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Down and Locked: A History of Beechcraft Landing Gear Indications

Confirming your landing gear is down prior to landing is a vital pre-landing check. Safety systems that warn us when the gear is not down are a last defense against a gear-up landing. Over the nearly 68 years since the first Beech Bonanza flew in December 1945, Beechcraft has provided several different landing gear indication and safety systems. For the pilot new to Beech airplanes, the veteran ABS member curious about the lineage of his or her Beechcraft, and the flight instructor preparing to provide superior customer service to the pilot of a Beechcraft Bonanza, Debonair, Baron, or Travel Air, here is a history of Beechcraft landing gear indications.

Original Design

The original design of the Bonanza landing gear system provides two independent position indications:

1. *Lights.* Two lights, on the right subpanel near the gear position switch, indicate the position of the landing gear. A RED light illuminates when the gear is fully UP, and a GREEN light shines when the gear is fully DOWN. The lights are activated by switches on the gear actuator when the system reaches either extreme of travel. No light illuminates when the gear is somewhere between fully up and fully down – the only time no gear light is on is when the gear is in transit.
2. *Pointer.* A mechanical wire pointer is attached to an idler arm on the nose gear actuating mechanism and moves directly with it. The pointer is located in the lower, center pedestal, and indicates when the gear is UP or DOWN.

This original system also has a gear-up warning horn that sounds any time the throttle control (or in the case of Travel Airs and Barons, when either or both throttle controls) is in a position that would produce less than 12 inches of manifold pressure at sea level. In turbocharged Barons, the throttle switch is set to a position that normally provides 20 to 24 inches of manifold pressure.

These ABS-type airplanes have the original-design landing gear indicating and warning system:

- Model 35 Bonanza through V35A serial numbers D-1 through D-9068.
- Model 33 Debonair through C33 and C33A, and Model E33, E33A and E33C Bonanza, serial numbers CD-1 through CD-1118; CE-1 through CE-289; and CJ-1 through CJ-25.
- Model 36 Bonanza serial numbers E-1 through E-184.
- Model 95 Travel Air through E95 (all TD-series serial numbers).
- Model 95-55 and A55 Baron and some B55 Barons, serial numbers TC-1 through TC- 1607.
- Model C55 and D55 Baron, and some E55 Barons, serial numbers TE-1 through TE-937.
- U.S. Army T-42A Cochise (all TF-series serial numbers).
- Model 56TC and A56TC Turbo Baron (all TG-series serial numbers).
- Model 58 Baron serial numbers TH-1 through TH-384.

Three-Light System

In the early 1970s Beech redesigned the landing gear indicating system to include the familiar "three green" lights. Each GREEN light is independently operated through a switch in the respective gear leg's wheel well, and activates when that strut reaches the extreme DOWN position. A RED "in transit" light illuminates when the gear is somewhere between the full UP and full DOWN position. No light illuminates during gear up operation. The nose pointer was eliminated with this design change, and the gear warning horn system remained unchanged.

The three-light landing gear indicating system applies to these Beechcraft:

- V35B Bonanza serial number D-9069 and after.
- F33, F33A, F33C, and G33 Bonanzas serial number CD-1119 and after; CE-290 and after; and CJ-26 and after.
- A36 and G36 Bonanza serial number E-185 and after.
- A36TC and B36TC Bonanza (all EA-series serial numbers).
- B55 Baron serial number TC-1608 and after.
- E55 Baron serial number TE-938, TE-943 and after.
- Baron 58 and G58 serial number TH-385 and after.
- 58TC Baron (all TK-series serial numbers).
- 58P Baron (all TJ-series serial numbers).

Indicator Dimming

With the introduction of three-light systems, the landing gear indicator lights automatically dim whenever the exterior navigation (or position) lights are turned on. As noted below, the nav lights feature was replaced by a panel mounted TEST/BRIGHT/DIM switch that permits you to select the intensity of panel annunicators including the gear lights:

- V35B Bonanza D-9948 and after.
- F33A Bonanza CE-674 and after.
- A36 Bonanza E-927 through E-2110 except E-1946 and E-2104.
- A36TC and B36TC Bonanza EA-1 through EA-388.
- B55 Baron TC-2003 and after.
- E55 Baron TE-1094 and after.
- Baron 58 TH-773 through TH-1396 and after except TH-1389.

Dimmed landing gear lights may be difficult to see during daylight operation. If you extend the landing gear in one of these airplanes and do not see the green lights, check to ensure the TEST/BRIGHT/DIM panel switch is in the BRIGHT or ON position, and that the navigation lights are off as applicable to the airplane.

