Bell Helicopter
A Textron Company

Rotorbreeze

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What's Inside...

MV-22 Resumes Flying, Exceeds Expectations

By Gidge Dady
NAVAIR Public Affairs

The MV-22 Osprey took to the skies above Naval Air Systems Command, Patuxent River, MD., May 29, for the first time after being grounded for more than 17 months following an operational pause.

The first MV-22 test aircraft to resume flying has improvements in its hydraulic and flight control software systems that make it practically a brand new aircraft and the most capable Osprey yet, according to V-22 program officials.

"The long awaited return to flight was a success. The Osprey not only performed what today's test plan called for, but exceeded our wildest expectations," said Col. Dan Schultz, V-22 program manager.

The original flight plan called for the aircraft to take off, hover and land. After successfully completing several vertical takeoffs, landings and hovering maneuvers over the runway, the pilots conducted rearward and sideward flights to check the aircraft's maneuverability in helicopter mode. The pilots gradually increased maneuver speeds up and down the runway, went into landing pattern circuits and began conversion work. Later in the afternoon, the Osprey's encore performance included a full conversion to airplane mode at level flight speeds of 250 knots. The Osprey logged nearly two-and-one-half hours of flight time and returned in full-up flight status.

Tom Macdonald and Bill Leonard, senior Bell Boeing V-22 Integrated Test Team pilots, who have a combined total of 13,000-flight hours in both fixed and rotary wing aircraft and more than 500 hours each in the MV-22, took the aircraft through a series of maneuvers to evaluate its handling and performance. Part of this series included converting out from helicopter to airplane mode to take standard vibration measurements to check out the tracking and balance of the individual blades of the two proprotors. This "test card" for the first flight series follows the Osprey's methodical and event driven approach to safely return the aircraft to flight testing.

"Along with everyone else on the V-22 test team, we are excited about being back in the flight test business. We are proud of the extensive safety and reliability enhancements to the Osprey's design, which was made possible by the concerted efforts of many people throughout the NAVAIR, Bell Boeing, Rolls Royce and supporting contractor teams," asserted Macdonald.

Leonard shares the excitement of being back in the air and moving forward with flight testing. "I'm dedicated to the concept and believe tiltrotor technology will be as important to aviation as the advent of the jet engine," he explained. "This aircraft has potential that we in the aviation community have yet to understand let alone exploit. I've been actively engaged in military and civilian aviation for over 35 years, flown well over 100 different aircraft and truly believe that this technology, if exploited properly, will impact both civil and military aviation to an incredible degree."

In preparation for today's flight, several days of aircraft ground runs and a systems checkout were conducted so both pilots would have further opportunity to re-acquaint themselves with the V-22 cockpit prior to the actual flight.

"To ensure that no stone has been left unturned in our pursuit of safety and excellence, the entire process was structured and viewed by the V-22 Integrated Test Team as a true first flight, almost as if the aircraft had never flown before and was making its maiden flight," said Macdonald.

As part of the training for this flight, Macdonald and Leonard had a dress rehearsal simulation at the Manned Flight Simulator, which allowed them to practice the first flight following the actual test cards and procedures developed for it with the Telemetry Room Engineering Team directing the flight and monitoring the progress and instrumentation in the control room.

This flight marks the beginning of an 18-month developmental flight test plan that will validate the engineering and design changes made to the aircraft and continue with developmental testing that will further test such areas as vortex ring state boundaries, dynamic ship board compatibility, formation flying, and low-speed hovering and landing conditions.

Other areas to be tested include the aircraft's icing, cargo handling and radar warning systems. A total of 1,800 flight test hours are scheduled over this period of time using seven MV-22 aircraft.

KHALIFA AIRWAYS TAKES DELIVERY OF ITS SECOND BELL...TWO MORE TO COME THIS YEAR

By Christophe Nurit, Sales Manager – Africa

On June 4, the executive committee of the Algeria-based Khalifa Group flew to Fort Worth to take delivery of their second Bell helicopter, a transport configured Bell 412 EP.

Rafik Abdelmoumen Khelifa, Chairman, CEO and President of Khalifa Group receives a 412 model from Glenn Hess, President and COO of Bell Helicopter.

