King Air

A MAGAZINE FOR THE OWNER/PILOT OF KING AIR AIRCRAFT

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Camera-Ready

King Air Stars in New Movie

2

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July 2023 Volume 17 / Number 7

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THE MAKING OF A

MOVIE STAR

On set shooting Dennis Quaid and Heather Graham in the King Air cockpit. In order to capture their hands on the yoke and throttle, the instrument panel had to be removable, but able to be usable for other shots.

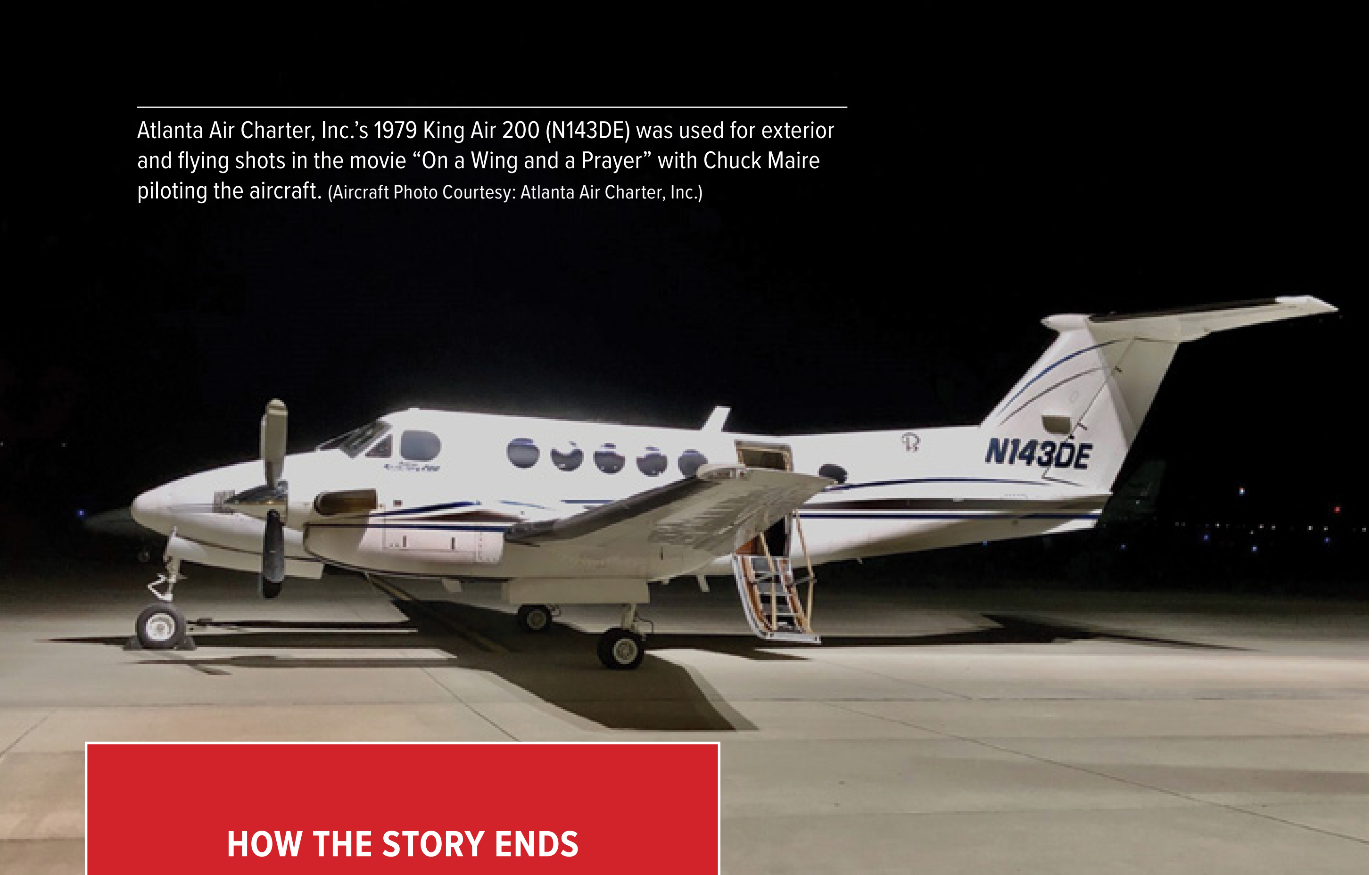
Meet the guys who helped prepare the King Air for a starring role in "On a Wing and a Prayer"

by MeLinda Schnyder

Photos provided by Doug Scroggins unless specified otherwise

The first thing you the reader of King Air magazine should know about the film "On a Wing and a Prayer" is that it was written and edited for the general public – an audience that movie studios believe values the dramatic over the technically accurate.

The second thing you should know is that fellow aviation enthusiasts were working behind the scenes – and in front of the camera in some cases – to accurately represent the Beechcraft King Air, which gets an incredible amount of screen time in the 2023 film starring Dennis Quaid, Heather Graham and Jesse Metcalfe.



Atlanta Air Charter, Inc.'s 1979 King Air 200 (N143DE) was used for exterior and flying shots in the movie "On a Wing and a Prayer" with Chuck Maire piloting the aircraft. (Aircraft Photo Courtesy: Atlanta Air Charter, Inc.)

HOW THE STORY ENDS

What happened to Doug White after his first King Air landing? According to material at the end of the film, just before credits roll: *Days after Doug White landed the King Air, he began a fast track training course to become an instrument-rated pilot. He later became a multi-engine commercial rated pilot. He has since flown relief missions to Haiti, Belize and missions for the Veterans Airlift Command.*

For those who haven't yet watched the movie, which was originally scheduled for a theatrical release but instead debuted April 7 on the streaming service Amazon Prime, here is the studio synopsis:

In this extraordinary true story of faith and survival, "On a Wing and a Prayer" follows passenger Doug White's (Dennis Quaid) harrowing journey to safely land a plane and save his entire family from insurmountable danger, after their pilot dies unexpectedly mid-flight.

It's a faith-based film that is based on the true story of the White family's flight in 2009 from Marco Island, Florida, returning home to Louisiana. According to a 2009 Associated Press account of the ordeal, Doug White had earned his pilot's license when he was 18 years but at 56 years old he had only recently started to fly again. He had fewer than 150 hours in a single-engine Cessna 172 and no experience flying the King Air 200. While he owned the King Air, he had never flown the airplane and was leasing it to an air charter firm.

In real life, White landed the King Air at Southwest Florida International Airport in Fort Myers about 30 minutes after takeoff and about 20 minutes after the pilot suffered a sudden cardiac death. He told AOPA at the time that he landed smoothly on his first attempt: "It was a greaser, to be honest. It didn't jump or skip. It just set down and stopped in 3,500 feet or less."

Brian Egeston wrote the screenplay and the film was directed by Sean McNamara, known for the films "Soul Surfer" and "The Miracle Season." Filmmakers injected more drama by adding a storm to the situation as well as an aborted first landing attempt. There were other dramatic additions, from the family moving the deceased pilot from his seat so Terri, played by Heather Graham, could sit in the cockpit with her husband to an allergic reaction in the cabin by one of the daughters.

The King Air appears on screen for a majority of the 102-minute film, either with Quaid and Graham in the cockpit, the family in the cabin or exterior shots of the airplane flying and taxiing.

Two airplanes were used for those scenes: a prop created from an actual King Air 100 by Scroggins Aviation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Scroggins, with the King Air film prop he created, also acted as a consultant (along with Maire) on realistic aircraft operations and correct wording to use for flying a King Air while on set.

Mockup & Effects and a 1979 King Air 200 (N143DE) owned and operated by Atlanta Air Charter. Still, some of the sequences were computer-generated. Here's how it all came together.

