for our attendance list, with a smile he said that this list is all part of underwriting and whether the pilots knew it or not their investment of time in attending the seminar would reap rewards. Your attendance here shows to all that this group does strive for excellence and is trying to better themselves.

This is not a plug for AIRSURE, but a lesson for all on insurance rates. At least once a week my phone rings from a helicopter operation that I know. They want to know (for example) what we pay for a hull rate on our Bell 206s. With this information they are going to go and beat up their broker. I have already touched on many helpful ways to improve your insurance rates, but I will list out most of them again. First and foremost please remember that talk is cheap and actions speak much louder than words.

Example: Many times a year my phone rings; the party on the other end is in a panic! They did not attend the annual Bell Recurrent Training as required by their policy and in 10 days it is being canceled! He had called Bell and can't get in for another 2 months, therefore I should drop everything and do their recurrent training, which I usually do. Is this account a good risk in the insurance company's eyes? Do you think this operator will get a "smoking deal" on renewal? Looking at this example; it is clear that actions speak louder than words by far!

Here are the basics:

1. Retain a broker who understands helicopters and has a large helicopter book of business! AKA...AIRSURE. IF this does not ring true, here is a perfect example: Broker #1 has a nice business and does about 1 helicopter a month. Broker #2 also has a nice business and does 1 helicopter a day. In your own operation if you have one customer who uses you 12 times a year and another that uses you 250 times a year, which one will you go to bat for? Get a broker that understands helicopters and is not just collecting their commission.
2. Help your broker, don't just call them up and scream about the rate.
3. Save all safety related material from last year and send it to your broker well before renewal.
  - a. Recurrent Training
  - b. Safety Audits
  - c. Airport Audits
  - d. OSHA or other Audits
  - e. Your own company's methods of operation such as, preflight check lists, weather minimums and so on.
4. Send pictures of your fleet to your broker. Let the company know that you are proud of your operation. We have all seen helicopters that we would not even start the engine on.
5. Relay any awards that your company or its employees received.
6. Make your insurance company aware of any safety seminars that anyone in your operation attended or sponsored. Before the Wings Form is sent in make a copy for yourself.
7. Anything else that you think will give you an edge over company B.

Please note that you may know one or more of the pilots that are used in the examples given in this presentation. Please keep their names to yourself. This program is meant to be a learning experience for all and is not meant to embarrass anyone! That is why after many hours of careful thought I decided to remove all accident pictures from this presentation.

### Weather Briefing

TFR's since 9-11 have us all getting weather briefings before flights, so we will go on to the next point.

## Preflight

The preflight is one of the most neglected aspects of a safe flight. I have watched the Cessna flight school next door to my facility several different times over the last 32 years. The results are always about the same; the instructor goes out with the new student and teaches a preflight, however, 9 out of 10 times I observe this being done from memory ONLY. Then at the next lesson the instructor stays inside and has a coffee or a coke while the fresh student struggles to preflight the aircraft.

There was an observation by an unnamed company's bean counter that sent a pilot out to pick up a recently purchased Bell 206. On the pilot's time report that he turned into the company upon his return there was recorded 2.3 hours of preflight. Well over a year later, the same Bell 206, but with considerably more time on it, was assigned to this pilot for a photo job. (This was not his normal aircraft to fly, he flew an L-3) On his preflight this day he took about 5 minutes. The bean counter was wild, either the pilot must have cheated the company on the initial trip or he is now unsafe. In the counter's eyes this employee should be terminated!

- Was the Helicopter safer on this day having more hours on it?
- Was it unsafe when he picked it up a year ago?
- Or does familiarity breed contempt?
- Or does the pilot actually need to be terminated?

Here is the "human factor" at its worse. Mentally, the pilot sees this particular aircraft day in and day out, either flying or in the hangar. So subconsciously it must be good and the regular pilot assigned to it always says what a great running helicopter it is. Which brings us back to my statement at the beginning: Nobody says they are going to wreck their car on the way to work, nobody says they are doing a lousy preflight – BUT WE DO! Not on purpose of course but overwhelmingly we do!!