This Bell 412 EP is being delivered four months after the delivery of Khalifa's first VIP Bell 427 helicopter. In conjunction with the light twin helicopter, the Bell 412 will be used by the Algerian airline company for transport of oil and gas personnel throughout Algeria. To fulfill the Algerian need in this market, Khalifa Airways is scheduled to take delivery of two additional Bell 412 EPs before the end of 2002.

With four Bell helicopters to be delivered this year, many additional Algerian personnel will come to Fort Worth to be trained, both in English and French, throughout the next three months. The Bell Helicopter Customer Training Academy has already started a comprehensive ground and flight training program for a dozen Algerian pilots, mechanics and engineers.

Khalifa Group, the parent company of Khalifa Airways, has a staff of over 35,000, which includes an airline, a communications company and a banking network in Algeria. Based in Algiers, Khalifa Airways is a new airline company that flies 36 brand new Airbus and Boeing aircraft, thus making Khalifa Airways one of the leading airlines of North Africa Khalifa's management has marked its preference for the excellent performance, unequalled safety and support of Bell helicopters, thereby becoming a 100 percent Bell client. During the delivery ceremony, Mr. Rafik Abdelmoumen Khelifa, Khalifa Group's Chairman, CEO and President, thanked all the Bell personnel for the warm reception and reinforced his company's desire to grow a strong and mutual relationship with Bell Helicopter for many years to come."

Khalifa Airways' new 412

DISCUSSING RADS-AT

By Don Maguire, Manager, PSE Light

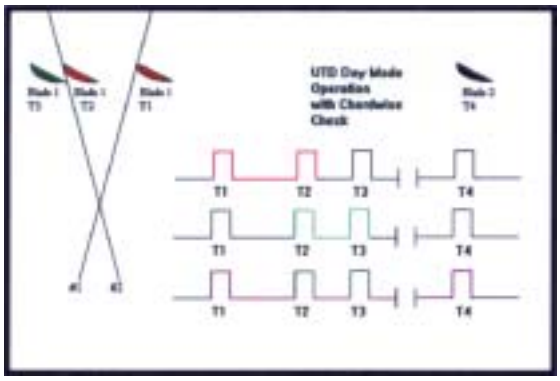
Rotor Analysis Diagnostic System – Advanced Technology

When the subject of vibration analysis or Rotor Track and Balance (RT&B) arises in a conversation with a customer, the questions can often be predicted with a high-degree of certainty. Why does Bell insist on using RADS equipment? Will Bell ever approve equipment other than RADS? Must I use the RADS when performing RT&B? In this article, we hope to address each of these issues, describe the equipment, its features and benefits and to validate the Bell position on this excellent tool.

It probably will come as no surprise that Bell Helicopter approaches rotor smoothing and vibration analysis with largely the same goal as the technician in the field. When faced with these tasks, Bell seeks to understand the condition under study, make adjustments to correct the undesired characteristics and return the aircraft to service with the least expense in manpower, engine starts and flight time. One difference in approach is that Bell chooses exclusively the RADS-AT equipment by Smiths Aerospace. So, why does Bell prefer the RADS-AT? Let's expand on the Bell position by first better understanding the equipment.

The photo at left shows the most significant items of the RADS-AT kit. At the left is the Enhanced Universal Tracking Device (E-UTD also known as UTD), at the upper right is the Control and Display Unit (CADU) and third item is the Data Acquisition Unit (DAU). In addition to these principal items are the accelerometers, cables and brackets typical or any vibration analysis equipment.

Industry-leading technology of the RADS is designed into the E-UTD, which achieves an accurate track picture (+/- 2mm) that does not rely on human interpretation of the track data. The E-UTD lens views the passing rotor through an 11-degree cone as shown in the graphic depiction below. The principle of operation may be described briefly as follows.



The difference between T1 and T2 displays the height of the blade over the E-UTD, and by comparison with other blades, shows relative track spread. Simply stated, the higher blade in track will take longer to pass through the cone of view, interpreted by the RADS-AT as track height. As the blade departs the viewing cone, the T2-T3 check verifies chord width and other installation parameters. This feature confirms that RADS installation and blade surface contrast are ready for RT&B procedures. Finally, the T3-T4 comparison above represents lead-lag characteristics between blades accurate to within .2mm, a feature that can be instrumental in early identification of elastomeric anomalies that may be contributing to the ride condition under study.

