

THE BELL 407GX_i – BETTER BY DESIGN

BY MIKE BRODERICK



AUTHOR'S NOTE: MY SOURCES FOR THIS ARTICLE ARE A COMBINATION OF RESEARCH USING: THE BELL WEB SITE, WIKIPEDIA, PUBLISHED PILOT REPORTS, AND AN INTERVIEW WITH GREG JUDD, GENERAL MANAGER COMMERCIAL FIELD SUPPORT FOR THE AMERICAS.

The Bell 407GX_i is the evolution of the 407 which is the progeny of the 206 L series helicopter. Beginning with full certification from Transport Canada and the FAA in February of 1996, the 407 has enjoyed a successful entry into operation accumulating more than 1.2 million flight hours operating in 40 countries across the spectrum of utility, air med, fire suppression, executive transportation, and law enforcement.

There are plenty of facts, figures, flight, and Bell marketing information accessible via the internet and published pilot reports. This information is all great copy and could be regurgitated into a somewhat interesting maintenance article of... well.... regurgitated technical data from a pilot's experience. But as maintainers you guys, deserve better than casual seconds. The 407GX_i is not your dad's Jet Ranger or Long Ranger. And so, as a maintainer, you should find out what to expect when you bring this model 407 into the hangar for maintenance and the info should be from a reliable maintenance source. So, I cornered Mr. Greg Judd, the general manager of the Americas for

Bell Customer Field Support. Greg, who also happens to be on the HAI's Technical and Maintenance Industry Advisory Council (IAC) with me, was eager to share his 407-maintenance experience with us.

Ok, so first things first. How 'bout we learn about Greg before attacking him with questions:

HM: So, Greg tell us a little about you....

GREG: "Well, I currently reside in Coalville Utah. I attended Utah State University and Dixie State College. I have been involved in various roles aviation product development during my 33-year aviation career, but appreciate helicopter maintenance above all. I have held my A&P for 23 years working the last 10 with Bell in my current assignment.

"In my career and life, I have had many successes including contracting for our military installing flight simulators, chief inspector, and accountable manager for a part 145 repair station. I was the DOM for a large fleet operator for seven years as well. I really enjoy the challenges that come with troubleshooting all types of issues with our product which includes rotor track and

balance, sheet metal work and component repair and overhaul.

My goals are to help Bell customers get the most out of their aircraft keeping safety as the top priority. My job is to be a mentor/consultant and troubleshooting source to the mechanic.

In my personal life I was a volunteer fireman for 10 years rising to the rank of Chief. Relaxing to me is working with my family on our cattle ranch and farm in Utah.”

HM: Thanks Greg.

Now you understand why I chose him to interview, and we will explore more about this helicopter with Greg you will get an appreciation of his customer support philosophy a bit later.

But next, let’s review the lineage of the 407: The Bell model 407 is a four-blade, single-engine, civil utility helicopter. A spinoff of the Bell 206L-4 Long Ranger, the 407 forward fuselage is an aluminum / carbon graphite structure, with the cabin is 8 inches (20 cm) wider with 35% larger cabin windows. The design and structure is semi-monocoque comprised of carbon

fiber composites. The attaching carbon fiber tail-boom integrates horizontal stabilizers, vertical fin, tail-rotor transmission, tail rotor hub and blades.

The main-rotor is a four-blade, soft-in-plane design with a composite hub that contains no “life limited” components. Originally this hub was developed for the United States Army’s OH-58D Kiowa Warrior replacing the Bell Helicopter, two-blade, semi-rigid, teetering rotor that has been / and remains the signature Bell 206/505 Series rotor system.

Powering the four-blade rotor system is the more potent RR250-C47. The 407’s airframe progression goes like this:

Bell 407: Derivative of the 206-L4

Bell 407GX: H-model Glass cockpit, Garmin G1000, improved flight controls

Bell 407GXP: Marketing designation to indicate engine RR 250-C47B/8

Bell 407GXi: Engine change to M250-C47E/4 and change to Garmin G1000H NXi avionics. Also added are redundant flight and operational reporting sources.

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HM: Greg, according to the presentation you sent me, there are five major improvements to the 407 that make it GXi.