I personally feel that a checklist should be used for each and every preflight. Our company rules state that before any aircraft is to fly a signed and dated preflight checklist must be in the dispatch office. We have supplied preflight checklists for Piston Enstroms, Turbine Enstroms, Bell Jet Rangers, Bell Long Rangers, Bell 407s and Bell 47s.

Now I will relay my own preflight deficiencies for your enjoyment! At our company I personally do very few preflights. They are usually done first thing in the morning by the mechanics. On one particular day, because of the workload and the fact that our Bell 407 was not scheduled to fly, its preflight was passed over and rescheduled for the following morning. At 10:00am, I received a call for the 407 to go out to Connecticut for a pickup and I was the only qualified pilot on hand. With all of the 407 trained mechanics busy, I grabbed the checklist and went to the aircraft to get started. Things were going great and faster than planned. When I arrived at the left engine door the preflight sheet said “Fuel and Oil Bypass Indicators Check Retracted”. I could not even find them with the checklist, so if I were not using a preflight sheet at all they would never have crossed my mind. With a laugh my director of maintenance showed me right where to find the indicators.

Here are just a few highlights and violation saving items that we incorporated into our preflight checklist:

1. Flight Manual – It sounds simple but you would be surprised at the amount of helicopters that come in for work with the flight manual missing. This is especially true with the 206s. I personally think some of the flight manuals are taken as souvenirs of the flight because of their location in the hat rack. You would be well advised to make a copy of your aircraft’s weight and balance and equipment lists. Just purchasing a new flight manual will not work without this information.
2. Missing Documents - Because helicopters are able to have their doors removed for different missions, a lot of Airworthy Certificates and Registrations have gone out the door without the pilot’s knowledge.
3. Medicals – In about 10% of the accidents I have investigated, the pilot had an expired medical. One major reason this happens is that the pilot had an appointment for the medical but their kid got in a bad car wreck or some other unforeseen disaster comes up and getting his or her medical done becomes the farthest thing from their mind. I have not personally adjusted an accident where I thought that the pilot could not have passed a medical.
4. Recording hours – If you are operating your helicopter mainly for pleasure, being forced into recording the hours helps to prevent over flying and forgetting to attend to needed items. If you own a 480 please track your cycles. Those who live by the cycle counter, die by

the cycle counter. Junk counters can add hundreds or even thousands of cycles, and sometimes they don't count at all.

5. Air in the Fuel Tank – Last, but still very important, is that as an industry we are still having massive problems with too much air in our fuel tanks. Having to record the fuel onboard helps to jog our memories as to the amount needed with a good reserve for the intended mission, giving us ample time to acquire more if needed.

Please keep in mind that this preflight check sheet is nothing more than a word-processed file and can be added to or subtracted from as your operation dictates. Anyone wanting a copy of our company's version of the preflight checklist can just e-mail me at [Roger@sharkeys.com](mailto:Roger@sharkeys.com) and tell me which aircraft check sheet you need.

Now Bayard will give you some of the important things to look at when doing a preflight. Bayard ...

### Startup

Here again is an area where I personally observe, in about 50% of the check rides I do, that no startup checklist is used. If it is used, I can tell that it was done for my benefit and is not the usual procedure. Two accidents that I have adjusted were a *direct* result of not using a check sheet. I do not have any hard numbers on the amount of accidents that were an *indirect* result of not using a check sheet. In one of the accidents that I investigated, the problem was that the fuel valve was only about half way in. The helicopter ran-up and hovered fine but when the nose was pushed over and the collective raised, it backfired and jerked violently; back to the ground it went. In the other accident, after the mag check, the mags were on left, instead of both. In this case, the helicopter went to do a photo job. When the pilot stopped to hover over the lake to look back at the house that was for sale to get the pictures, the bottom fell out. The pilot and photographer both went for an unexpected swim. When the helicopter was retrieved from the water the position of the mag switch was noted along with the fact that there wasn't even a checklist present in the helicopter. In a piston Enstrom helicopter if you do not or will not use a checklist, at least do step 5 in warm-up and ground check.

1. Instruments for proper indication
2. Seatbelts and doors



3. Fuel valve pushed in to ON!
4. Mags on both!
5. Fuel boost pump
6. Check mixture – not necessarily pushed in
7. Caution lights
8. Anti-collision light
9. Collective and throttle friction

Everyone should use the checklist but if the piston Enstrom pilots here just can't, then please verify these 9 items before you pull pitch!