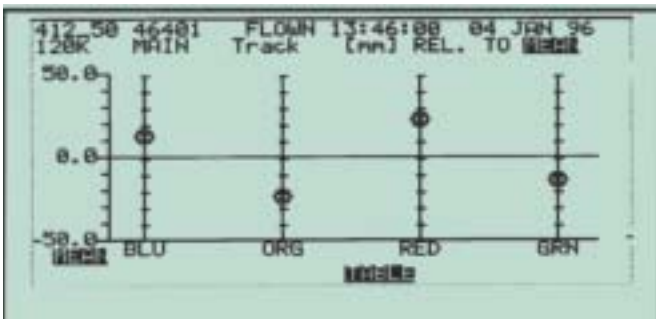
A complete explanation of RADS-AT features and benefits would consume much more than the space available in this article, but a brief description of the more significant is appropriate. The E-UTD is not affected by most ambient light conditions, is capable of both night and daytime use, does not use a strobe light and does not rely upon human interpretation for track display. The DAU has channels adequate to accommodate up to 14 accelerometer inputs, two tachometer channels and two tracker channels. The ability to acquire data simultaneously on four channels significantly reduces flight test time and each flight automatically records data ranging from 1:1 up to 12:1 for each accelerometer channel. Similarly, frequencies can be viewed from 2 Hz to 20 KHz, and with two Meg of on-board memory, even extensive flight test profiles can be accommodated with confidence.

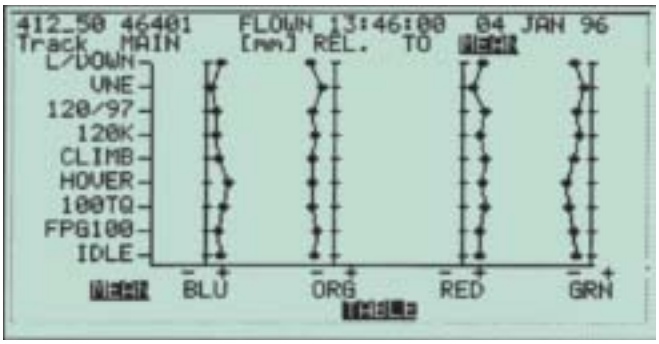
Very helpful added "soft features" include the Credit Card Memory (CCM), edit and prediction functions, e-mail of downloaded data to other destinations, and the program "open" architecture. The

CCM allows programming and flight test data to be stored and transferred by means of a removable "credit card memory." The edit function allows the tuning technician to not only elect to not use certain adjustments, but also to use a feature that predicts the ride resulting from proposed adjustments. One example of an edit choice is a minor trim tab adjustment, perhaps difficult to affect accurately, or due to concern for over-bending or concern for difficulty to regain the original tab location. In a case like this, the technician can edit the trim tab from the suggested adjustments, and seek the desired smoothness by other, more finite means. Once the edit has been made, the user may then view the predicted changes on the "View Predictions" page to see if the adjustment would be appropriate and the desired ride quality would be obtained.

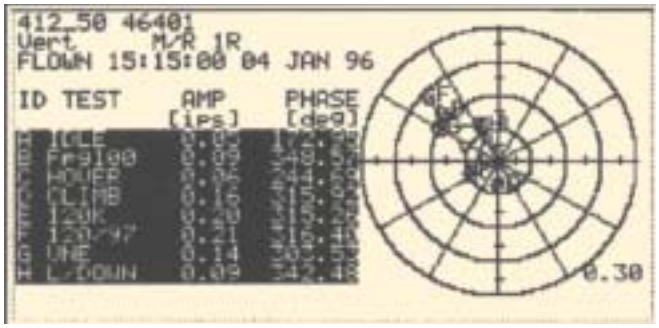
The e-mail and open architecture features are true benefits that isolate RADS-AT as superior to other offerings. The e-mail capability not only allows communication with the factory for vibration comparison with the original production flight test values, but also Bell Product Support Engineering and Dynamics Engineering expertise can be easily sought for interpretation of the test results and guidance on the best course of remedial action. The open architecture permits Bell to modify script files and quickly introduce programming improvements to the RADS units in the field, eliminating delays in software revision. By using RADS and remaining in touch with Bell, no technician performs RT&B in isolation, but rather he performs these tasks with factory experience and assistance readily available.

