DOWNLOAD PDF HELICOPTER PERFORMANCE

Chapter 1 : Factors Affecting Helicopter Performance

A helicopter's performance is dependent on the power output of the engine and the lift produced by the rotors, whether it is the main rotor(s) or tail rotor. Any.

Items that reduce the effectiveness and increase the risk of the mission include weight, temperature, altitude, and visibility. Helicopter missions that transport external loads increase risk. Be watchful of conditions that are High, Hot and Heavy! All helicopters have different maximum performance capabilities, so be aware of the capabilities of the specific helicopter that you are working with. Low-level helicopter operations often occur in heavy smoke where hazards e. Determine the risk level for every mission. Is the risk level acceptable? Can the risk be mitigated? If the risk is not acceptable or it cannot be mitigated, then the mission should not be flown. A large part of the success of a helicopter mission is the result of good communications between the pilot and the user on the ground. Accurate target and hazard descriptions are essential to a safe mission. Locate this information and relay it to the pilot. Things to consider in the target description include: Have you considered what the target would look like from the air? Are you located where the pilot can see you? Do you have a signal mirror? Are you using cardinal directions or clock directions in relation to the track of the aircraft? What is the wind direction? Provide this information to the pilot. Are all firefighters clear of the drop area? Is there a safer way to carry out an effective suppression action?

Chapter 2 : aircraft performance

Helicopter Performance Solutions, currently provides helicopter performance planning software for MI-8/17 airframes. We target helicopters that don't presently have reliable performance planning software and will be adding to our airframe inventory in the future.