Interior

Doug Scroggins grew up around the film industry, eventually picking up contractor work on the technical side such as pulling cable, lighting and camera operation. He also grew with a connection to the aviation industry with his father taking him to local airfields and knowing his grandfather was a World War II pilot flying Boeing

B-17 aircraft and then flew Boeing Stratocruisers for Pan Am.

Scroggins' interests led him to get into researching old aircraft accidents, and his work in aviation archaeology led him to direct and produce a few documentaries. By 2001, he was working full time in crash recovery, commercial aircraft dismantling and recycling of decommissioned airplanes. In 2010, he disassembled a retired Boeing 767 he had in Victorville, California, and reassembled it in the California desert as a crash landed airliner for the television series "The Event." A turning point for the trajectory of his business was winning a contract to supply two full airliners and the cockpit of a third for the 2012 Academy Award-nominated film "Flight" starring Denzel Washington. He also provided technical advice on recreating a crash scene to director Robert Zemeckis.

By 2015, he had formed Scroggins Aviation Mockup & Effects to focus on supplying real aviation set pieces to the motion picture and television industry.

"I've worked as a manager overseeing aircraft parts sales, dismantling and recovery, and I've worked as a director of photography – it's a great combination because it allows me to understand what the director of

Scroggins Aviation Mockup & Effects procured a King Air 100 specifically for the movie and dismantled it to make it useful for filming. The cockpit detaches and the left and right wall panels are removable. The fuselage is also reinforced with a steel frame on the underside so that it can roll around and be placed on a platform to shake it and create turbulence.

photography needs and what can be done from an aircraft standpoint."

The company is based in Las Vegas and creates aerospace mockups, miniatures and effects that you see in movies and TV shows. They provide cockpit sections, passenger cabin sections, wreckage, seats, galleys and lavatories as well as complete aircraft, varying from helicopters to commuter planes, cargo planes and light aircraft. They have more than 30 helicopters, dating back to 1946 and as large as a Boeing CH-47 Chinook. In addition to the King Air 200, they have a Cessna C-208B Caravan, a Beechcraft B2000 Starship and MiG-15 fighter jet, as well as many airliners.

Scroggins said what sets apart his business is that he operates, with eight employees, a full service fabrication and effects shop to offer custom builds. That is what he was asked to do for "On a Wing and a Prayer."

He procured a King Air 100 specifically for the project and then dismantled it to make it useful for

MOVIES, TV AND VIDEO GAMES THAT HAVE PROMINENTLY FEATURED KING AIRS

MOVIES

A Few Good Men (UC-12F Huron)
American Made
Blackhat
Chinese Zodiac
Devil's Gate
Jurassic Park II
Point Break
Sister Act
The Bodyguard
The Forgotten
The Lost City

TV

El Capo
MMG Engineers
Psych
The A-Team
Top Gear
Whiskey Cavalier

VIDEO GAME

LEGO Jurassic World (yes, built with Legos!)
Microsoft Flight Simulator
Microsoft Flight Simulator X

Sources: IMPDb.org and Fandom.com

filming. They call it "wild" when a piece of the set or scenery is designed to be easily removed for crew or camera access.

The cockpit detaches, the left and right wall panels are removable as are the front wind-screen structure and panel.

"For filming purposes, the King Air is a very, very small aircraft," he said. "So we had to literally butcher the fuselage, reinforce it with a steel frame structure on the underside so that they can roll it around and it can be picked up with a forklift. It also can be placed onto a platform where they shake it around and create turbulence. You have to factor all that in and figure out a way to keep it safe when there's $100 million worth of actors inside it."

This was the smallest airplane he'd modified for use in filming, and it took a great deal of preplanning to maintain the integrity of the structure while having the ability to connect and separate the segments quickly. With filming costs easily reaching $600 a minute, time is money on set, he said.

"The most important thing was to make sure we could open up the airplane in the front where the camera can get in there," Scroggins said. "The intent was to be able to have the actors still have their hands on the yoke and you can see that on film, or for the camera to capture their hands on the throttle. That meant the instrument panel had to be wild, so we could remove it and plug it right back in."

The exterior of the King Air was finished in a white matte paint to reduce glare on camera. Scroggins said he purchased the retired King Air in October 2020 and had about nine months to prepare it for use in the film. He then hauled it to Georgia in a 53-foot van trailer for filming starting in September 2021.

Exterior

Chuck Maire has known Scroggins for several decades and worked as a technical consultant to him during the filming of the 2016 movie "Sully" that chronicled Chesley "Sully" Sullenberger and Jeffrey Skiles landing an Airbus A320 on the Hudson River.

Scroggins again got Maire involved with "On a Wing and a Prayer." He is a U.S. Air Force veteran and a retired airline pilot, now working as chief pilot for Atlanta Air Charter, Inc. The company operates three King Air aircraft from Cobb County International Airport (KRYY) in Kennesaw, Georgia, just north of Atlanta: a 1994 King Air B200 (N700NA), a 1980 King Air 200 (N383JP) and the 1979 King Air 200 (N143DE) used in the film.

The choice to use N143DE was as simple as it would require the least amount of work to look like the actual airplane from the 2009 event, and the film did not have a large budget according to both Scroggins and Maire.

"We didn't want to paint the airplane so we used shrink wrap," Maire explained. "One of our pilots has a

The King Air 200 fuselage prop on set during filming of the movie "On a Wing and a Prayer." Scroggins said that although it was built specifically for this particular movie, that it will continue to work in the film and television industry.

company that does that, though this was the first time he ever had tried it with a King Air. We put N143DE down in the shop at the airport where we did all the filming, Fulton County Airport, because once we applied the shrink wrap we would have an FAA waiver in place that limited us to flying within 30 miles. The shrink wrap worked out really nice. When you look at the photos you have no idea that's just plastic stuck on the airplane. We didn't lose any of it in the filming, and when they were all done it just peeled right off."

That King Air has since had two new engines installed and next will get an avionics upgrade, Maire said. "The plane is about as basic as they get but it is a solid airplane and our most reliable King Air," he said. "We all love flying it, it's a really nice airplane."

For the movie crew to film various shots, they asked Atlanta Air Charter to have the aircraft on set for five days, during which Maire said he flew about 90 minutes including takeoffs, taxiing and three to four approaches.

To stay true to the event, they had Maire in the right seat dressed to look like Dennis Quaid and one of his fellow pilots from Atlanta Air Charter in the left seat dressed to look like Heather Graham, in case a glimpse of their head or body made it into the film (you'll see Maire's shoulder in several scenes when the aircraft in taxiing.)

"I had watched the actual footage of the real event, and I knew that the guy did a pretty decent job," Maire said. "I was trying to be accurate. I wasn't trying to be dramatic. But the stunt coordinator wanted me to bring it down right in front of the camera, land on one wheel and make it look like an amateur was bringing the airplane in. They kept telling me to make it look rougher, so I was rocking and rolling and pitching up and down. That's how I got the stunt pilot credit for the movie. In the end, they didn't use my landings because of the CGI (computer-generated imagery) cost. They were going to have to block out all the stuff in the background

The cockpit was able to separate from the cabin so shots could be filmed from the front as if you were looking from the cockpit.

with CGI, which is extremely expensive, so they went with the special effects guys, who I thought made it look very cartoony."

You do see footage of Maire roll out from an actual landing and taxi in. "It was really interesting to watch the process and to just see how it ended up coming together," Maire said. "I mean, this is my first rodeo with regard to filming scenes. To me one of the most incredible things to realize is that all of those interior shots including all the cockpit scenes were done in the mock-up that Doug created, none of them are from the real airplane. He did a fantastic job on creating that for the movie."

While Maire and Scroggins both consulted filmmakers on realistic aircraft operations while on the set, much of the editing work on the film and final decisions were done in a studio during post-production without consultation.