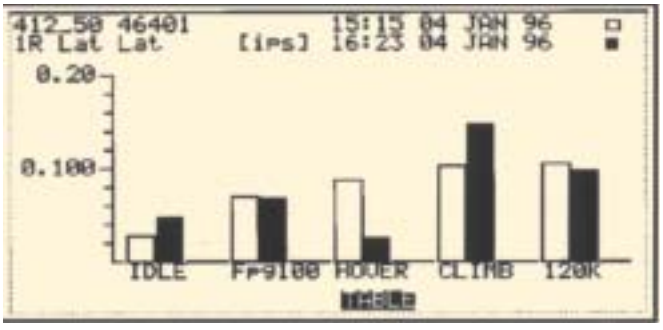
These benefits alone may be enough to confirm the RADS-AT as the leading technology, but in addition the designed-in flexibility and versatility of the system further defies criticism. Acquired data may be displayed in various formats to satisfy interpretation, analysis, presentation and purely personal preferences. Track separation for example may be displayed in mm, inches, feet, meters or mils, and in a printout format easily understood as shown. Multi-blade rotors (2-8) are individually displayed as in the Bell 412 case above, with the identifying blade identification color and flight characteristics readily visible.





For comparative purposes, data may be displayed (below) in a polar or bar chart format for ease of interpretation and comparison versus earlier flights or historical data. Examples include those below where a polar chart permits phase changes to be studied between flights or test states for diagnosis of





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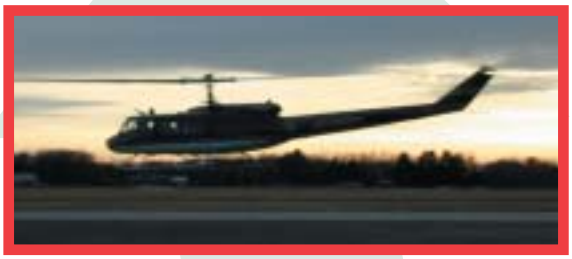
Huey II Upgrade Modification Process

By Bill Goebel, Bell Helicopter Textron, Huey II Program Manager and
Steve Burns, Managing Director, Helipro, East Coast Division



As the customer takes delivery of the aircraft they are reassured of the workmanship and reliability of the Huey II installation and components.

The true transformation of this 38-year-old veteran becomes apparent following painting. The Huey II incorporates numerous new components that are fully supportable through the Bell CSF and Parts supply systems for several decades to come.

In the paint shop, the aircraft is stripped to bare metal where it was discovered that this aircraft had at least seven layers of paint!

First engine start and ground run are uneventful and transmission tests, leak checks and initial blade track and balance follow in preparation for the post-maintenance test flights. Later the aircraft will be flown to the paint shop.

Aircraft final assembly is next, followed by flight control rigging, aircraft weighing and flight test preparation. Time for all eyes to take a good look and QA to approve for engine runs and flying.

Part II Reassembly

This is part 2 of a pictorial essay representing the upgrade modification of a UH-1D/H into a Huey II configuration. Special thanks goes out to HELIPRO's East Coast Division for their assistance in obtaining the pictures demonstrating the steps taken during the disassembly of the UH-1D/H, general description of the kit components and the assembly of the Huey II. We at Bell Helicopter hope that this information clarifies the modification process and gives insight to the Huey II achievement.

The freshly upgraded T53-L-703 is installed in the airframe with some minor modifications to the baffling, plumbing and wiring. A new driveshaft tunnel accommodates the new, larger tail rotor driveshaft, and a new Kaflex engine driveshaft will be installed.

Meanwhile, the main transmission is back from the overhaul shop where it has been modified by the installation of new main case, new support case, new top case, new ring gear case, new sump assembly, and new input quill assembly. All wired and plumbed, this assembly is ready to install.