Our team is passionate about accomplishing all missions efficiently and safely while working with the finest aircraft and equipment. The company is fond of the Sikorsky and Bell line of utility aircraft. We start with regular helicopters and then add all the available high performance upgrades like powerful turbine engines and composite technology blades, which significantly improves lift performance. These helicopters are stable, powerful, predictable and safe, which is the perfect combination needed to conduct precision helicopter lift services in all environments. High Performance Helicopters works with a variety of clients ranging from individuals and small contractors to federal and state governments that are spread all over the United States. Regardless of your geographic area our utility helicopter service has a creative and competitive cost structure to support your needs. Flexible helicopter service is our standard, HP Helicopters can accommodate your helicopter needs for one day projects such as an asset recovery of aircraft, vehicles or equipment. HP Helicopters specializes in long term projects such as aerial construction support and precision helicopter long line service for building repeater towers, power lines, hydro systems, specialty construction and seismic projects. Why Are We The Best? Top of the line aircraft and support equipment along with a professional staff has enabled us to maintain our fantastic safety and business record that includes no accidents, aircraft damage, major injuries, contract defaults, lawsuits or FAA violations since our inception in Helicopter, crew and project safety is ALWAYS our primary factor in decision making followed by customer satisfaction, economics, and production. Hot temperatures, steep mountains and high altitudes typically equal high winds which in many cases are used to our advantage. Some of our helicopters can typically maintain gross weight performance up to 11, feet pressure altitude. As with all aircraft, increases in temperature negatively affect aircraft performance but with our light weight airframes, large turbine engines and composite rotor blades, the effects of higher temperatures are reduced allowing us to maintain high performance in extreme environments. Experience The success of HP Helicopters is a result of our experience. With well over a decade of experience HP Helicopters has been proven in regards to both safety and customer satisfaction. We have extensive Baja experience and have chased for many teams and top drivers in the sport. Our medium helicopters are the perfect platform to provide air support for all races including the Mint , Parker , Baja and the Baja With just a little advanced notice from the helicopter flight crew the driver can greatly reduce the risks associated with off road racing for himself and others. If there is an incident with the race car the helicopter is already there and loaded with fire extinguishers, driver extraction tools and a on board medic. Our number one priority is to safely remove the driver and navigator from the wreckage unless injuries prohibit this , suppress fire and coordinate the appropriate emergency response tactics. Every situation is different but common communication and coordination tactics include the following objectives: It is intended that helicopter air support is only utilized for photography, incident avoidance and emergency response. Race promoters such as B. E are very adamant about helicopters not being used to create a competitive advantage over the smaller race teams that can not afford the air support. Our helicopters are based in the center of off road racing and are only 30 minutes flight time from the Barstow testing grounds. Whether your testing or racing, HP Helicopters can add a significant level of safety to your race program and help insure that both drivers and navigators return safely. From building repeater towers to power lines to mountain top water tanks our construction helicopter crane service has the capabilities needed to safely and productively build or repair infrastructure in the toughest places. Emergency Frost Control HP Helicopters is centrally located in some of the most productive agriculture areas in California. Our location and fast ferry times allow us to provide effective San Jacinto helicopter frost control, Imperial valley helicopter frost control and San Joaquin helicopter frost control. Our Bell medium helicopter is equipped with auxiliary fuel tanks that keep the aircraft airborne for over 4 hours. Unlike small frost control helicopters our bell medium weighs over lbs when loaded full of fuel. The horsepower engine produces high heat and the 52 foot rotor diameter moves massive amounts of air for effective helicopter frost control. For comparison small frost control helicopters weigh lbs and have horsepower engines which can make it tough to move enough air on large farms and when time is of the essence, bigger is better. If very large amounts of air need to be circulated quickly then consider our American Hawk UH60 helicopters. Our American Hawks utilize two large GE turbine engines and have a gross weight limit of 22, lbs. The American Hawk is a large and cost effective solution for moving and warming massive volumes of air in a short amount of time. All of our helicopters are equipped with excellent lighting, synthetic flight vision systems, weather radar and flight path grid tracking systems which allow for safe and productive flight grids to be flown on the darkest of nights. Our mobile heli bases are completely self sufficient to keep the crew onsite for the entire patrol contract without the need for off site lodging or fueling. Remote Crew Delivery Delivering construction crews to remote construction sites is an important factor for safely and efficiently getting helicopter projects completed. Rest assured that our operating environment demands that we maintain our aircraft above and beyond the typical charter aircraft maintenance standards and the Bell medium series helicopters are one of the most capable and proven air frames in history. Our flight crews will work hard to get your construction crews as close as possible to the work site without compromising safety. Our crews have seeded thousands of acres utilizing our large Isolair broadcaster. We are able to load up to 3,lbs of seed into our oversized high output material broadcaster in less than two minutes which allows for fast turn times and efficient operations. We have a proven track record for accurately and consistently applying the proper pounds of PLS seed per treatment acre in many different regions of the western United States. Helicopter Logging HP Helicopters is very proficient with high production helicopter logging and hazardous fuel reduction operations. Our aircraft have unique altitude capabilitiesthat help keep our average turn weights up even in thehottest and highest environments. We utilize a high production 4 slot nubbins hook system and have hundreds of chokers that are designed for all types of wood extraction. We utilize short 20ft chokers for large wood and long 40 ft double bell chokers that allow us to daisy chain multiple loads together and choke large brush piles for extraction. HP Helicopters can provide all PPE, two way radios and onsite training to allow for your crews to conduct all the ground and hooking operations to save you money. Our mobile Helibases are fully self sufficient with Sat TV, Internet and communications that keep our team connected in remote locations. Our bases can sustain the crew for weeks without the need for hotels, grocery stores or restaurants. The support rigs carry all critical helicopter spares such as gearboxs and servos along with all other items required to keep our aircraft online all the time. Special Projects We thrive off of all the different types of calls and requests for special helicopter services. This UFO is covered in thousands of small lights and looks amazingly realistic when hanging feet under a helicopter at night. We dimmed the aircraft navigation lights and flew the UFO low level through the canyons while the very surprised crowd was trying to figure out what they were seeing and if it was real. Vertical reference long line operations can be very difficult at night when the sky is dark and you are in the mountains but its these types of challenges that keep our team motivated and driven to succeed. Call us for all for your special requests and we will try everything possible to make it work. Onsite Aircraft Support Aircraft support rigs are absolutely critical to running a successful operation. At HP Helicopters our support trailers were ordered new and were specifically configured to perfectly support which ever operation they are assigned. Crew comfort is paramount when the team is expected to work long days away from home. High moral is a critical element to high production along with the proper tools and parts inventory. The crew can typically save a few hours per day of traveling to and from the work site by staying in our remote helibase set ups.