They said Quaid was open to the feedback and told them that because he was a pilot himself, he wanted the script to be as accurate as possible. They suggested some changes to words and movements Quaid's role as pilot of the King Air was scripted to perform, and one way he thanked them was by giving Scroggins a speaking role in the film. Near the end of the film, just after the plane lands, you see Scroggins as the airport operations manager telling the pilot to cut the engines of the King Air.

"I was there when Dennis wrote the part into the script, but it wasn't until the next day the director told me that Dennis wanted me to play the part as a thank you for helping out," Scroggins said. "That was kinda cool of him, I thought."

While Scroggins Aviation Mockup & Effects built this King Air mock-up specifically for the film "On a Wing and a Prayer," the airplane will continue to work in the film and television industry. KA

RECENT SCREEN APPEARANCES BY SCROGGINS AVIATION MOCKUP & EFFECTS:

Book Club: The Next Chapter film – EC-135 helicopter

65 film – escape vessel, a set of airlock doors, crew seats and control panels

True Lies TV series – EC-135 helicopter

Dear Edward TV series – Airbus A320 full fuselage with cockpit and wreckage, plus other props

PLANE film – Airbus A320 forward cockpit with cabin and other props

Echo 3 series – Sikorsky UH-60 Black Hawk helicopter

Black Panther: Wakanda Forever film – EC-135 helicopter & Eurocopter AStar AS350 helicopter

Black Adam film – Eurocopter AS365 Dauphin helicopter

The Terminal List series – Sikorsky UH-60 Black Hawk helicopter

UPCOMING FILMS TO WATCH FOR:

Blue Beetle (DC Comics film)

Captain America: Brave New World (Marvel Studios)

Bad Boys: Ride or Die (Sony Pictures)


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Propeller Erosion ... and How to Avoid It

by Tom Clements

PHOTO CREDIT DAN MOORE VMG LLC

Walk down a ramp where numerous King Airs are parked and look closely at their propeller blades. I wager that you will see quite a variety of conditions. Some will look almost new, whereas others will be badly sandblasted. It may be that the reason for the difference is reasonable and unavoidable. Namely, one airplane operates only on long, paved, well-maintained runways, and the other aircraft spends much of its life operating from a short, dirt strip on the owner's ranch. But it also may be that the one with the sad-looking props, even though it spends much of its time on good runways, is also suffering from one of two things or a combination of both: Poor pilot technique and/or power levers that are poorly adjusted in the Beta and Reverse ranges. The goal of this article is to review proper operating techniques with you, as well as, providing a procedure for knowing if your Beta/Reverse rigging is as it should be.

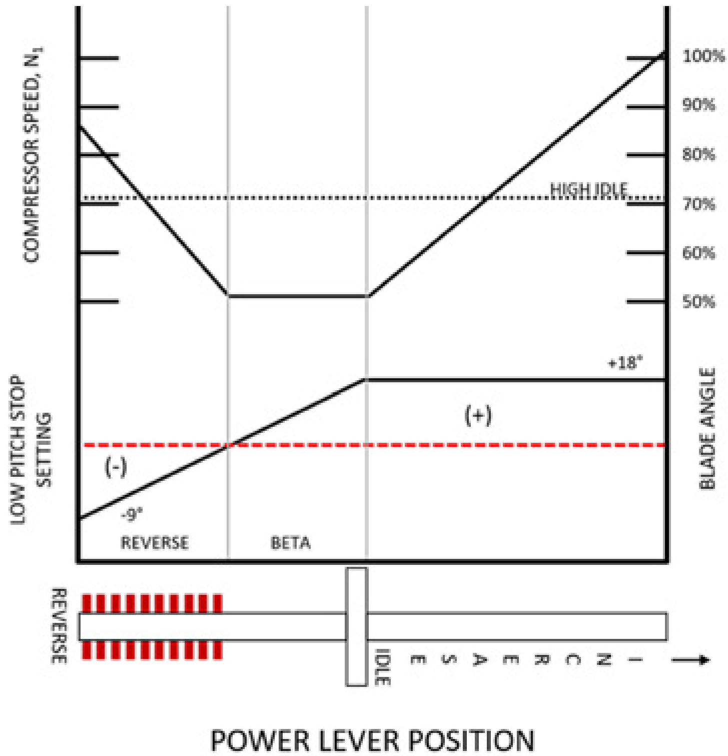
Let's start with the rigging discussion and first review the three-blade model 200 graph (right).

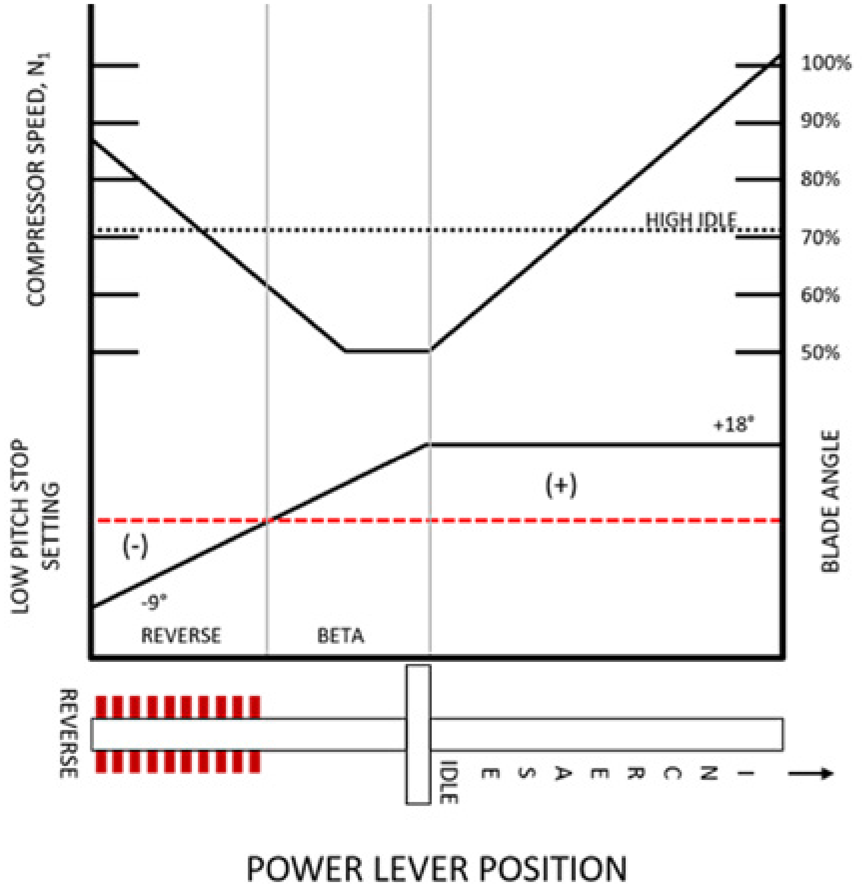
This particular graph presents numbers applicable to a three-blade model 200 and except for the numbers, it applies to all PT6-powered King Airs. The later models have the Ground Fine stop between Beta and Reverse and do not have the red stripes. The (+) and (-) symbols represent the areas where positive or negative thrust occurs, statically on the ramp.

As the graph shows, the position of the power lever controls two different things: Compressor Speed (N1 or Ng) and the position of the propeller's Low Pitch Stop (LPS). (This stop also goes by the name of "Flight Idle Stop" in some references, including portions of the maintenance manuals. I have always believed that "Low Pitch Stop" is a more obvious term that better describes exactly what is being repositioned.)

Notice the flat portion of the upper line, the Beta area. This flat portion, in which N1 should not change, is appropriately known as the "Dead Band" since movement of the power lever within this range causes no response – dead reaction – from the Fuel Control Unit (FCU). By definition, the Beta Range is where the propeller's LPS is being repositioned to flatter blade angles while N1 is not changing.