Bayard...

### First Pickup to a Hover

By far the first pickup of the day is the most critical! All helicopters should be picked up like an "old lady". This may sound simple but just take a look at the HAI accidents. Here are just a few of the pilot's statements after an accident took place:

- "I just picked it up and it took off backwards with full forward cyclic towards the hangar"
- "I was hovering above my trailer for about 30 seconds then the flight controls just let go and the helicopter laid on its side"
- "I was hired to fly the helicopter so it could be tracked after a transmission change, after the warm-up and mag check the next thing I knew I was on my side"
- "I pulled it into the air and it spun around about 10 times"

In the next two we never even got to remove the collective friction.

- "I was just doing a clutch check when the tail of the helicopter hit a snow bank"
- "Just doing a clutch check and the tail hit the fuel pump"

They go on and on, experience level doesn't matter. Just because we have 5000 plus hours doesn't mean we should be worried about looking like a student taking their time to bring the helicopter into a hover. If we all gently pull our helicopters into a hover, so as to allow time to reduce pitch if we don't like what's happening, we can solve all our problems especially problem #1 of saving our pride.

On this same subject: One of Bell's great instructor pilots (Initials B.S.) would have the examinee do a hovering autorotation. He would then sneak up his right foot on the right pedal and hold it in. He reported to me that it was unbelievable the number of high time pilots that would pull the helicopter into the air, and then spin around in circles. Thank God I was not one of them on my ride, I did enough other things wrong.

### Hovering and Hover Taxi

In hovering Autos the "human factor" is that we as human beings want instant gratification. If we lead with the right pedal before the power cut then the sudden right turn can make us turn on power and pull pitch. This is a normal human reaction because we don't like what is happening. Hovering autorotations are not anywhere near as bad as regular autos for destroying good running helicopters but they are bad enough. This is mostly a piston helicopter problem, because you can't turn the throttle the wrong way in most turbine helicopters. Always reposition your left hand outboard so as to make it impossible to turn the throttle the wrong way.

### Side Hill Work

Here again we see the "human factor". If the hill is too steep once we are past center and pull pitch (you almost can't help yourself), we will be on our side. I believe that this can happen to even a high time pilot after reading about accidents of pilots that are high time having side hill disasters. Here the best approach is to not test the extreme parameters of our machine or ourselves. Pick a mild slope to start.

### Takeoffs and Landings: The Wind!

Simply put, we fly in the relative wind but land and takeoff on the ground. Here again we all have a "human factor" problem. For Example:

- Do you want to earn the same amount of money this year as you did last year, or would you like to better yourself?
- You start giving helicopter rides at a fair and on your first weekend you average 16 people an hour. Your next fair is a month away; will you try to improve your operation in order to give a few more rides an hour?

- Your son is a quarterback and in his first game of the season he passes for 90 yards. In the next game don't you want him to improve his yards passed? How proud will you be at the improvement?

Believe it or not, this same factor is at work in all of us. Here are some examples of what I hear from pilots after down wind related accidents:

- "I have done that very same thing a thousand times and this never happened"
- "I can't understand what happened, this is the same approach I have used for years"
- "When I got to the bottom I pulled collective and the bottom just fell out followed by the low rotor horn. The helicopter started to rotate to the right, the engine must have failed"
- "I think the torque gage was about 110% and then the ship started to rotate to the right, must have got LTE!"
- "It just would not get translational lift. The engine seemed good but must not have been; I had the throttle on the stop. The low rotor horn sounded and the helicopter settled back to the ground with forward speed"

Now we are back to the wrecking our car scenario. I don't think many pilots would say that they takeoff and land down wind, but they do, we all do. It usually starts with 2 or 3 knots of wind. Then after about 6 months of this working out it then becomes 4 to 6 knots. Now, a year or two later with all still going well, we graduate to 10+ knots of wind. The first major problem is that there is no information published in the flight manual that says - at 4000 density altitude and 2400lbs gross weight we can takeoff with 9.75 knots of down wind. All of us get away with it for years without incident. In reality it is safer to takeoff vertically into the wind than to takeoff down wind. Any down wind is too much. Problem number 2 is that no skid equipped helicopter lands well from a down wind autorotation. You just have to hope and pray that you have a long smooth surface to land. With all of the accident reports every year that are related to down wind, why do we all still do it? Human factors. We are always pushing the envelope whether consciously or unconsciously; trying to better ourselves even if better is down wind.

