

# Part Number 41065

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**A**s explained in “The Object Formerly Known As Nessie,” one of the elements that appears to be identifiable in the Bevington Photo is part of the retraction mechanism listed in the Lockheed Model 10 Parts Catalog as “Part Number 41065, Gear, worm.” If our identification of the part is correct, its presence in the photo guarantees that the wreckage on the reef in the 1937 photo is specifically from the Earhart aircraft.

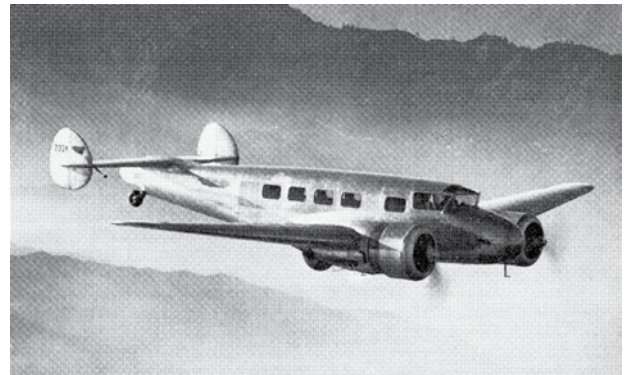
In 1936 Lockheed made a major change in the landing gear retraction mechanism of the Model 10. Earhart’s Model 10E Special, delivered on July 24th of that year, was the last of only 54 Electras built with the original system – Lockheed Landing Gear Installation 40650.<sup>1</sup> When you know what to look for the change is easy to spot, but it took a bit of research to piece together how and why the modification was made.

## NEW COMPANY, NEW STAR

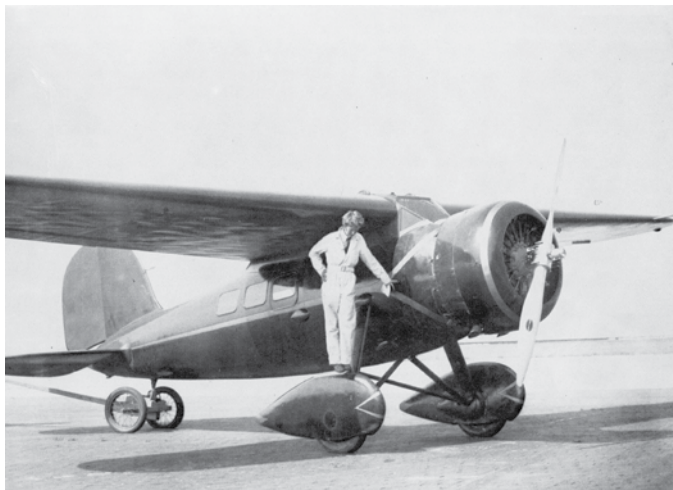
**I**ntroduced in 1934, the Model 10 was the tenth design marketed by Lockheed. Like the earlier Model 5 “Vega,” Model 8 “Sirius,” and Model 9 “Orion,” the new design was named for a star, in this case “Electra,” the “lost star” of the Pleiades cluster in the constellation Taurus. Despite the appearance of continuity, this was a new Lockheed Aircraft Corporation and the new airplane was a

radical departure from previous designs. Lockheed had built its reputation on fast single-engine airplanes with sleek molded-plywood bodies and cantilevered wooden wings designed by Jack Northrop and flown by customers with names like Post, Earhart, Lindbergh and Kingsford-Smith. However, fame proved to be no antidote to the Great Depression and on June 16, 1932 the doors of the Burbank factory were closed.

Just five days later Lockheed Aircraft Corporation was reborn, its assets purchased by a group of investors for \$40,000. A new design team headed by Lloyd C. Stearman began sketching out an all metal, ten-seat, single-engine airliner until the primary investor and new Treasurer, Robert Ellsworth Gross, convinced them that the future of commercial sales was in multi-engine aircraft. A second engine was added and the new Lockheed company’s first offering was an all-metal, twin-engine, low wing monoplane with retractable landing gear.<sup>2</sup>



*Introduced in 1934, the first Electra – c/n 1001 – featured the then-fashionable forward slanting “Fokker style” windshield.*

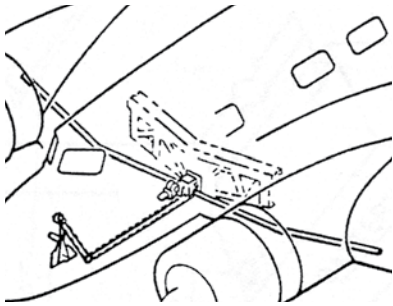


*The Vega in which Earhart flew the Atlantic was typical of the classic Lockheed designs of the late 1920s and early '30s.*

## THE FLYING CEMENT MIXER

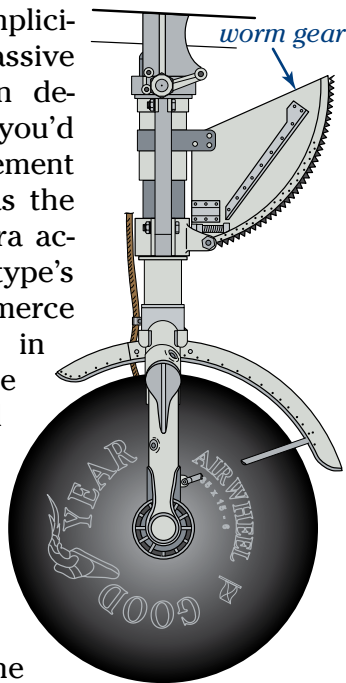
**L**ike the rest of the airplane, the system devised for retracting the wheels was straightforward and robust. Steel drive shafts extended out from a centrally mounted electric motor and transmission. A “worm” on the end of each shaft engaged the cogs of a steel “worm gear” – Part Number 41065 – bolted to the rear of each landing gear

strut. When the shaft rotated, the worm walked the worm gear and the attached strut and wheel rearward and upward into the engine nacelles.