Behind Beta is the Reverse Range. By definition, not only is the LPS continuing to be repositioned to lesser blade angles – it is, in fact, going to negative angles, meaning that the propeller is pushing air forward instead of aft – but also N1 is proportionally increasing, getting greater the more aft the power lever is moved. Typically, Maximum Reverse, all the way aft, should yield an N1 speed of about 85%. Remember that the relative speed of the compressor is not the same as the engine's relative power output.





In other words, 85% N1 does not yield 85% power. On the contrary, 85% N1 is probably a bit less than 50% power!

That King Air on the ramp with the badly sandblasted props? I'll bet its dead band is too small, too narrow. The engines are increasing N1 speed before the propeller blades reach flat pitch.

This not uncommon problem means that the airplane is difficult to slow down while taxiing. Before the blades can reach flat pitch, when the propeller is then acting as a large disk giving neither positive nor negative thrust, power is already being added. In other words, an N1 increase is being encountered before we have reached the bottom of the Beta range. When power is added while the blades are still providing a positive bite of air, we start to go faster, not slower!

What many misguided pilots do in this situation is to pull the power levers back more until finally the taxi speed slows down. What has taken place is that at last the residual thrust has been eliminated by forcing the LPS to flat or even negative pitch but at the expense of a higher-than-needed and higher-than-desired propeller speed (Np), since the increased N1 is creating more exhaust gases that are driving the propeller with more power. This higher prop speed, usually associated with a slightly negative blade angle, causes lots of blade erosion.

I have received this question many times during my King Air training events: "Why don't we get similar blade erosion when the blade angle is at, say +10°, then when it is at -10°? Even with High Idle selected, we can taxi all day with the power levers at Idle and not erode the props, yet we chew up the blades at -10° and 70% N1. This doesn't seem to make sense."

The reason why a blade angle of -10° leads to more erosion than an angle of +10°: Realize that there is a pronounced twist in each propeller blade, such that the inboard areas are taking a significantly larger bite than the outboard areas. So, when +10° is happening at the 30-inch station – the normal location out from the hub where angles are measured – the blade tip near the ground may be almost flat. That flat tip creates very little airflow disturbance so the sand and grit and gravel and dirt on the surface are disturbed little. But when the angle is -10° at the 30-inch station – the tip may be at -20°, creating a great little sucking vortex that vacuums the debris off the ground with unfortunate efficiency!

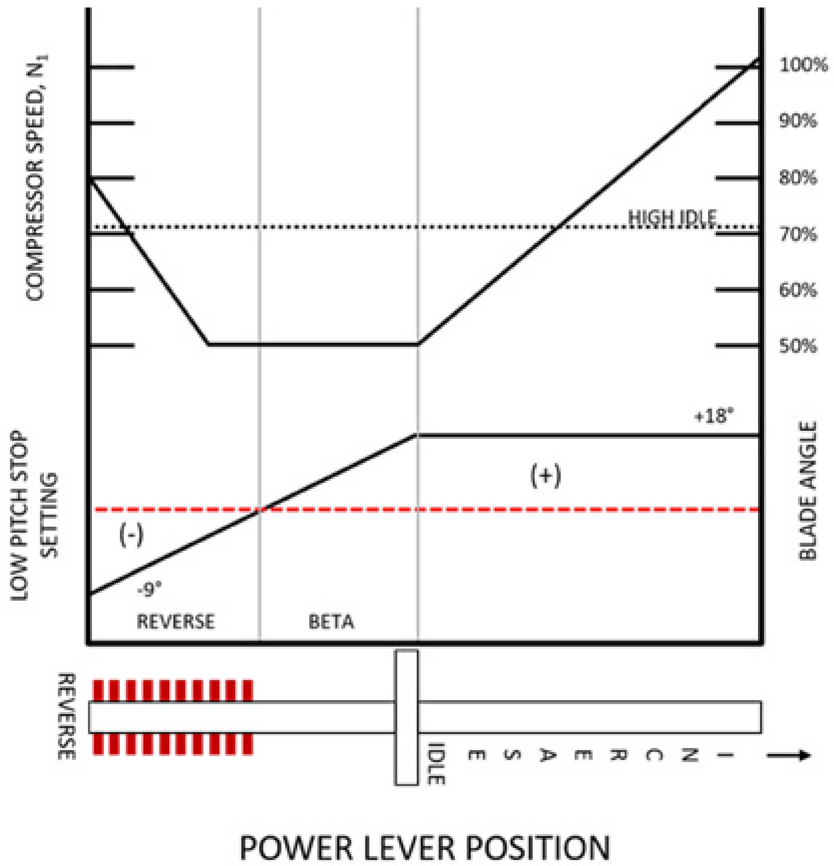
Vice versa, suppose the dead band is too large, like the graph (right).

Now it is easy to kill residual thrust without an increase in N1 speed (and I surely like that!), but it is now common to find that propeller speed decreases so much before N1 increases that Reverse is sluggish and often asymmetric. Also, especially on the Honeywell (née Bendix) FCUs, Maximum Reverse is usually not near the proper 85% value. Starting to rotate the FCU's speed setting shaft too late may not allow it to rotate far enough for the proper amount of Reverse power.

My preference would definitely be to have a bit too much dead band than not enough. So long as Maximum Reverse delivers reasonable stopping power, the wider dead band ensures being able to kill residual thrust for taxi.

By the way, how many readers are pulling the propeller levers all the way back into Feather while taxiing? With some situational awareness, this is a great technique! Not only can we achieve a propeller feathering check, but also with the blades slapping the air "sideways" as they rotate we have zero taxi thrust. Plus, it is quiet!

So, what is this "situational awareness" I mentioned? First, although the propellers feather quite rapidly – just a few seconds – they take as much as 30 seconds to unfeather. So, if you will need positive taxi thrust to make it up that hill ahead or to maneuver with some tight turns on the ramp, it is not the time to feather. Second, we must remember that it is only safe to feather when the power levers are at Idle, not back in Beta or Reverse.



Third, if we roll to a stop and leave the props in feather, there is a chance that our hot exhaust gases will not be blown safely away, but may negatively impact the nacelle and nose paint, oil temperature, as well as cause overheating of the nose-mounted avionics boxes. Remember to push those prop levers forward when stopped.

This in-and-out of feathering while taxiing is especially useful is we have found that our dead band is too small – N1 is picking up too early – yet the mechanic has not yet had time to adjust it properly. It is easy to taxi without residual thrust, no matter how messed up our rigging is, by using the feathering technique.

Also, remember this useful "trick." When starting to taxi, if the airplane does not begin to roll when the brakes are released, try a quick in-and-out feathering instead of an application of power. Isn't that cool?! The momentary bigger bite of air is just what was needed to make the plane begin to roll, yet with zero chance of blade erosion.

Another time that it is easy to erode the prop blades is during high-power run-ups. For example, the Overspeed Governor test requires a lot of power. Please make every effort to find and use a rather clean, paved area of the tarmac when conducting your checks.

Similarly, consider the condition of the runway as you initiate the takeoff roll. If it is unpaved or the pavement is in poor shape, now is the time to make a rolling takeoff with power application coming in proportionally as the airspeed increases. Of course, when the runway is of minimum length, we won't have the luxury of slow power application. But when there is excess runway, it is a technique that has merit.

How about landing? How do we avoid blade erosion now when we need and want to use Reverse? Easy answer: Go in quickly and deeply, then get out.

For a landing where aggressive Reverse will be used, it is common to run the propeller levers full forward well before touchdown so that we waste no time moving them after touchdown. All we have to do is lift and pull the power levers aft. Here is a time that aggressive, fast action is indeed called for and won't harm a thing. Remember when I stated that Maximum Reverse is less than 50% power? Hence, there is no way that torque, ITT, not N1, is of any concern to you, the pilot, when those power levers are buried all the way back. "Slam" is a word used rarely when talking about flight and engine controls but, truly, here is the time to slam those power levers into Maximum Reverse without delay. Also realize that the power levers move in an arc, not in a straight line. To position them at Max Reverse requires more of a downward push during the last bit of travel, than an aft pull.