Food for thought: One of the major laws of physics states, "mass at rest stays at rest and mass in motion stays in motion and that mass travels in a

straight line unless a force is applied”. If our helicopter needs 18 knots of airspeed to gain translational lift and we have 10 knot of wind and depart into it, then we only need to accelerate our helicopter to 8 knots to gain translational lift. If we takeoff down wind then we need to accelerate the helicopter to 28 knots. We are going to need 3 ½ times the power and about 5 times the amount of space available to go down wind as opposed to going into the wind. In some cases the power required may be greater than the power available or the distance required may be more than is available. When this happens we will all get to read about it in the HAI accident reports.

### Running Takeoffs

If an Enstrom C, F, 480, or any skid equipped turbine helicopter will not hover and a running takeoff is needed then you have a problem. You either have a power problem or you are greatly overloaded. In my opinion, if the helicopter won't hover then it won't fly and its performance is questionable! This aircraft should be left on the ground!!

Why do you think they put wheels on large helicopters?

### Max-Performance Takeoffs

If you are in a confined area and must do a max-performance takeoff, then determine the wind and put as much space as possible in front of you. Here the fixed wing saying comes into play: “runway behind and air above you don't help.” Pulling the helicopter vertical and leaving clean, undisturbed air in front of you to use if necessary is by far the best approach.

### Landing Down Wind

Landing down wind proves to be especially disastrous in confined areas. Almost all of the pilot reports on these types of accidents read something like this: “When I got to the bottom I pulled collective and the bottom just fell out.” What comes after this will vary slightly: “the helicopter turned to the right”, “the low rotor horn sounded”, “the ground was all of a sudden there”, “I could not stop the helicopter”, or “the next thing I knew I was looking backwards”. When talking to an honest pilot or reading the report it will say something like “the pilot reported that the helicopter was fine before the accident.”

The down wind landing in a confined area gets us because, near the end of the landing, we are looking out the window and not at the instruments in order to hit our spot. If our airspeed drops to less than translation and if our vertical speed is over 300 feet per minute, we become prime candidates for settling with power. There is no way to increase speed because of our surroundings, so the human factor tells us to grab 3 handfuls at the bottom and hold our breath. Sometimes this works and sometimes it doesn't. Here again if we are well below the density altitude hover ceiling of our helicopter and if we have a small confined space that we must land in, then it would be safer to land vertical into the wind with well under 300 feet per minute decent rate than to land down wind with ground speed because we won't have any airspeed near the end.

### Running Landings

Running landings have destroyed many good helicopters. A skid shoe is broken and catches on the ground, forward speed is too high on ground contact, practiced on the grass to "save" the skid shoes and the aircraft rotated, this list also goes on and on. The human factor here is to pull back on the cyclic because we don't like our forward speed. A better approach to teach running landings is to have the student hold the helicopter off the ground about 5 feet. When they can accomplish this, with the tail behind them, then go to a hard surface (not on grass) to finish the training.

### In the Air

If you read the percentages, most accidents happen in the takeoff and landing phases of flight. Here we will go over some of the problems we may encounter during the in flight phase.

### Weightless

Weightlessness is a very misunderstood problem. Rather than spending 2½ hours on the problem I will give you the solution that works every time. When the seat belt gets tighter aft cyclic, that's all there is to it. This is guaranteed to work. If this is not done then the human factor is the reason why we will fall out of the air in pieces.

## Chasing

Chasing bad guys or animals is another problem we run into. Just watch the news, more and more police agencies are changing their chase policies. One of the worst cases of the human factor is that when we are chasing anything, be it a person in a fleeing car or a coyote, we become caught up in the chase. Our brain releases chemicals that only make the problem worse for us. Sooner or later, if done enough times with a helicopter, we will find ourselves down wind or settling with power. I have been involved with 2 settling with power incidents that involved chasing people and 5 down wind helicopter accidents involving chasing animals, 3 of which were coyotes.

