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Office of Research and Engineering

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AIRCRAFT PERFORMANCE

Specialist's Study

January 5, 2026

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A ACCIDENT

Location: Heber, Utah
Date: April 21, 2024
Time: 15:30 mountain daylight time, MDT
21:30 UTC
Airplane: Alexander Schleicher GMBH & Co ASH 26 E motor glider, N644CC

B AIRCRAFT PERFORMANCE SPECIALIST

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C SUMMARY

On April 21, 2024, about 1530 mountain daylight time, an experimental Alexander Schleicher GMBH & Co ASH 26 E, N644CC, was substantially damaged when it was involved in an accident near Heber, Utah. The pilot was not injured. The motor glider was operated as a Title 14 Code of Federal Regulations Part 91 personal flight.

According to the pilot, he planned to practice takeoffs and landings at Heber Valley Airport (HCR). During the second takeoff, the pilot realized that the motor glider was not climbing or maintaining altitude. He reported that he was wearing a headset and could not recall if the engine was running rough and did not recall what the engine rpm was. The pilot elected to perform a 180° left turn to land on the taxiway. Upon completion of the turn, the motor glider was to the right of the taxiway without adequate altitude to correct to the taxiway. The pilot elected to land straight ahead on hilly terrain. During the landing roll, the motor glider struck vegetation and came to rest upright. The pilot stated that he exited the motor glider without assistance and observed that the engine was not running.

D DETAILS OF THE INVESTIGATION

1.0 Airplane

The ASH 26 E is a single-seat sailplane with a deployable propeller for self-launching [1]. The engine drives the two-bladed propeller through a toothed-belt transmission with a 1:2.78 reduction ratio. The ASH 26 E employs a single-stage Wankel rotary engine identified as an Austro Engines AE50R, delivering a maximum of 37 kW (50 HP) at 7500 RPM at sea level [2]. Maximum takeoff engine rotation is

7500 RPM (for 5 minutes), and maximum continuous engine rotation is 6900 RPM. A photograph of an exemplar airplane is shown in Figure 1.

2.0 Weather

Weather was recorded at HCR at 15:30 MDT as winds from 210° true at 7 kt, gusting to 15 kt, with clear skies and 10 statute miles visibility. The temperature was 21 °C (69.8 °F), dew point -3 °C (26.6 °F), and the barometric setting was 30.11 inHg.

Winds aloft, temperature, and pressure as functions of MSL altitude were also taken from a High-Resolution Rapid Refresh (HRRR) model sounding from the National Oceanic and Atmospheric Administration¹. The data were downloaded for coordinates 40.48° North, 111.44° West, at 15:00 MDT.

3.0 Airport

Heber Valley Airport (HCR) is at an elevation of 5636.8 ft. It has one runway 04/22, which is 6898 ft long by 75 ft. wide. The magnetic variation is 11° East. Both takeoffs were to the southwest on runway 22.

4.0 Data

Automatic Dependent Surveillance – Broadcast (ADS-B) data was downloaded from ADS-B Exchange². ADS-B broadcasts an aircraft’s Global Navigation Satellite System (GNSS) position and other data to ground stations and other aircraft. The ADS-B Exchanged data included latitude, longitude, pressure altitude, GNSS-based altitude, groundspeed, and track angle, and these data were recorded approximately once per second. The GNSS position data is expected to have an uncertainty of approximately 20 m (65 ft) in horizontal and vertical dimensions. No ADS-B data was available from the Federal Aviation Administration, but it was possible to download ADS-B data for the aircraft from ADS-B Exchange. The ADS-B data extended from 15:24:30 to 15:35:34, and the data captured the initial flight and return to the airport, as well as the second takeoff leading to the crash. The GNSS-based altitude above the reference ellipsoid was corrected to the mean sea level (MSL) altitude above the geoid by adding 51 ft.

Engine rotation rate was calculated from a sound spectrum analysis of a video showing the second takeoff [3]. The video began at 15:34:56, engine sounds decreased substantially about 15:35:31, and the sounds of ground impact were heard in the interval from 15:35:37 to 15:35:39.

¹ [READY Archived Meteorology](#)

² [Serving the Flight Tracking Enthusiast - ADS-B Exchange](#)

5.0 Rate of Climb Calculations

The focus of this study is to evaluate whether the rate of climb during the second takeoff was reduced when compared to the first takeoff, and if so, whether the reduced rate of climb could be attributed to a reduction in engine power consistent with the engine rotation determined in a sound spectrum study [3].