There are three important reasons for obtaining Max Reverse immediately. First, the sooner we can establish full reverse thrust, the shorter our landing distance will be. Second, the drag that Reverse provides is dependent upon airspeed squared. That is, at 80 knots, the drag is four times as effective as at 40 knots. Third, we only want to utilize Reverse when we are moving forward fast enough to leave the sucked-up dirt and debris behind us.

It is maddeningly common for me to observe a pilot who uses very little Beta or Reverse after touchdown but then, when he sees the turnoff coming into view, he at last starts pulling Reverse thrust. No, no, no! Now, not only is Reverse not very effective due to the slow airspeed, but also blade erosion is almost guaranteed if the surface is less than perfect!

Sure, if you are quite familiar with the airport layout and know that the turnoff is far ahead, the use of Beta only after touchdown – and maybe not even much of that – is just fine. But when the turnoff is a bit "unknown," it is much better to be aggressive first, then play with the Beta range only when at 40 KIAS or below. Remember that the POH states that Reverse should not be used below 40 KIAS. I suggest that you begin slowly moving the power levers forward from the all-the-way back position when you see 60 KIAS, and make sure that they are at Ground Fine or at the bottom of Beta by the time you see 40. Don't make the common mistake of thinking you need to be over the Idle Gate by 40 KIAS. No, staying in Beta is the proper procedure, but just make sure you are out of Reverse, back into the dead band Beta, area.

To conclude, let's see how we can evaluate our Beta and Reverse rigging, from a pilot's standpoint. The first thing to do is to make sure that your Low Pitch Stop (LPS) begins its travel back into Beta at the proper blade angle. Since it is almost impossible to find a mechanic who will use a protractor on a blade while it is spinning, angle is verified not by an actual angle measurement, but rather by a "Flight Idle Torque" setting. A graph exists in Chapter 76 of the maintenance manual that shows what this torque should be and at what RPM, for any given altitude and OAT. Realize that the value is not the same for most retrofit props, as it is for the standard propeller options. I'll make it easy for you. The chart (above right) provides most of the values for different King Air models and different propellers, at Sea Level on a Standard (15°C) day.

MODEL	TEST SPEED (RPM)	TORQUE VALUE (ft-lbs)
All 3-Blade 90- & 100-Series	2,000	600 ± 40
C90B (4-Blade)	2,000	605 ± 40
C90GT	1,800	545 ± 40
4-Blade McCauley, 90-Series	2,000	580 ± 40
4-Blade Raisbeck 90- & 100-Series	1,800	505 ± 40
4-Blade Raisbeck (Magicam)	1,800	805 ± 40
F90 and F90-1, Standard Prop (GLPS)	1,800	360 ± 40
A100	2,000	440 ± 40
3-Blade Hartzell, 200-Series	1,800	800 ± 40
3-Blade McCauley, 200-Series	1,800	750 ± 40
4-Blade McCauley, 200-Series	1,800	660 ± 40
4-Blade Hartzell-Raytheon, B200	1,800	520 ± 40
4-Blade Hartzell-Raisbeck, 200-Series	1,800	635 ± 40
MODEL	**TEST SPEED (RPM)**	**TORQUE VALUE (Percent)**
300 (FLPS)	1,500	42 ± 2%
350 (FLPS)	1,500	36 ± 2%

In a clean run-up area, aim into the wind, make sure the propeller levers are fully forward, then add power until you reach the specified propeller speed. Record both left and right torque values, as well as OAT and Pressure Altitude (29.92 in Hg), and pass them on to your maintenance folks. (If the wind is really howling that day, take both an upwind and downwind reading so that they may be averaged out.)

While still in the run-up area, select High Idle on the condition levers and bring the power levers to Idle. Next, move either power lever back over the Idle gate – even over the Ground Fine gate, if need be – while watching the propeller speed. As the blade flattens, giving less rotational resistance, the RPM should rise. As the blade angle goes negative, the extra rotational resistance will cause the RPM to fall. Experiment until you find exactly the flattest pitch position and make a mark on the power quadrant where the aft edge of the power lever shaft is now located. (Putting some masking tape next to the slot makes this task easier and less messy.)

Now do the same with the other power lever – find where the RPM is the highest and mark it appropriately. Are both sides close together? I hope so, but the marks will tell the story to your mechanic. Next, while the power levers are still at the flat pitch position, retard the condition levers back to Low Idle. If both left and right N1 speeds do indeed fall back to Low Idle, that's great! It confirms that your dead band is large enough to kill your residual taxi thrust without adding power.

However, if one or both N1 speeds hang up at something between Low and High Idle, then your dead band is too narrow and your props are candidates for sandblasting … not good. I have even discovered rigging so out-of-spec that the N1 started to exceed High Idle before we found that flat pitch, peak RPM position. Yuck! This dead band is much too small!

We are not quite done yet. Presuming your N1 speeds did indeed drop to Low Idle when the condition levers were pulled back to the hooks – as they should – now take each power lever individually and pull it back further from your Flat Pitch mark until you see an N1 increase. We hope it happens almost immediately, before we move even 1/8-inch. If we need to move significantly more than that, then the dead band is so large that a big decrease in propeller speed will be seen, leading to sluggish reaction when Maximum Reverse is reached.

There is one last check to make and record: What is the stabilized N1, Np and Torque in Max Reverse? Make sure the run-up surface is very, very clean before selecting full Reverse while stopped. Do this with one engine at a time, since there is a possibility of rocking back onto the ventral fin if both propellers are in Maximum Reverse at the same time. If no such ultra clean run-up pad exists, then record the values after you have selected Max Reverse while rolling down the runway soon after touchdown, before beginning to ease out of Max Reverse when 60 KIAS shows up. We hope the N1s come out near 85% and that Np is within 100 to 200 RPM of takeoff redline.

It takes an experienced and dedicated PT6 mechanic to make the proper rigging adjustments in a timely and accurate manner. If you have access to such an individual, I am happy for you. If you don't, then it will be a time-consuming and frustrating endeavor. The description of the work in the Maintenance Manual leaves much to be desired. Having access to an old-timer with lots of experience is invaluable!

Poor Beta and Reverse range rigging is common to find and, in truth, has little impact on safety. But when the rigging is correct, the pilot's job is easier and more enjoyable, and the propeller blades will fare much better! KA

King Air expert Tom Clements has been flying and instructing in King Airs for over 50 years and is the author of "The King Air Book" and "The King Air Book II." He is a Gold Seal CFI and has over 23,000 total hours with more than 15,000 in King Airs. For information on ordering his books, contact Tom direct at *twcaz@msn.com*. Tom is actively mentoring the instructors at King Air Academy in Phoenix.

If you have a question you'd like Tom to answer, please send it to Editor Kim Blonigen at *editor@blonigen.net*.