Please, if you do this kind of work, you must not let your emotions cloud your judgment when getting the bad guy or the coyote. Know your wind direction and airspeed at all times. A way to help with the wind is to put it in the HSI heading bug, in the VOR, or ADF head. Keep it updated from any source such as ATIS, a flag, or water. This can be a real lifesaver when you get all caught up in the chase. When that sinking feeling comes, a quick glance at the appropriate indicator tells which direction to turn the aircraft into now! As many police departments have found, there is a large human factor problem with chasing. Sometimes there are only ego injuries, but more often serious injuries, or worse yet, death can occur. In these cases, tearing up equipment is in the background.

## Thrills

We go to an amusement park and ride their new, super biggest in the world, roller coaster. On the first trip and subsequent trips that day, we will get a rush and a thrill - this is only human. If we happen to work there and we have to ride it every morning for the maintenance check, by the middle of the season most of the thrill would be gone for us. That very same thing is present in our helicopter flying. Why do you think we have tour operators hitting ledges, 135 operators clipping trees or military helicopters running into each other? Just as in the roller coaster, the pilots say they are giving their passengers a thrill, but in reality they are really giving themselves a thrill. The 150 FT clearance after 6 months just doesn't thrill them anymore so they make it 100 FT and so on until common sense, a reprimand, or an accident follows. Believe me, the 150 feet of clearance still thrills the passengers even if it is their 5th ride. This is only one example, thrills are present in many forms including steep banks, exaggerated pushovers, low

lever flight, a ride down the river valley(this has got a lot of them), and the list goes on and on. Think of your own actions and you may see yourself in these or similar situations. If this is the case, now would be the best time to make a change.

### Safety and Pilots Food for Thought

The Dow Jones Company, who owns the Wall Street Journal newspaper, wanted to hire us to move a small group of people from Manchester, New Hampshire to their headquarters on RT 1 in New Jersey several times over a 2-month period. They own an S76 but need it to go back and forth to the city. Their flight department manager protested at the thought of 3 people in a single-engine Bell Helicopter, whether it was our L-3 or a 407. Management told him to get the hard numbers on the real safety of the twin-engine aircraft verses the single-engine one. I believe that we can all learn something from their work:

- The study was done on Bell Long Rangers and Bell 407s. I, however, think that it would hold true for any brand of single-engine turbine verses twin-engine turbine.
- A single-engine 135 turbine was safer in the way of serious injury or death with 2 pilots than a twin-engine turbine was with 1 pilot!
- Copit Resource management (2 pilots) was more important by far than the second-engine.
- With all this information on hand we reviewed the high number of medivac helicopter accidents and we found that almost all of them were single pilot operations flying both twin-engine and single-engine turbine helicopters. The number of engines did not appear to help and in the case of two accidents the cause turned out to be that, in the twin-engine ship, the good engine was mistakenly turned off.
- By the way, we got the job.

I personally believe that it is a lot safer to fly with 2 pilots. When we have a delivery to make, a hard-working student or newly rated pilot is selected to make the trip with our delivery pilot; this allows us to kill three birds with one stone.

- Bird # 1 The student or fresh pilot gains invaluable experience. We do not charge for this. It is a benefit of doing business with Sharkey's.
- Bird # 2 The student or new pilot tells everyone what a great time and learning experience they had, thus adding a free advertising benefit for our company.
- Bird # 3 The trip is made a lot safer by having two available pilots, even if one of them is still a student. Students sometimes have a better set of eyes than the pro pilot. Also please keep in mind that we all started out with zero hours!

### System Failures in Flight

Another example of the “human factor”: *What is this?* You are driving on a street that you have never driven on before and up ahead you see a red, 8-sided sign. No one has to wait until they can see all the letters on the sign to know that it is a STOP sign. We look quickly and our brain tells us that we should start to slow our vehicle down before we get to the stop sign.