*As illustrated in the Model 10 Maintenance Parts Catalog, the Electra's retractable landing gear was driven by steel shafts that extended out from an electric motor and transmission mounted on the girder-like main beam.*

The price of simplicity was weight. The massive “worm gear” has been described as “something you’d normally see on a cement mixer” and its bulk was the cause of the first Electra accident. On the prototype’s final Bureau of Air Commerce certification test flight in August 1934 one of the wheels failed to extend for landing. Apparently one of the drive shafts was not up to the task. Lockheed test pilot Marshall “Babe” Headle made a successful one-wheel landing but the cost of repairs was a blow to the struggling young company.<sup>3</sup>



*Landing Gear Installation 40650*



*In this photograph the worm gear can be seen on the left main landing gear strut of Earhart's Electra.*

a full 18% lighter than its big sister, aided in large part by a new, lighter, faster landing gear retraction system.<sup>5</sup> Instead of the clunky worm gear, the Electra Junior’s landing gear featured an articulating “knuckle” that was hinged in the middle and jack-knifed forward as the wheel was pulled up and back.



*The Model 12 Electra Junior was smaller, lighter and faster than its big sister.*

## LEARNING FROM JUNIOR

**D**espite some birthing pains, the Model 10 was well received and by the end of 1935 nearly fifty Electras had been delivered to airlines such as Northwest, Pan American, Eastern, and Delta.<sup>4</sup> Hoping to expand on the success of the basic Model 10 formula, Lockheed entered a Bureau of Air Commerce design competition for a small twin-engine transport to serve feeder lines. By scaling down to a shorter fuselage with accommodation for six, rather than ten, passengers while keeping the same 450 HP engines, the Model 12 “Electra Junior” (there was no Model 11) would be faster and have better over-all performance than the Model 10, but weight reduction would be key. In the end, the Model 12 weighed in

Babe Headle made the first takeoff in the prototype Model 12 on June 27, 1936, three days before the Bureau of Air Commerce competition deadline. The new design clocked a top speed of 225 mph at 5,000 feet and delivered a cruising speed of 213 mph (compared to 202 mph and 190 mph for the Model 10A) and won the Bureau of Air Commerce competition.<sup>6</sup> Adapting the new retraction system to the Model 10 was a no-brainer and, beginning with constructor’s number (c/n) 1056 – a Model 10B delivered to Chicago & Southern Airlines – Landing Gear Installation 45100 replaced 40650 on all subsequent Electras.





*In this photo of Lockheed Model 10A c/n 1130, under rebuild at the National Museum of Naval Aviation, the "new" retraction system – Installation 45100 – is clearly visible.*



*Lockheed test pilot Marshall "Babe" Headle with Amelia Earhart. "You see Amelia? We got rid of that heavy worm gear mechanism like the one on your airplane and replaced it with this new drag strut system." Ironically, the Electra in the photo is Model 10A c/n 1060, registered VH-UXH and destined for Guinea Airways in Lae, New Guinea.*

*In Lae, New Guinea Fred Noonan assists with maintenance on the left engine propeller hub of NR16020. The bottom edge of the worm gear is clearly visible on the rear side of the left main landing gear strut.*



Earhart's Model 10E Special, c/n 1055, was the last airplane built with the old worm gears.<sup>7</sup> It is a bit surprising that the system was not upgraded when the airplane was in the shop for extensive repairs following the Luke Field debacle but that was probably because time and money were in short supply. Photos of NR16020 in Lae, New Guinea leave no doubt that the airplane still had the 40650 system when it disappeared.

If we have a photo of a worm gear on the reef at Gardner Island (now Nikumaroro), what aircraft could it be from? Of the fifty-four Electras that had worm gears, only two airplanes ever traveled west of California. Model 10A, c/n 1034, was delivered to the Mesta Machine Co. in Pittsburgh, PA in August 1935 and, at some later time, was sold to Qantas Empire Airways in Brisbane, Australia. That airplane was destroyed in a crash near Charville, Queensland in February 1949.<sup>8</sup> The only other candidate is Amelia Earhart's Model 10E Special, c/n 1055, and the wreckage on the reef can only be from that aircraft ... unless somebody misplaced a cement mixer. ◆

## NOTES

- 1 Lockheed Model 10 Maintenance Parts Catalog – 1939.
- 2 Francillon, René. *Lockheed Aircraft since 1913*, Naval Institute Press, 1987.
- 3 Emmert & Larkins. "Lockheed's Model 10 Electra" in *Journal of the American Aviation Historical Society*, Summer 1978.
- 4 *Ibid.*
- 5 Francillon.
- 6 *Ibid.*
- 7 Lockheed.
- 8 Emmert & Larkins.