Figure 2 is an overhead view of the complete flight path on a Google Earth background. Select points are annotated with the time MDT, altitude above mean sea level in feet and groundspeed in knots. Figure 3 is an oblique view of the complete flight path, looking generally to the west.

The airplane took off from runway 22, first turning right and then turning left to circle around the airport before descending to perform a touch and go on runway 22. The ADS-B data covered approximately 11 minutes.

Figure 4 shows the pressure altitude for the complete flight, along with the GNSS-based MSL altitude and the density altitude calculated using the atmospheric conditions. Figure 5 shows the recorded groundspeed for the complete flight, along with the true airspeed calculated using the wind of 7 kt from 210° from the airport weather report and the calibrated airspeed calculated using the atmospheric conditions from the HRRR model sounding.

The MSL altitude and the airspeeds for the first and second takeoffs are compared in Figure 6. The engine RPM for the second takeoff determined in the sound spectrum study [3] is also shown in Figure 6; it is assumed that the engine was at 7500 RPM for the first takeoff, as would be expected from the flight manual. The time origin of the first takeoff was taken as 15:27:18.52 MDT, and the time origin of the second takeoff was taken as 15:34:34.15 MDT. The groundspeed at the time origin of the first takeoff was 13.8 kt, and the groundspeed at the time origin of the second takeoff was 13.2 kt. (The airplane did not come to a complete stop during the touch and go before the second takeoff.) Linear fits to the altitude data were used to calculate the rate of climb. For the first takeoff, the data from 24.21 s to 99.84 s were used in the fit. For the second takeoff, the data from 23.42s to 50.03 s were used in the fit. The average rate of climb for the first takeoff was 540 ft/min, and the average rate of climb for the second takeoff was 281 ft/min.

The rate of climb ROC can be calculated as

$$ROC = V_T \left(\frac{T - D}{W} \right) \quad (1)$$

where V_T is true airspeed, T is thrust, D is drag and W is the weight of the airplane. Power available $P_a = TV_T$ and power required $P_r = DV_T$, so this equation can also be written as

$$ROC = \left(\frac{P_a - P_r}{W} \right) \quad (2)$$

Power available can also be written in the form $P_a = \eta HP$, where η is a propeller efficiency and HP is the engine horsepower. Data from the flight manual [1] and the engine manual [2] were used to calculate parameters to predict the rates of climb for the accident flight. The flight manual lists rates of climb for three conditions, as shown in Table 1. The flight manual indicates that gliding flight can be extended by climbing for 5 min at 7500 RPM (at a median altitude of 1640 ft) and then climbing for 15 min at 6900 RPM (at a median altitude of 4921 ft). Standard atmospheric conditions and maximum takeoff weight are assumed.

Table 1. Rates of climb for three conditions from the aircraft flight manual.					
ROC (ft/min)	Altitude (ft)	Engine RPM	Weight (lb)	Calibrated airspeed (kt)	Engine horsepower
669.3	0	7500	1158	51	50.2
629.9	1640	7500	1158	51	48.0
413.4	4921	6900	1158	51	38.9

The engine manufacturer provides a figure that shows the engine power as a function of engine RPM at sea level and a separate figure that shows the percentage of sea level power available at altitude. The sea level power data extended from 6000 to 7500 RPM, and it was fit to a straight line as

$$HP_{sl} = (0.0088)\text{RPM} - 15.78 \quad (3)$$

The percentage of sea level power available at higher altitudes data was also fit to a straight line as

$$\text{Percentage} = 100\% - 30\% \left(\frac{\text{altitude}}{11000 \text{ ft}} \right) \quad (4)$$

The engine manual notes that the reduction in power is a result of a reduction in air density, so it is assumed that the density altitude is the appropriate altitude to use in equation (4). The calculated engine horsepower available (including RPM and altitude effects) for the conditions from the flight manual are listed in the last column of Table 1.

The equation for rate of climb can then be recast as

$$ROC = \frac{\eta HP - DV_T}{W} \quad (5)$$

or

$$\frac{(W)(ROC)}{V_T} = \frac{\eta HP}{V_T} - D \quad (6)$$

where each term in equation (6) has units of force (lb in this case). Since the calibrated airspeed is the same for the three conditions from the flight manual, it is assumed that the drag is constant, so a straight line fit to the data from the flight manual will allow calculation of η and D . The data and the fit are shown in Figure 7,

with the result that $\eta = 0.72$ and $D = 80$ lb, with a corresponding drag coefficient of $C_D = 0.072$. The calculation assumes a calibrated airspeed of 51 kt, and a wing area of 125.72 ft².