This same scenario has played out with many turbine helicopters that have had forced landings. The only problem was an N1 system failure but when the horn went off the pilot slammed the collective on the floor, and then looked around at the gages. The torque gage read “0”, the TOT read 450 degrees, and the N1 gage was winding down going through 18%. After the following observations the pilot’s worst nightmare has come true, a real live engine failure. Thinking quickly back to his training for what to do; fuel valve off, battery and generator switch off and engine to idle cut off. That should help to prevent a post crash fire. Next the doors were unlatched so that they could get out if the airframe was sprung. Any landing you can walk away from is a good one.

In this case it was a good one; 1 destroyed Bell 206 and 2 people unhurt! The pilot told me what a great job he did in a bad situation, having an engine failure with no people hurt on the ground or in the helicopter. As far as the destroyed 206, that’s why they bought insurance! Why do you think you have to practically sell your soul to get a low-time piston pilot a decent price for turbine helicopter insurance? We all pay for this kind of accident, in our insurance rates! I have personally done 3 accident cases where there was nothing wrong with the engine, but the helicopters were all destroyed. Now that I have related the problem, here is the reason and solution.



“Human factor” is next to impossible to relearn, especially if every time you do something there is positive reinforcement. I will give you a perfect example that I heard at a safety clinic many years ago: You are stranded at a strange airport 5 miles from town and you desperately need to use a car to go into town. The only person at the FBO is a psychology teacher moonlighting for the summer. When you ask to use his car, the reply is that you will probably get into an accident with his car. When you push him (you really need to get into town) he says that he is doing a cause and effect study and has not finished working on the car. When you push him again his reply is that he is working on a positive reinforcement how to un-learn and has swapped the brake and the throttle pedals, therefore he does not want you to use his car. After some time you convince him to let you use the car, then in a panic when a child runs out in front of you, we all can guess what happened. Human Factor!

The engine out horn is related to the above story. In cruise flight in a counter-clockwise rotor, it is impossible to have an engine failure without a massive left yaw! If the torque is removed in a counter clockwise rotor, and no pedal change is made, the American helicopter has to turn left. Back to our pilot, the aircraft had no torque because the collective was slammed on the floor; the same goes for the TOT. The N1 was winding down because of an N1 system failure, not because of an engine failure. No yaw, no failure! To help overcome the human factors in this problem, we have all been beaten to death - engine out collective down, and to date it has worked AKA positive reinforcement. After you regain control of the helicopter and your wits, raise the collective slightly until the rotor is down to 97%. If the torque starts to rise then you're in luck, if not then you have lost nothing in trying, push pitch back down and good luck.

### Over Grossing

Here we are all guilty at one time or another. I have heard it said thousands of times; “if a helicopter will hover then it will fly”. This is true! Why do many helicopters allow more weight on the cargo hook than inside the helicopter? In most cases, the higher the inertia, the less the spread. The simple answer is that a lot more goes into a manufacturer calculating the gross weight of their helicopter than what it will lift.

1. Structural Integrity – there have been some fatal accidents caused by over grossing where the main rotor blades failed.
2. Autorotation – A major factor in the gross weight is what the helicopter will auto-rotate at. We all know from experience that if our helicopter is heavy then the rotor will turn a lot faster. As a competent pilot we add some pitch to put the rotor back in limits, but when we get to the ground it becomes very exciting. Doing a successful (no damage) autorotation on a hot day, in a massively over gross helicopter, is next to impossible.
3. Legality – Another very important point is that it is illegal!

### Settling with Power

This first part is pirated from a safety seminar that I attended. When are you most likely to encounter settling with power in your everyday flying? This question was asked of a mix of pro, commercial and private pilots. *Ask the crowd*

The #1 answer was when landing in a confined area down wind. The #2 answer was when doing any job that has a challenge involved which raises adrenaline levels, such as chasing an animal. In any settling with power problem, your best defense is a good offense. Keep air speed above translation and keep vertical speed under 300 feet per minute.

### Emergency Procedures

This is the single largest self-induced problem for our industry. Just take a look at the HAI accident reports; please keep in mind that these only show reported accidents, as many autorotation accidents go unreported and the helicopter is just repaired and returned to service. Since January I know of 2 autorotation accidents in my region that went unreported. In both incidents, a considerable amount of money was spent on the aircraft.