Completely modified fuselage is transported to the hangar where this customer's new high-skid gear awaits. The short drive inspires a few curious onlookers to offer commentary from the sidewalk.

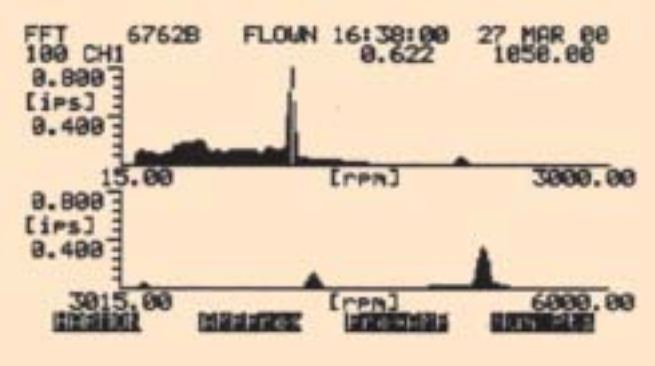
The main rotor is being statically balanced in preparation for installation on the aircraft. The standard Huey II kit comes with gray and white main rotor blades. This customer elected to install the optional high-visibility blades for their operation.

Continued from page 5

mechanical faults. The polar chart is an excellent method of understanding damper performance versus rotor speed, and in some cases, eliminating the rotor blade adjustment as a contributor to a change in ride quality.

When troubleshooting an unusual vibration or trending an aircraft to record vibration characteristics, the flexibility of the RADS-AT stands out in the region of spectrum measurement.

Various accelerometers may each be orientated in the desired plane for survey, and one vibration channel at a time may be selected with no requirement for a magnetic or optical tachometer to be installed. Frequency ranges may be selected from 2-20KHz, registering data from 120 RPM to 1,200,000 RPM. (Note that HzX60=RPM) For ease of study, data may be viewed with a resolution as low as 400 display points or with the simple touch of a button, zoomed as high as 6400 display points to separate closely adjacent frequencies. Amplitude may be displayed in "IPS," "Gs" or MILS, and frequencies in Hz or RPM (below).



Through robust design, flexibility to suit multiple roles in flight test for all manner of helicopters and tilt rotors, field operations and engineering development programs, the RADS-AT by Smiths Aerospace is the only equipment known to reliably meet or exceed expectations of the discriminating user. This is not only the opinion and experience of Bell Helicopter, for the RADS-AT is becoming the defacto flight test vibration analysis equipment preferred by rotorcraft manufacturers and fleet users worldwide. Bell Helicopter has in fact, evaluated other similar diagnostic equipment and none surpasses or even remotely challenges the achievements and potential of the RADS-AT by Smiths Aerospace.

Though this article merely touches upon an extensive list of attributes, does Bell insist that only RADS-AT is used for RT&B of Bell products? Au contraire mon frere, owners are welcome to use rotor smoothing and analysis equipment of their choice, however, certain conditions may apply. If, for example the conclusion of alternate equipment is to replace parts, Bell may insist upon a validation by use of the RADS-AT before any warranty compensation is considered.

In the case where an operator has not yet felt justified in the investment of RADS equipment, may I strongly recommend the following cost comparison? Since RADS is unequalled in matching rotor system components for the best possible ride, and reducing flights by suggesting multiple adjustments, an accurate cost comparison will most likely encourage the purchase of RADS-AT equipment. It is not uncommon for an experienced tuning technician to affect 10 or more adjustments per flight as recommended by the RADS-AT, thereby significantly reducing the cost associated with RT&B. By recording crew-labor hours invested, flight time, engine starts and down time for RT&B and vibration analysis tasks, an accurate cost picture can be established for comparison with similar tasks performed with the assistance of the RADS-AT.

The attributes and user benefits of the RADS-AT by Smiths Aerospace truly single-out this equipment as the most versatile, reliable and competitively priced tool for RT&B and vibration analysis readily available to the rotorcraft industry today. The famous auto magnate Henry Ford reportedly said "If you need a certain piece of equipment for your operation, you will pay for it even if you don't have it!" (sic) The same principle is applicable to the cost saving available to you by using RADS-AT by Smiths Aerospace for your RT&B needs.