Chapter 3 : Helicopter Performance | NWCG

Helicopter performance revolves around whether or not the helicopter can be hovered. More power is required during the hover than in any other flight regime. Obstructions aside, if a hover can be maintained, a takeoff can be made, especially with the additional benefit of translational lift.

Density altitude air density Wind velocity during takeoff, hovering, and landing Air density Air, like liquids and other gases, is a fluid. Because it is a fluid, it flows and changes shape under pressure. Air is said to be "thin" at high altitudes; that is, there are fewer molecules per cubic foot of air at 10, feet than at sea level. The air at sea level is "thin" when compared to air compressed to 30 pounds of pressure in an automobile tire. A cubic inch of air compressed in an automobile tire is denser than a cubic inch of "free" air at sea level. For example, in a stack of blankets, the bottom blanket is under pressure of all blankets above it. As a result of this pressure, the bottom blanket may be squeezed down until it is only one-tenth as bulky as the fluffy blanket on top. There is still just as much wool in the bottom blanket as there is in the one on top, but the wool in the bottom blanket is 10 times more dense. If the second blanket from the bottom of the stack were removed, a force of 15 pounds might be required to pull it out. The second blanket from the top may require only 1 pound of force. The above principle may be applied in flying aircraft. At lower levels the rotor blade is cutting through more and denser air, which offers more support lift and increases air resistance. The same amount of power, applied at higher altitudes where the air is thinner and less dense, propels the helicopter faster. Density altitude Density altitude refers to a theoretical air density which exists under standard conditions of a given altitude. Standard conditions at sea level are: Atmospheric pressure - Standard conditions at any higher altitude are based on: Atmospheric pressure reduced to sea level: The actual barometric pressure at an elevation of 5, feet under these conditions would be approximately The average temperature decrease per 1,foot increase in altitude is 3. Figure 51 above right shows a density altitude chart. The four factors which affect density altitude are altitude, atmospheric pressure, temperature, and moisture content of the air. Altitude We have already seen the effects of altitude on air density in the first section of this chapter. The greater the elevation of an airport or landing area, the less the atmospheric pressure and, consequently, the less dense the air. The less dense the air, the greater the density altitude. What is the result when operating at a high density altitude? Helicopter performance is decreased see figure 52 to the right. It can be seen from the density altitude chart that, as altitude increases, density altitude increases. Atmospheric pressure The atmospheric pressure at an airport or landing area at a given elevation can change from day to day - sometimes a very noticeable amount which, when combined with other factors, could be significant. The lower the pressure at a given elevation, the less dense the air; the less dense the air, the higher the density altitude and, as a result, the less performance the helicopter will have. The daily and seasonal variations in atmospheric pressure at a given place will not have as significant effect on the density altitude as the daily and seasonal variations of temperature and moisture. The density altitude chart is based on pressure altitude, not indicated altitude see figure 51 above. To determine the pressure altitude at any given place, if an altimeter is available, adjust the altimeter setting to However, do not forget to reset the altimeter to the current altimeter setting if available, or to field elevation if an altimeter setting is not available. Temperature Even when elevation and pressure remain constant, great changes in air density will be caused by temperature changes. The same amount of air that occupies 1 cubic inch at a low temperature will expand and occupy 2, 3, or 4 cubic inches as the temperature rises. Therefore, as temperature increases, air becomes less dense, density altitude is increased, and the helicopter performance decreases see figure 53 to the right. A study of figure 51 easily reveals that, as temperature increases, density altitude increases since the pressure altitude lines slope upward to the right. We have already used the density altitude chart to find the density altitude at an elevation of 5, feet under standard atmospheric conditions for that elevation - that is, atmospheric pressure reduced to sea level When the atmospheric pressure, reduced to sea level at a given elevation, is A helicopter operating at this elevation under these conditions would be flying in air with a density equivalent to that at the 8,foot level. Therefore, the performance of the helicopter would be as though it were flying at the 8,foot level rather than the 5,foot level.