Beginning with the change to the power quadrant, "new panel" design in 1984, the three green indicator lights automatically dim in low-light conditions. A small photoelectric

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cell directly adjacent to the indicator lights controls the dimming function. The F33A did not receive this change, which does affect these airplanes:

- A36 and G36 serial number E-1946, E-2104, E-2111, and after.
- B36TC serial number EA-389 and after.
- Baron 58 and G58 serial number TH-1389 and TH-1396 and after.
- 58TC Baron serial number TK-147 and TK-151 and after.
- 58P Baron serial number TJ-436 and TJ-444 and after.

Additional Safety Systems

Squat switch. All ABS-type airplanes have a squat switch that opens when the right main gear strut compresses under aircraft weight. An open squat switch breaks a circuit and prevents electrical power from running the gear motor. This is designed to prevent gear retraction when the airplane is on the ground, even if the cockpit gear selector switch is moved to the UP position. About the same time Beech switched to the three-light gear indicating system it also began installing a second squat switch, on the left main gear. Both switches must be closed, i.e., there can be no weight on *either* main gear leg, for the gear motor to receive electrical power. Many earlier Beechcraft have been modified with the addition of the second main gear squat switch.

Throttle switch. Later Beechcraft have a throttle position switch that also interrupts electrical power to the landing gear motor when the throttle (or in the case of Barons, one or both throttles) is in a position that normally develops 17 inches or less of manifold pressure at sea level (20 to 24 inches in turbocharged Barons). This is another way to prevent gear retraction during ground operations. It works at any time; however, so if the throttle in these Beechcraft is reduced below the 17 inch position in flight and the gear is down, it will not retract if the pilot moves the gear selector to UP. If you try to retract the gear at reduced power in flight and it will not retract, advance the throttle, retract the gear, *and then* readjust the throttle as needed.

These airplanes have the 17-inch position throttle switch (20 to 24 inches in turbocharged Barons):

- F33A and F33C Bonanza serial number CE-1301 and CE-1307 and after, and CJ-180 and after.
- A36 and G36 Bonanza serial number E-2458 and E-2468 and after.
- B36TC Bonanza serial number EA-488 and after.
- Baron 58 and G58 serial number TH-1543 and TH-1545 and after.
- 58TC Baron serial number TK-147 and TK-151 and after.
- 58P Baron serial number TJ-436 and TJ-444 and after.

Gear up annunciator. Shortly after Beech added the throttle safety switch, it also included a red GEAR UP warning light on the annunciator panel along the lip of the glareshield, directly ahead of the pilot. Any time the gear warning horn sounds, the GEAR UP annunciator flashes as well. Even when other indicator lights are dimmed, the GEAR UP light illuminates at full brightness when activated.

Full flap warning. Also concurrent with introduction of the throttle switch, the gear warning horn and GEAR UP annunciator light activate any time the flap switch is the in FULL DOWN position and the landing gear is not down. This is designed to warn the pilot who prepares to land by extending full flaps, but who has forgotten the landing gear.

Modifications

Many Beechcraft have been modified to include additional landing gear indication systems. The once-popular Clark Three-Light System is a Supplemental Type Certificate (STC)-approved upgrade of original design gear indicators to a three green light system. This STC is now owned by D'Shannon Aviation, which recently (May 2013) told ABS it may return this STC to market. Numerous pre-1984 Beechcraft and F33As with dual control columns installed, which make checking the gear indications difficult, have had a small set of three green lights added somewhere on the panel as a minor alteration or under a one-time FAA approval. ABS has heard of one-time approvals for full-flap warning horn activation in earlier airplanes as well. Lastly, there are a number of aftermarket warning systems based on indicated airspeed, airplane configuration, radar altimetry and even GPS ground speed readouts that have been or will soon be approved by the FAA and international authorities. Watch the advertising in *ABS Magazine* for your full range of available options.

Gear indications and warning systems are not your only way to confirm landing gear position after takeoff and before landing. Sound is a powerful confirmation of proper gear movement, as is the combination of airspeed, attitude, power setting, and vertical speed – if any of the four are not as you expect, the landing gear position is the first thing to suspect. Ultimately, however, we're looking for "three green, no red" or "green light and a pointer" at gear extension and again in a short-final landing gear check. And now you know what to look for in any Beech Bonanza, Debonair, Travel Air, or Baron you may fly.