So after all this discussion, why does Bell prefer to use and recommend the RADS-AT for vibration analysis and rotor smoothing? To quote a line from Richard Gere's role in the movie "Pretty Woman" "because it's the best!"

Note: For more information, and to expand on this discussion contact www.rads-at.com

WHAT IS LEAD-TIME?

By Dennis Green, Manager, Commercial Material Management

One of the more frequently misunderstood terms in the Materiel World is lead-time. Properly defined, lead-time includes the elapsed time from the first action taken until the part is properly located with the end user, either in a stockroom or in his hands. All elements of the procurement cycle must be included, beginning with the recognition of a need. Similarly, it does not end until the item is properly accounted for in the system that receives it.

Let's discuss lead-time as it relates to Bell Helicopter. Being in the materiel world, it is an issue we face daily and its importance cannot be overstated. Our stock replenishment activity hinges on the accuracy of our lead-times. Every item in our COOP order system has a usage projection and a lead-time. The combination of these two figures represent a calculation that generates for us a reorder point. It should be the same in your system. As a review: if you use four parts per week and it takes 12 weeks lead-time to receive a replenishment of parts then you would have to order (reorder) when you have only 48 items in your system. (Usage X Lead-Time = Reorder Point).

Generally speaking, your parts if Bell, actively stocks them, (some 57,000 part numbers) are shipped between 24 to 72 hours. In addition, approximately 90 percent of the time, Bell Helicopter delivers the part you ordered from our shelf stock.

It is our intent to have every actively stocked part sitting on the shelf at the time your order is received. This is in spite of Bell's average replenishment lead-time being more than 12 months. There are many reasons why your part may not be on the shelf when you want it. These reasons can range from under-forecasting to a vendor having a fire or flood! The more complex the part, the longer the supply chain and the more opportunity there is for a shortage. Think in terms of a main rotor blade that may contain over a 100 parts and therefore a 100 opportunities for something to go wrong!

There is one final area to discuss: Special Order parts. Bell does not normally stock these parts. Our decision to stock or not stock a part is based on our projection of the future demand substantiated by historical usage. If we have a regular pattern of orders over a given period, we will stock the part on a routine basis; otherwise, it becomes Special Order. We build or procure Special Order parts upon receipt of your order. The vast majority of these parts are structural parts, but they can be most anything, often non-standard to the basic configuration of the aircraft. It is not uncommon for these parts to sell no more than once in five or more years.

It is likely this is the area where most confusion arises as it relates to "When am I going to get the part?" In answering the question about availability, the issue of the parts, lead-time usually surfaces. These items, being no different from items we actively stock, also have lead-times.

Lead-time, as described, is stated in routine terms. That is, it presumes that all activities will flow through normal channels without human intervention. The lead-time on a Special Order part can be reduced by many things; expediting the process (human intervention), the availability of excess material in other Bell facilities, the availability of raw material, etc. The list goes on and on. Remember, that normal lead-time presumes you start from zero at the systems' pace. Theoretically, it can be reduced to days or weeks rather than months depending on availability of material and the priority of the order. Can we do this every time? Obviously no, but it will not be from lack of effort. We take very seriously urgent requirements for items not available whether they are normally stocked or Special Order.

In summary, you may hear manufacturing/procurement lead-time quoted from time to time, but it should be regarded as the starting point rather than the "final answer." It would be most helpful if we know your real "need" date when ordering a special order part. This would do much to assist us in timing the various actions and priorities.

CONSIDER BELL FOR YOUR NEXT OVERHAUL!

Faster Turnarounds and Competitive Prices Merit a Look at Bell Tennessee R&O

Bell Helicopter is pleased to announce the creation of a dedicated repair and overhaul facility to greatly improve turn times and bring competitive prices to customers. Lower prices and faster turnarounds plus the benefits of OEM quality combine to make Bell a company to consider with your next overhaul requirement.

Bell has always been in the repair and overhaul business in support of the Bell fleet. Though not always considered the customer's first choice, Bell traditionally offered OEM quality and a world-class warranty to back the work performed. Recent expansions and investments at our FAA approved Tennessee facility now allow us to combine our OEM quality with lower costs and faster turnaround times for component overhaul customers.