Moisture When temperature and pressure are constant, changes in the moisture content of the air will change air density. Water vapor weighs less than dry air. Therefore, as the moisture content of the air increases, air becomes less dense; density altitude is increased with a resultant decrease in helicopter performance see figure 54 to the right. The higher the temperature the greater the amount of moisture the air can hold. Relative humidity, which is expressed as a percent, is the ratio of the amount of moisture in the air to the amount it is capable of absorbing at a given temperature. The greatest decrease in air density increase in density altitude due to moisture content will be at a high temperature. The density altitude chart figure 51 does not take the moisture content of the air into consideration. It should be remembered that the actual density altitude can be much higher than that computed from this chart if the air contains a high moisture content. The importance of this added effect of moisture on helicopter hovering performance will be seen shortly. High density and low density altitude conditions The terms "high density altitude" and "low density altitude" should be thoroughly understood. In general, high density altitude refers to thin air; low density altitude refers to dense air. Therefore, those conditions that result in thin air - high elevations, high temperatures, high moisture content, or some combination thereof - would be referred to as high density altitude conditions; those conditions that result in dense air - low elevations, low temperatures, low moisture content, or some combination thereof - would be referred to as low density altitude conditions. It is important to note that high density altitudes may be present at low elevations on hot days with high moisture content in the air. Because the difference between the power available and the power required is so small for a helicopter, particularly in hovering flight, density altitude is of even greater importance to the helicopter pilot than it is to the airplane pilot. Helicopter performance is reduced because the thinner air at high density altitudes reduces the amount of lift of the rotor blades. Also, the unsupercharged engine does not develop as much power because of the thinner air and the decreased atmospheric pressure. Hovering flight High density altitudes reduce the hovering capabilities of the helicopter see figure 55 above. Under any given load condition, the higher the density altitude, the lower the hovering ceiling; that is, the elevation at which the helicopter will be able to hover will be lowered as the density altitude increases. Figure 56 gives the hovering ceiling in ground effect for one helicopter at various gross weights and temperatures both in dry air and air at 80 percent relative humidity. The following previously established points should be easily recognized from this chart: Figure 57 right illustrates the hovering ceiling in ground effect for temperature and gross weight variations for one helicopter, but does not reflect the effect that moisture content has on the performance. Takeoff For any given gross weight, the higher the density altitude at point of departure, the more power that is required to make a vertical takeoff to a hover see figure 55 above. In fact, under certain gross weight and density altitude conditions, a helicopter may not have sufficient power to lift off vertically, in which case, if takeoff is made, it would have to be a running takeoff. Figure 58 right shows a chart that is used to compute the takeoff distance required to clear a foot obstacle under various gross weight, pressure altitude, and temperature conditions. A brief study of the chart immediately reveals the previously established points, that is, as gross weight, altitude, and temperature increase, the takeoff performance decreases. This chart is used in the following way: In the first column, locate the helicopter gross weight. In the second column, opposite the gross weight, locate the pressure altitude at point of takeoff. Follow this pressure altitude row out to the column headed by the temperature at point of takeoff. The figure at the intersection of the pressure altitude row and the temperature column is the number of feet required for this particular helicopter to take off and clear a foot obstacle. If the gross weight, pressure altitude, or temperature, or any combination of the three, fall between the listed values, the interpolation process will have to be used to compute the distance. In the first column, locate 2, In the second column opposite 2,, locate 6, The distance required to clear a foot obstacle under these conditions then is feet. The solution requires interpolation. In the second column opposite 2,, locate the 4, and 6,foot rows. Since 5, feet falls midway between 4, and 6,, we assume that the takeoff distance at this altitude falls midway between 1, and 1, By taking half of the difference of the two distances and adding it to 1, or subtracting it from 1, , the distance required to clear a foot obstacle under the conditions of the problem is 1, feet. Since this chart does not take into consideration the decrease in air density due to moisture content, takeoff distances may be even greater than those computed from the table. Rate of climb For any given gross weight, the higher the density altitude, the less the rate of climb for any helicopter. Although a helicopter may be able to take off and clear obstacles close by, higher obstacles farther away may not be cleared because of this reduced rate of climb. Figure 59 illustrates the type of chart that is used to compute the rate of climb for one model of helicopter. The steps for using this chart are exactly the same as those listed previously for the takeoff distance chart. Figure 60 right illustrates another type of chart used to compute rate of climb for another model helicopter. To use this chart, you must follow these steps: Compute the density altitude at the departure point using the density altitude chart figure Locate this density altitude along the left side of the chart figure Follow this altitude line horizontally until it intersects the diagonal line. From this point of intersection, move vertically downward to the bottom of the chart where you read the rate of climb under the existing conditions. From the chart to the right in figure 60 right , you can determine the best rate of climb airspeed under the various density altitude conditions. From the density altitude at the left side of the chart, move horizontally across until the line intersects the diagonal line on the right-hand chart. From this point of intersection, move vertically downward to the bottom of the chart where you will read the best rate of climb speed in miles per hour. Landing Because a pilot can hover at a takeoff point with a certain gross weight, it does not mean that hovering power will be available at the destination airport. The pilot will have to make a running landing under these conditions. The pilot should be able to predict whether hovering power will be available at the destination through 1 a knowledge of temperature, relative humidity, and wind conditions, 2 the use of charts in the helicopter flight manual such as figures 56 and 57, and 3 by making certain power checks in flight prior to attempting to land. These power checks will be discussed later. The illustration to the right is a typical chart that is used to compute the total landing distance over a foot obstacle for one model of helicopter.