GREG: Yes, sir here they are:

- 1.) Replace the RR250C47B/8 with M250-C47E/4 which stretches the available shaft horsepower from 813 to 862 with the bonus of reducing the engine emissions via a more efficient fuel management technique.
- 2.) Replacing the Full Authority Digital Engine Control System (FADEC) single Electronic Control Unit (ECU) with 2 separate Units; Each Engine Electronic Device (EED) has a Primary Engine Control (PEC) and Backup Engine Control (BEC). Independently, both units have full authority from “Off to Fly”. There are 4 levels of failure before going to “Fail Fixed”.
- 3.) Removal of Manual Mode; replacing N1 Teleflex Cable with an Electrical Linear Variable Differential Transformer (LVDT). (LVDT is an acronym for an electromechanical transducer converts the rectilinear motion of an object to which it is coupled mechanically into a corresponding electrical signal.)
- 4.) Replace Garmin G1000H with Garmin G1000NXi; Obsolescence driven changes.
- 5.) New Software to interface with C47E/4 engine and NXi Line Replacement Units (LRUs)

HM: “NXi LRUs”?

GREG: LRUs.....the main difference between the GX and GXi is the installation of NXi displays which have more processing power and storage space which decrease response time in maintenance mode when performing maintenance functions. Also, the display clarity is improved.

HM: the Dual Channel FADEC (Primary Electrical Control – “PEC” & Backup Electrical Control – “BEC”) have full authority from OFF to FLY (100%), with an incorporation of Automatic channel transfer

in case of failure sensing and overcoming 4 levels of failures before going fail fixed.

HM: Any issues with this improved FADEC system?

GREG: Early on we did see a few isolated cases of water intrusion into the EEC boxes.

HM: Water intrusion? What issues did that cause?

GREG: The water intrusion entered the ECC via the vent holes. This caused ECC degrades and ECC failures.

HM: So now that the Engine Critical Sensors are Duplex Sensors and that OEM Diagnostics Pages are now showing lower level FADEC Faults for improved troubleshooting, has that given the mechanic enough troubleshooting assistance that you are not on the phone as much?

GREG: It has not changed our call volume much maybe less calls for the same troubleshooting. However there is a learning curve with this new feature.

HM: And to assist in reducing Direct Maintenance Costs the airframe fuel filter has been removed. So, there is no fuel filtering between the airframe supply and the engine?

GREG: Correct there is a screen and filter in the engine fuel system, however we are looking at a solution to support those operators who do not have access to fuel additives for Icing conditions.

HM: Bell also replaced the Garmin Signal conditioner and introduced a new ADAHRS (GSU75H) How come?

GREG: We are always looking at improving reliability and advancing with technology changes on our Aircraft, we make changes like these to keep up this process.

HM: How are all these new improvements going to affect maintenance activities?

GREG: In short, the speed at which you can retrieve

data during troubleshooting and the details of the data. Also, now the software load is stored in the display units which means you do not need your software loader card for LRU replacement and system maintenance.

HM: Are there operational characteristics that we should be aware of...the rotor system — main and tail?

GREG: There are minor differences in engine control responses with the new dual channel FADEC system. Other than this, no.

HM: What does GEA (Garmin Engine Analyzer) do for us as mechanics...I know the CAS = Crew Alerting Systems which are sent via Software upgrades with the EEC to the Garmin system...

GREG: Simply the GEA converts signals coming in from the Engine to a language the Garmin unit can understand. It is important for the technician to understand its function which will help when they troubleshoot the system.

HM: So Greg, in closing, are there any other significant changes to the 407GX that we should mention before I quit pestering you with questions?

GREG: The main difference is dual channel FADEC enhancing redundancy.

HM: Greg, thank you very much for taking the time to help me write this article. And as you have seen Greg knows his product and enjoys his job as a mentor / consultant and troubleshooting source to the mechanic.

However, we haven't heard the last of Greg! Stay tuned as Greg and I are planning on follow-up maintenance articles. For the next one we are thinking about discussing the challenges found in the exciting sport of main rotor track and balance. ◀



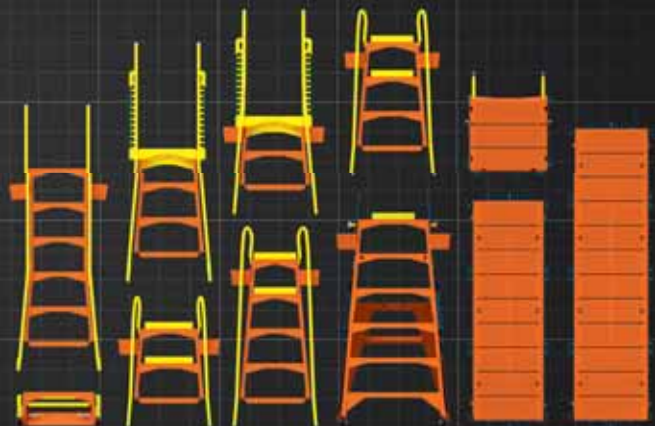
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