Our goal with Bell Tennessee is to provide the most comprehensive repair program in the world. Bell Helicopter – the company that designed, built, tested and certified these components now provides this responsive and economical service. In addition we back our work with a **Two-Year — 1500 Hour Warranty!**

Services offered by Bell Tennessee initially focus on drive train components for the Bell turbine engine fleet. Components to be overhauled in the start-up phase include:

Main Rotor Hub **Swashplate Assembly**
Mast Assembly **Transmission**
Drive Shaft **Tail Rotor Hub**
Intermediate and 90° Gearboxes

We offer overhauls and inspections on components for the Bell 206 Series, 407, 427, 222 Series, 230, 430, 204, 205, 212, 214B, 214ST, 412 Series, and also UH-1 helicopters.

For more information on pricing and delivery, contact us at: sales@bellhelicopter-tn.com or 817-280-7272.

Service from the company that . . .

- **Designed it**
- **Built it**
- **Tested it**
- **Certified it**

WITH A 2-YEAR – 1500 HOUR WARRANTY

SHOP TALK

Q: In the Bell 412 MAINTENANCE MANUAL (BHT-412-MM-2) chapter 5-00-00 Starter Generator inspection there is a reference to "BHT-412-CR&O VENDOR DATA (No. 23700)" where can I get it?

A: Contact: Lee Graham of TRW Lucas at Tel. 201-541-3250 or fax 201-894-1965

Q: Our Collective Lever 412-010-408-101 has enlarged holes can it be repaired?

A: There are 2 oversize bushings available 412-010-428-103 and 412-010-428-105 they are 0.010 and 0.020 oversize respectively.

Q: We have requirement to use MS20470DD rivets (refrigerator). However at my operation we cannot keep the rivets cold long enough to use.

A: Rivets MS20470DD have been superseded with MS20470E rivets and MS20426DD rivets have been superseded with MS20426E rivets neither of which require a refrigerator.

NEW PART RETURN PROGRAM

In an effort to provide better overall service, turnaround times and status reporting

Bell Helicopter Textron (BHT) has recently initiated a process improvement activity in the "Customer Property Return module." One outcome of this activity is the institution of a Return Material Authorization (RMA) policy. Prior to returning goods to BHT, it is required that BHT be contacted for an RMA number assignment. The RMA number may be obtained from your Fort Worth Spares Administrator.

The assigned RMA number should then be referenced on the customer's shipping documents. It will be used by BHT to uniquely identify and track the returned item(s) throughout the return process.

By referencing the RMA number when contacting BHT, customers can obtain status of the returned unit(s).

Please note units returned to BHT without a RMA number will be subject to processing delays and/or return shipment.

DESTROYED AIRCRAFT

The following calendar year 2002 Bell Helicopter aircraft identification data plates have been returned to Bell, were subsequently destroyed and documented as such. The serial numbers have been retired. Additionally, Bell has recommended to the certification offices of the FAA and Transport Canada that the aircraft serial numbers be removed from the applicable type certificate data sheets.

Model	Serial Number
206L-1	45237
206L-3	51272
UH-1D/UH-1H (military surplus)	4032, 4077, 5341,5704, 9113

The following Bell Helicopter aircraft were reported by official aviation investigation authorities as destroyed in 2002. Based upon that finding, Bell has recommended to the certification offices of the FAA and Transport Canada that the aircraft serial numbers be removed from the applicable type certificate data sheets.

Model	Serial Number
206B	2820, 3750
206L-3	51367
212	30625
407	53055
430	49038
UH-1H (military surplus)	5717

It is very important that owners and operators understand the significance of an aircraft officially reported by an accident investigation authority as destroyed, or where the aircraft data plate has been destroyed. Bell Helicopter furnishes listings of destroyed aircraft and destroyed data plates as a service to customers, the FAA and Transport Canada and worldwide certification authorities. Bell does not represent that these lists constitute all of the aircraft or data plates that have been destroyed. Listed are only those aircraft where Bell has recently received final reports from official accident investigation authorities describing the aircraft as destroyed or where Bell has destroyed the aircraft identification plate as requested by others.

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V-22 Osprey