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As early as 1947, Walter H. Beech realized that a new, modern airplane was needed for training student pilots that would be significantly less expensive to operate than World War II-era aircraft such as the North American AT-6 and SNJ. The U.S. Air Force agreed, and in 1953 began flying the T-34A. Similarity to the Model 35 Bonanza is obvious, but the wing's angle of incidence was slightly different but span remained at 32 feet, 10 inches. All T-34A trainers were powered by a six-cylinder Continental O-470-13 rated at 225 horsepower. (Edward H. Phillips Collection)

Teacher's Pet – the Model 45

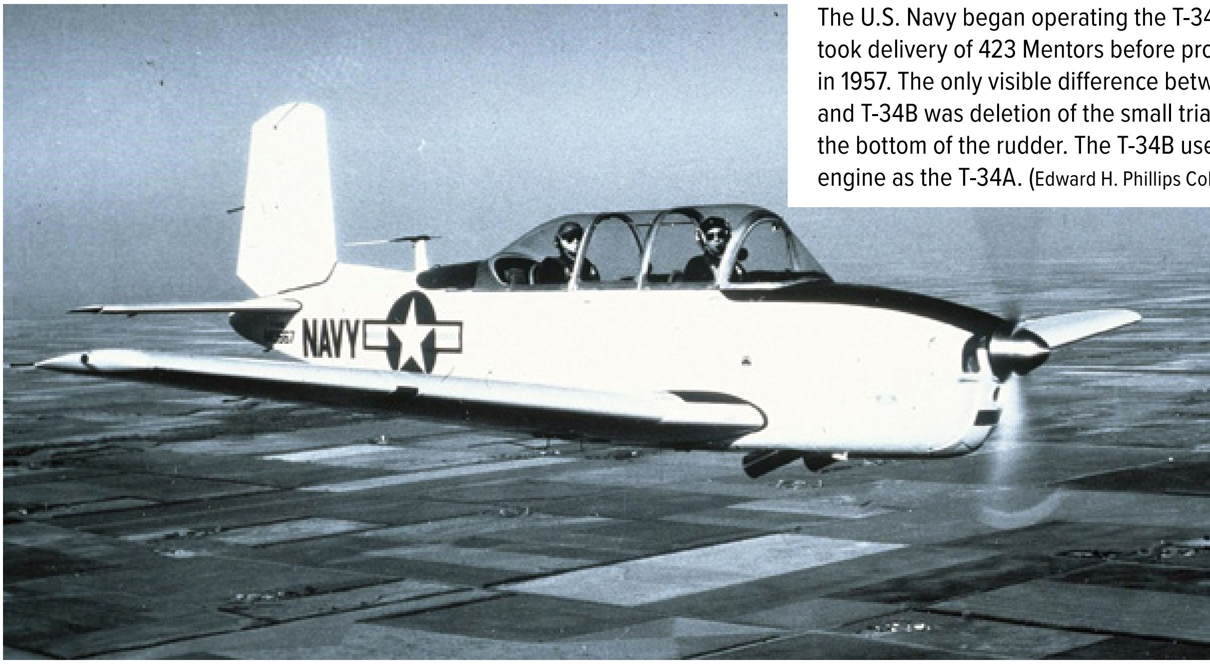
In 1948, senior management at Beech Aircraft Corporation saw the need for a new military trainer to equip postwar air forces. Their solution was the "Mentor" that would become one of the most popular Beechcrafts ever built.

by Edward Phillips

When World War II ended with the unconditional surrender of Japan in September 1945, the United States Army Air Forces and the U.S. Navy continued to train cadets in the Boeing-Stearman PT-13 and N2S biplanes, respectively, before progressing to advanced trainers such as the North American AT-6 "Texan" and SNJ monoplanes. Although the AT-6 and SNJ were well suited to the task, their thirsty, static, air-cooled radial engines gulped fuel and their airframes were aging fast. In 1948, Walter H. Beech and his engineers realized there was an opportunity to replace the venerable AT-6/SNJ with a modern and cost-effective airplane that could do the work of both a primary and basic trainer.

A series of design studies commenced that year. Fortunately, a significant amount of time and development costs were reduced by using the Model 35 Bonanza airframe as a foundation for the new Beechcraft. The Model 35's airframe and Continental engine had established a record of dependability since the airplane's certification in 1947.

Although there is evidence that the design studies did include incorporating a V-tail on the Model 45, it was rejected in favor of a conventional vertical stabilizer that was more suitable for a military trainer. Overall, the Model 45's dimensions were similar to those of the Bonanza, but the Mentor featured a narrow fuselage and tandem seating for an instructor and student pilot. In addition, a Plexiglas, three-piece sliding



The U.S. Navy began operating the T-34B in 1954 and took delivery of 423 Mentors before production ended in 1957. The only visible difference between the T-34A and T-34B was deletion of the small triangular fillet at the bottom of the rudder. The T-34B used the same engine as the T-34A. (Edward H. Phillips Collection)

canopy covered the cockpit and provided both occupants excellent visibility.

A prototype was completed in late 1948, powered by a Continental E-185 six-cylinder, opposed piston engine rated at 185 horsepower at takeoff and 165 horsepower for cruise. The airframe was designed to withstand 10 positive and 4.5 negative g-force – more than adequate for instructing pilots in aerobatics and combat maneuvering. Veteran Beechcraft chief test pilot Vern L. Carstens took the prototype aloft for its maiden flight December 2, 1948. Maximum speed was 176 mph at an altitude of 10,000 feet, with a cruise speed of 160 mph at a gross weight of 2,650 pounds.[1]

Development continued through 1949 and a Model 45 was sent on a nationwide tour of military bases in the United States and Canada to demonstrate the Mentor to officials of the U.S. Air Force and the Royal Canadian Air Force. Later, the airplane was shipped across the Atlantic Ocean where Beech demonstration pilots flew more demonstrations to showcase the Model 45's capabilities to military forces in Western Europe. One of the more interesting demonstrations, however, occurred in 1949 during the National Air Fair held at Chicago's O'Hare International Airport.

On July 4, a Model 45 was flown by two-time women's aerobatic champion Miss Betty Skelton before thousands of spectators. Beech Aircraft Corporation historian William H. McDaniel described it this way: "Proving that brute strength was not required to put the Mentor through a breathtaking array of maneuvers standard in military combat operations, pretty, petite, 100-pound Betty Skelton – only 22 years old and a two-time women's aerobatic champion – thrilled the cheering crowds. To sober-minded military observers, they were a reminder of the need for continued readiness to maintain air power in the defense of the free world – a reminder already accented by the Communist blockade of Berlin."[2]

Walter Beech believed in the value of public aerial demonstrations, but he was seeking orders from the military, and by the end of 1949 he had received none. In the wake of major budget cuts to America's armed forces after World War II, money was scarce and both the U.S. Air Force and Navy were looking for airplanes that would give them "the most bang for the buck." In March 1950, the Air Force placed an order for three YT-34 Mentors for in-depth evaluation as a primary/basic pilot training airplane. Their projected economy of operation, which was predicted to be significantly less than existing aircraft employed in that role, was a major factor in the decision to test the new Beechcraft.

According to company records, the three airplanes were designated Model A45T by the factory and YT-34BH by the Air Force. As part of the evaluation, two of the three airplanes were powered by Continental E-185-8 engines rated at 185 horsepower, while the third airplane was equipped with a Continental E-225-8 powerplant that produced 225 horsepower for takeoff. All three Mentors were tested thoroughly not only by experienced pilots, but also by pilot instructors and their students as part of the daily training routine. During the testing period, the trio of YT-34BH accumulated more than 400 hours of flight time in only 32 days. That feat was followed by a function and reliability check that lasted nearly 24 hours and involved seven landings with rapid turnarounds to refuel and change pilots. These flights were conducted at the remote site of Edwards Air Force Base, California.[3]

One other feat that was unintentional but did much to convince Air Force officials of the Beechcraft's "battleship" construction, it was reported that during one of the evaluation flights a pilot accidently struck a cable while flying at more than 180 mph. The cable, stretched across the wide span of a canyon, did not break but nearly stopped the Mentor's forward motion before spinning it around. With less than 400 feet of altitude to work with, the pilot managed to regain airspeed and control before striking the ground, and flew back to the base. Upon inspection, only the right-wing surfaces and leading edge suffered damage and bore the imprint of the cable.