Chapter 4 : What effect does cold weather have on helicopter performance? - Aviation Stack Exchange

A significant number of New Zealand helicopter accidents are performance-related, with the majority of these accidents occurring during the takeoff or.

Helicopter Performance, Stability and Control About this online course Course video This course gives an extended introduction to the field of rotorcraft including conventional helicopters, hybrid aircraft-rotorcraft configurations such as tiltrotors and helicopters carrying slung loads. The direction of future rotorcraft development is covered with an outline of the research that is still needed to transform rotorcraft in a reliable future means of transportation. This course covers the following topics see "details" tab for more information: And for those wishing to move into the area of helicopter and rotorcraft design, development and operation it will also prove invaluable. This course will benefit practicing engineers, managers or other professionals involved in rotary wing engineering, design, testing, operational evaluation or other technical aspects. The course is suitable for entry level engineers and advanced level as well. Download Course Syllabus Details Nowadays helicopters are generally reliable flying machines capable of fulfilling missions impossible with fixed-wing aircraft. But a direct lift aircraft could come in and save his life. But helicopters remain complex vehicles and their development tends to lag behind that of fixed-wing aircraft some two decades. This course addresses these issues by covering the following topics: Assessment You will complete four assignments during the course and one final assignment which consists of building a piloted simulation model for flying a typical pre-selected helicopter maneuver. These assignments will be handed in digitally through the Electronic Learning Environment. Qualifications Certification If you successfully complete your online course you will be awarded with a TU Delft certificate. This certificate will state that you were registered as a non-degree-seeking student at TU Delft and successfully completed the course. If you are admitted, you can then request an exemption for this course that you completed as a non-degree-seeking student. The Board of Examiners will evaluate your request and will decide whether or not you are exempted. Admission General admission to this course Required prior knowledge A relevant BEng or BSc degree in a subject closely related to the content of the course or specialized program in question, such as aerospace engineering, aeronautical engineering, mechanical engineering, civil engineering or applied physics. The faculty of aerospace engineering will decide whether you will be admitted based on the information you have provided. Appeal against this decision is not possible. Expected prior knowledge In addition to the entry requirements mentioned above, prior knowledge of the topic is necessary in order to complete this course. For admission purposes, TU Delft will not ask you for proof of this prior knowledge, but it is your responsibility to ensure that you have the sufficient knowledge, obtained through relevant work experience or prior education. To view the essential background knowledge, please check your knowledge against the learning objectives of these comparable TU Delft courses: If your working language is not English or you have not participated in an educational program in English in the past, please ensure that your level of proficiency is sufficient to follow the course. TU Delft recommends an English level equivalent to one of the following certificates given as an indication only; the actual certificates are not required for the admission process:

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Chapter 5 : Comparing helicopter performance - PPRuNe Forums

Helicopter Performance. Basic Helicopter Design. Helicopter Controls. Cyclic Control. The "cyclic" is controlled by the pilot's right hand. Aircraft moves in the direction that pressure is applied to the cyclic.

Army began a program to study improvements to current helicopters that could be demonstrated by testing. Analyses by three helicopter companies showed that performance could be greatly improved. After the study, Bell submitted a proposal for the High Performance Helicopter. The first configuration was the basic YH helicopter with drag reduction changes. The second configuration added a pair of jet engines for additional thrust. The third configuration added swept wings for extra lift. New aerodynamic fairings were developed using fiberglass honeycomb sandwich for the rear fuselage , a cambered vertical stabilizer was developed which, in cruise flight, aerodynamically unloaded the tail rotor. The skid landing gear also had streamlined fairings applied to it and the rotor mast was replaced by a mast that could be tilted in-flight. Modifications to the flight controls allowed either rotor to easily be fitted to the aircraft in a short time, and the three-bladed rotor could be mounted on the gimbal or rigidly to the mast. Bell configured the with two The sweep of the wings was adjusted by maintenance personnel on the ground. Later in the program, the tilt of the wings was linked to the collective control to limit lift and to control rotor speed during autorotational profiles. After flight tests to determine the characteristics of the aircraft with the wings installed, the wings were removed. The thrust from the two pound 4. Following the modification, flight tests were resumed on 2 March , with both wings and engines mounted. In an effort to achieve even higher speeds, Bell removed the JT-9 engines and replaced them with 1,pound 7. Bell removed the wings previously used and replaced them with a stub wing mounted higher and further back on the airframe. Bell also modified the helicopter flight controls to change pitch control from inputs to the rotor during lower flight speeds to airplane-style elevator control during high-speed flight. On 15 April , the Model achieved its highest speed of Afterwards, the Model was returned to its original two-bladed configuration and retired.

Chapter 6 : Helicopter Performance, Stability and Control | TU Delft Online

Certain helicopter missions push the limits of the aircraft's performance capabilities. Items that reduce the effectiveness and increase the risk of the mission include weight, temperature, altitude, and visibility.

Chapter 7 : Helicopter Performance Solutions

Federal Aviation 2 Administration Helicopter Performance in HEMS March 15, 2 Objectives â€¢After this presentation, the audience will: Understand the certification aspects of Category-A.

Chapter 8 : Eurocopter AS Ã‰cureuil - Wikipedia

helicopter performance Assuming that a helicopter engine and all components are operating satisfactorily, the performance of the helicopter is dependent on three major factors: Density altitude (air density).

Chapter 9 : BLR Aerospace â€“ Aircraft Performance, Airbus Helicopters, Bell Helicopters, Hawker Beecho

Helicopters /Filipe Szolnoky Cunha Helicopter Performance Slide 34 Forward Flight Performance â€¢ Tip relief effects can be accounted for in the BET using a effective local Mach number at each blade element in.