I am not here to build a fire on the risks verses the benefits of touch-down autorotations. I will say that no casino owner would allow them - “the small intake of knowledge gained from the last 5 feet as opposed to the possible payout just doesn’t add up.” I realize that the most respected name in helicopter training, the Bell Training Academy, does them and every now and then even they break one. They can afford it, we can’t!

Back to the reason for this seminar, the human factor plays a major role in broken helicopters from doing touchdown autorotations. Take any year of HAI accident reports and the amount of auto related accidents will scare you, it is always between 8 and 19%. Please also remember that for every 2 accidents reported, 1 goes unreported, and when this is factored in, the numbers get really scary.

#### Human Factors:

- An applicant works his tail off on the oral and is pounded during the check ride. Then the check airman says, “do a good touch-down autorotation and the CFI license is yours.” How much heat is on here? The major powers at the FAA must be fixed wing pilots. A CFI fixed wing applicant can get a spin sign off but not a touchdown auto sign off. When you think about it, this makes no sense!
- When doing a sales demo ride, the potential buyer says, “I understand that *brand X* falls like a safe and does a lousy auto. I also hear that *brand Y* that you are trying to sell me does great touch-down autorotations. I want to see one and if it is impressive you have made a sale.” Human Factor? How hard will you try?
- A pilot is giving 2 friends of his a ride in his Jet Ranger. They both happen to be Robby pilots. One of them says, “After last night hearing all of your war stories about your annual trip to Bell Training last week and how good you are at touch-down autos, we want to see one.” Human factor? Too much beer last night?

This list also can go on and on, but I think we have all gotten the drift. Anyone here who thinks they are so good at doing autorotations that they are above breaking a helicopter has a real problem. I personally turned down a major factory when they wanted me to go there and teach their certification pilots touchdown autos. My reply was, only if they would come to NH and use my equipment would I take the contract. I did their chief pilot here in New Hampshire; boy is he good!

Lets talk about the cure, and in this case the cure is not worse than the disease. We are dealing with a human factor, mostly our egos. Please don't get me wrong, your ego is a very important part of being a good pilot but it must be kept in check. Think back to the start of this presentation, which pilot do you want doing autos in your helicopter #1, #2 or #3? **Ask Crowd**

Don't decide to do a touchdown auto in the preflight briefing, to get a contract, in a sales presentation or from up in the air; all autos should start out as a power recovery. This approach will save you writing a check that your aircraft, unexpected developments, wind, or even copilot intervention makes it impossible for you to cash. Also it will protect your ego in the event things just weren't quite right. Always decide to do a touchdown in the flare if everything is absolutely perfect.

Never do a complete throttle chop. Never.

This has caused about 17% of all reported autorotation accidents in 2001. In a piston carbureted engine, the sudden slamming shut of the throttle plates causes a sudden increase in pressure in the venturi (similar to a fire hose being turned off too fast). If the needle and seat are worn when the pressure equalizes, the fuel may ride in the float bowl and, in effect, richen the mixture. In a fuel injected engine the needle in the flow divider may stick from the sudden change in fuel flow or on a hot day the large decrease in fuel pressure allows the fuel to boil, (such as on cool down when it won't run right without the boost pump on and a small load) with the same result as with the carbureted engine, it might quit.

In a turbine engine never chop the throttle from the co-pilot seat. Almost all turbine helicopters, Enstroms included, have a rigging design problem with the co-pilot throttle allowing more cable travel than the pilot's throttle does. The reason for this is that the idle release is on the pilot collective and the throttle cable is downstream of the release, therefore the normal wear in the system allows more cable travel when chopped from the copilot collective. This combined with the mousetrap design of the fuel control, either full on or full off, allows for a momentary interruption in the fuel flow which results in a flame out.

Lead the helicopter in the recovery. In this way you will not get behind the governor or tear up the over-running clutch in a piston. If you get behind the governor, you can expect a massive over torque, hard left pedal, or not enough pedal, or worse case, compressor stall with subsequent flame out.

Never give a simulated forced landing where an actual landing can't be made safely in the event of a problem. AKA a hard prepared surface.

Always go to a prepared hard surface. I know the grass feels better and even sounds a lot better, but on a hard surface the helicopter has a lot better chance of staying upright.

Try to do the recovery with a small amount of forward speed; this reduces the initial power required by about  $\frac{1}{2}$ .