Satisfied with every aspect of the rough-and-ready Model 45, in 1953 the Air Force ordered a small number of Mentors designated T-34A (company designation A45). The first two Mentors were delivered in September of that year, followed by another 88 trainers one year later. All of these airplanes were powered by the Continental O-470-13 engine rated at 225 horsepower. Performance included a maximum speed of 189 mph and a cruise speed of 175 mph at a gross weight of 2,950 pounds. Service ceiling was 20,000 feet. When production ended in October 1956, the factory had delivered 353 airplanes.[4]

The Royal Canadian Air Force (RCAF) also wanted the T-34A, and in 1954 the Canadian Car & Foundry Company, Ltd, of Fort William, Ontario, obtained a license from Beech Aircraft Corporation to build the Mentor. The Canadian company built 25 airplanes for the RCAF and eventually another 100 for the U.S. Air Force, bringing total production of the T-34A to 453 airplanes.

Meanwhile, the U.S. Navy had been giving serious consideration to modernizing its aging fleet of primary trainers. The Navy Bureau of Aeronautics conducted a series of very tough evaluations at Naval Air Station Pensacola, Florida. Beech Aircraft provided the Navy with one of the earliest Mentors built, but it easily held its own against competing aircraft. Despite its age, the airplane was praised by Navy pilots for its rugged construction and particularly its nearly indestructible landing gear. During testing that lasted from September until December 1953, the airplane was subjected to abuse at the hands of pilots learning how to land on the deck of an aircraft carrier. Unlike the Air Force that had long runways to land on gently, the Navy taught its aviators to slam the airplane down on the deck to catch the arresting cable and "trap" the airplane. Although

At the behest of the Navy, in 1972 Beech Aircraft Corporation engineers redesigned the T-34B to accept a PT6A-25 turboprop engine built by Pratt & Whitney Canada. Rated at 400 shaft horsepower, the engine breathed new life into the aging Mentor airframe. More than 300 of the more powerful Mentors were produced from 1975-1990. An export version designated T-34C-1 proved popular as basic trainers and light ground attack aircraft with air forces in Peru, Morocco, Argentina, Mexico and Ecuador. (Edward H. Phillips Collection)

the landings "washed out" the gear of some competing aircraft, the Mentor's tricycle landing gear never failed under those severe conditions.

During the summer of 1954, the Navy announced that the Model 45 (company designation D45) had won the competition and would become the Naval Air Training Command's primary trainer. Initial deliveries began in December. There were only a few distinctions between production Mentors for the Air Force and Mentors for the Navy. These included:

- A small, triangular fillet at the bottom of the rudder was deleted
- Provision was made for differential braking that allowed nose wheel steering for maneuvering on the ground (the T-43A featured a steerable nose wheel using the rudder pedals, much like that of the commercial Model 35).
- Rudder pedals were adjustable instead of adjusting the seat
- Wing dihedral was increased slightly
- The overall exterior paint scheme used a highly visible, bright yellow color that Navy officials believed would make the airplanes more visible in the air and around the training airfields.

Production of the T-34B began in October 1954 and continued unabated until October 1957, when the last 12 airplanes were delivered. During those three years, a total of 423 Mentors rolled off the assembly lines. Performance was almost identical to that of the T34A, with a maximum speed of 188 mph at a gross weight of 2,985 pounds (empty weight was 2,170 pounds). Maximum diving airspeed was 280 mph. All T-34B were powered by six-cylinder, air-cooled, opposed Continental O-470-13 engines that developed 225 horsepower for takeoff, and were fitted with Beech-built two-blade, constant-speed propellers that helped the Mentor achieve a respectable rate of climb at sea level of 1,280 feet per minute. During a 10-year period spanning 1948-1958, Beechcraft employees eventually built 1,904 examples of the Model 45.[5]

Much to the Navy's delight, the T-34B's record as a primary trainer allowed the service to reduce the number of flying hours to 36 from 74 because students learned more quickly in the Beechcraft than in the SNJ with its conventional landing gear configuration. The Mentor also slashed the time required to solo by more than 50%, and the overall accident rate decreased as well compared with the SNJ. In short, the T-34B taught fledgling naval aviators better and more quickly while drastically reducing operating costs.

It is interesting to note that in 1961 the Navy reported that since flight operations began in 1956 at Pensacola, more than 9,000 naval aviators had been trained in the T-34B. These airplanes had flown more than 445,000 hours and boasted a safety record five times better than their predecessors. Navy training squadron VT-1, operating from Saufley Field in Pensacola, reported a record 75,000 consecutive accident-free flying hours surpassed only by VT-3's 80,000-hour record.

One T-34B, the 39th to roll off the Wichita assembly line, earned a "gold seal of approval" from Naval Air Training Command after completing more than 5,000 hours and traveling 700,000 miles in the air. More than 100 Navy and Marine Corps pilots had been trained in the aircraft, which records showed had made 16,459 landings, 4,604 loops, 3,401 spins and 17,904 stalls and was refueled 3,325 times.[6]

During the early 1960s, the U.S. Air Force began phasing out its fleet of T-34A trainers in favor of jet-powered basic training aircraft. A competition was won by Cessna Aircraft Company's twin-jet T-37 that featured side-by-side seating for the instructor pilot and the student. In the mid-1950s, Beech Aircraft Corporation did build its own version of a jet trainer designated as the Model 73. It was powered by a single turbojet engine and its airframe borrowed heavily from the Model 45. Although the airplane flew well and made many

"… the T-34B taught fledgling naval aviators better and more quickly while drastically reducing operating costs."

demonstration flights, it failed to win any orders from military forces.

As for the Navy's fleet of Mentors, they soldiered on faithfully for more than 35 years until 1975 when deliveries began of the much improved T34C. In 1973, the Navy awarded Beech Aircraft a contract to develop a turboprop version of the T-34B, and the first of two YT-34C prototypes flew in 1974. Beech engineers modified the T-34B airframe to accept a Pratt & Whitney Canada PT6A-25 turboprop engine rated at 400 shaft horsepower. The engine and other systems upgrades would extend the life of the venerable Mentor for another 25 years until being replaced by the Beechcraft T-6A "Texan II" – another PT6A-powered airplane that is currently serving both the U.S. Air Force and Navy as a basic trainer. The Navy accepted 18 T-34C trainers in 1975, to be followed during the next seven years by more than 330 airplanes. A final batch of 19 trainers were delivered in 1989.

The T34C had a maximum speed of 246 mph and possessed a service ceiling of more than 30,000 feet. It featured a wingspan of 33 feet,4 inches and a fuselage length of 28 feet 8.5 inches. In addition to the U.S. Air Force and Navy, the U.S. Army took delivery of six T-34C trainers in 1987 from Navy inventory. Three aircraft replaced the aging North American T-28 "Trojan" with their static, air-cooled radial engines that had been flown by the Army Aviation Engineering Flight Activity based at Edwards AFB, California. Another three were operated by the Army Airborne Special Operations Test Board located at Fort Bragg, North Carolina.[7]

The factory also built an export version of the T-34C known as the T-34C-1, powered by a 550-shp PT6A engine. It was intended primarily as a basic trainer but could be equipped to operate as a light attack aircraft. The chief modification centered on four hard points under the wings that could accommodate up to 1,200 pounds of ordinance. In the late 1970s, the Ecuadorian Air Force took delivery of 14 airplanes and Peru, Morocco, Argentina and Indonesia also ordered the T-34C-1.

Commercial and export versions of the Mentor received the company designation Model B45. Per factory records, 85 were delivered in 1953-1954, 47 in 1954-1955 and 21 in 1955-1956. Another 45 were delivered in 1956-1957 followed by 29 in 1957-1958 and 91 in 1958-1959 when production was terminated. In 1953, Chile ordered more than $1 million-worth of T-34A trainers after the Beechcraft proved superior to American, British and French competitors. Chile eventually operated a fleet of 65 Mentors. Japan soon followed by obtaining a license for Fuji Heavy Industries to build the T-34A and 137 aircraft were completed. Other armed forces that flew the T-34A include the Mexican Navy and the Venezuelan Air Force. The first sale of Mentors for civilian use occurred in 1958 when the International Training center for Civil Aviation in Mexico bought four airplanes to train pilots.

The exact number of Beechcraft Mentors being flown by civilian pilots worldwide is unknown, but a reasonable estimate is 100-150. The airplane is prized by sport pilots for its robust airframe and aerobatic capabilities, and some airplanes have been painted in U.S. Air Force and Navy color schemes that replicate the Mentor in service as a "warbird."

Notes:

1. Phillips, Edward H.: *"Pursuit of Perfection: A History of Beechcraft Airplanes;"* Flying Books, Eagan, Minnesota, 1992.

2. McDaniel, Willian H: *"The History of Beech;"* McCormick-Armstrong Co., Inc. Wichita, Kansas, 1971.

3. Ibid

4. Ibid

5. Ibid

6. Ibid

7. Harding, Stephen; *"U.S. Army Aircraft Since 1947"*: Specialty Press, Stillwater, Minnesota. 1990.

Ed Phillips, now retired and living in the South, has researched and written eight books on the unique and rich aviation history that belongs to Wichita, Kansas. His writings have focused on the evolution of the airplanes, companies and people that have made Wichita the "Air Capital of the World" for more than 80 years.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Technical PIREP Front Nose Steering

by Kim Blonigen

Photos by King Air Academy

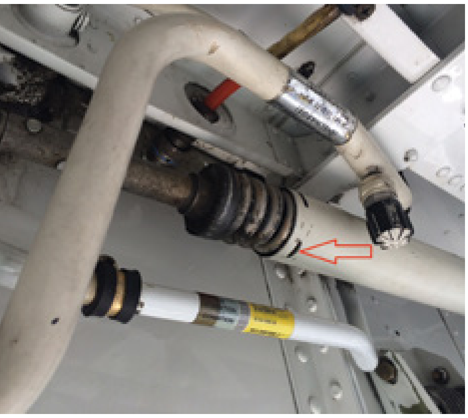
Editor's Note: This information was originally released by the King Air Academy in 2017 and received a large response from the receiving audience, many finding their retaining clip compromised. We thought it would be beneficial to publish it again for those who may not have seen the first transmission. It is paraphrased below.

This is regarding an incident involving a King Air BE20 where after a normal touchdown, the nose tire skidded for approximately 2,000 feet before the aircraft came to a stop. The nose wheel was deflected significantly right (see photo below, left).

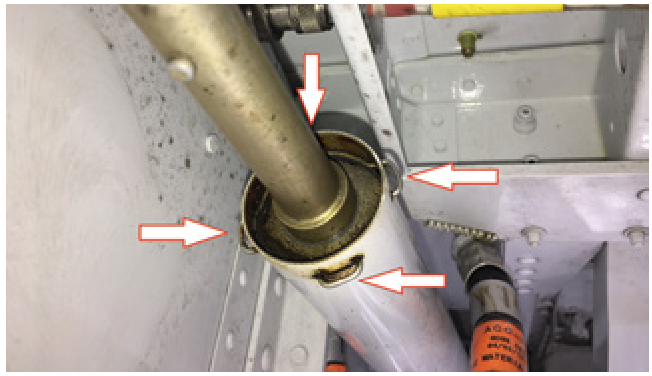
Upon closer inspection, the retaining clip at the aft end of the nose wheel shock link was found to be missing, which allowed the spring inside to extend and effectively create a "right turn" input to the nose wheel.

What can cause this?

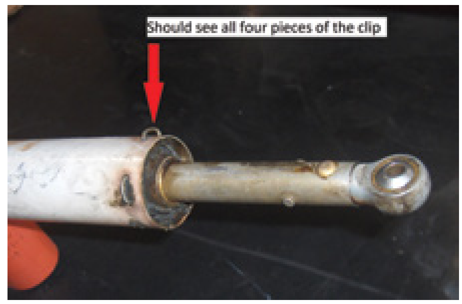
A shock link retaining clip can be broken, with one or more "keepers" missing. This can have the potential for the same type of failure the BE20 experienced.



Be sure to check all four "keepers" (reference photos at right) on the retaining clip during your preflight inspection. Feel all the way around the clip or reach your phone up into the wheel well and take a picture of the area that is hard to get a visual on. We have heard of a few shops that are safety wiring the clip in place. This is not an approved practice.



The retaining clip is a very inexpensive part and can be easily replaced before it fails. Next time you preflight, give this area extra vigilance and save yourself some tense moments and potentially expensive repairs. KA



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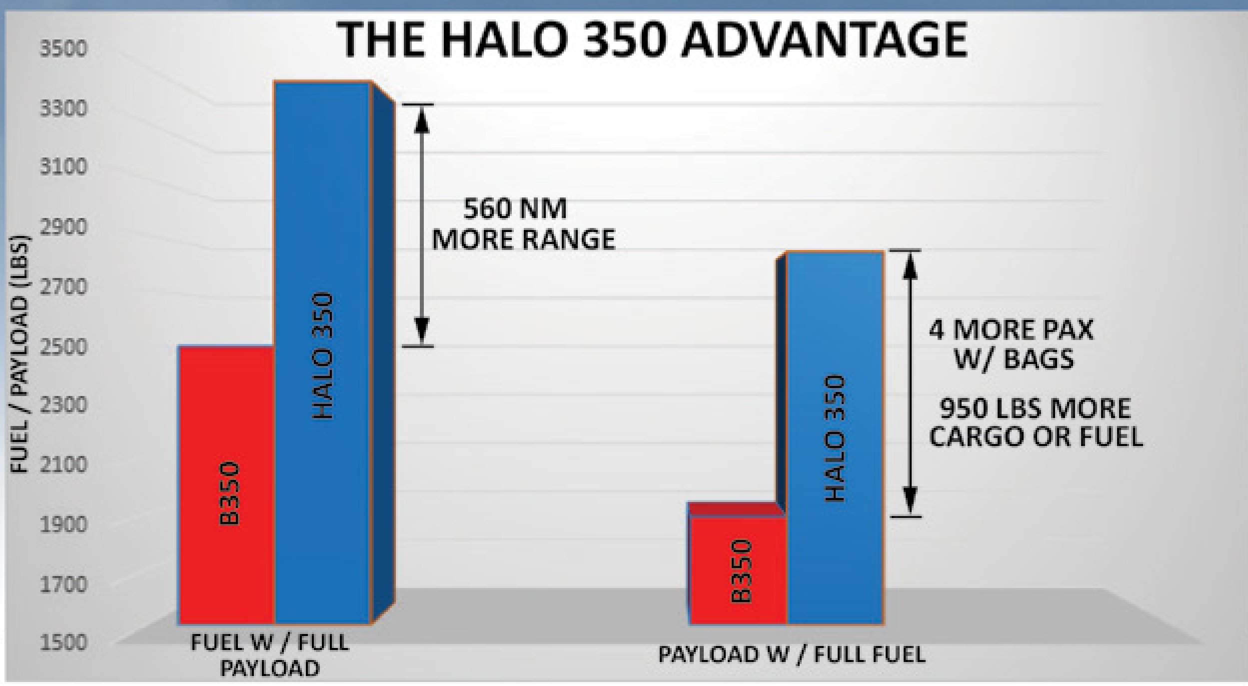

HALO 350 Information Chart

Increase Max Ramp Weight	15,000 to **16,050**
Increase Max Takeoff Weight	15,000 to **15,950**
Max Landing Weight	No Change **15,000**
Max Zero Fuel Weight	No Change **12,500**
Payload Increase	**950**

Weight and payload shown in pounds.

HALO 350 STC Kit:

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