A propeller efficiency of $\eta = 0.72$ is relatively low, possibly a result of interactions of the airflow with the mast on which the propeller is mounted or from other losses in the drive train. The propeller efficiency η is a function of the advance ratio of the propeller, which equals V_T/nd , where V_T is again true airspeed, n is the rotation rate of the propeller, and d is the propeller diameter (5.08 ft). The advance ratio for the data from the flight manual ranges from 0.377 to 0.441.

Similarly, the calculated drag coefficient of $C_D = 0.072$ is much higher than that calculated from the glide performance in the technical data sheet³, which cites a best glide ratio of 50 at 51.8 kt. The glide ratio is approximately equal to the ratio of lift to drag, L/D . Assuming the same weight as that used in Table 1, and assuming the lift is equal to the weight, the drag is calculated as 23.2 lb. For sea level conditions, the drag coefficient from the glide ratio is then calculated to be $C_D = 0.021$, or less than one-third the drag coefficient calculated for climbing flight. Again, the mast on which the propeller is mounted is likely the source of additional drag.

The drag coefficient can be broken into a parasite (friction) component and an induced drag component

$$C_D = C_{Dp} + \frac{C_L^2}{\pi AR e} \quad (7)$$

where $AR = 27.74$ is the aspect ratio and the efficiency factor will be taken as $e = 1$ for this high-aspect-ratio wing. Assuming the lift is equal to the weight, the parasite component of the drag coefficient in the rate of climb data from the flight manual in Table 1 can be calculated as $C_{Dp} = 0.060$.

It is assumed that takeoff 1 was performed with the engine at 7500 RPM, as specified in the flight manual. Engine RPM for takeoff 2 was determined in the sound spectrum study [3], and that data is shown in Figure 6. At the start of the video, the engine was at 7500 RPM, but it then reduced to about 6900 RPM about 10 s later. About time 56 s in takeoff 2, the engine sound dropped off entirely and was not audible afterwards. Sounds of the crash were heard about time 64 s in takeoff 2. The calculated engine power for the two takeoffs is shown in Figure 8, including the effects of RPM and density altitude.

A prediction of the rate of climb that the airplane should have been able to achieve can then be made using equations (5) and (7) with $C_{Dp} = 0.060$, along with the air density, the 7500 RPM assumed for takeoff 1 and the measured engine RPM for takeoff 2, and the speeds in Figure 6. The lift coefficient C_L used in equation (7) is

³ [AS Einzelprosp 26 e 03 07](#)

again estimated by assuming the lift is equal to the weight. An intermediate weight of 1000 lb is assumed for both takeoffs. (The flight manual indicates a fuel usage of 4.23 gal/h, but the flight only lasted about 500 s, which would have used 0.59 gal or 3.5 lb of fuel if the engine was running the whole time during the flight.) The propeller advance ratio calculated during the two takeoffs ranged from 0.387 to 0.461, so the range of advance ratios was similar to that for the climb rates provided in the flight manual.

Figure 9 compares the predicted rates of climb with the average rates of climb from the fits to the altitude data in Figure 6. The predictions match the rate of climb for takeoff 1 reasonably well. The reduction in power during the second takeoff resulting from the lower engine RPM is only about 10 %, which is somewhat offset by a lower speed and therefore less drag, so the predicted rates of climb for the two takeoffs are nearly equal. However, the measured rate of climb during the second takeoff was only about half that of the first takeoff. Since the reduction in engine RPM is not enough to account for that, it is likely that there was some change in configuration between the first takeoff and the second that added more drag to the airplane.

E DISCUSSION

The rate of climb in the second takeoff was only about half the rate of climb in the first takeoff. The sound spectrum study [3] found that the engine RPM was about 10 % less than the 7500 RPM specified in the flight manual. A prediction of the rate of climb using data from the flight manual was reasonably accurate for the first takeoff, but the calculations also indicated that the 10 % reduction in engine RPM did not account for the substantial decrease in the rate of climb. It is likely that there was some change in configuration between the first takeoff and the second that added more drag to the airplane.

Submitted by:

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REFERENCES

1. Flight Manual for Powered Sailplane ASH 26 E, Alexander Schleicher GMBH & Co., July, 1995.
2. Engine Manual, Operation/Maintenance/Installation, AE50R, AE50RA, AE50RAB, Austro Engine GMBH, March, 2011.
3. Sound Spectrum Specialist's Study, National Transportation Safety Board, Washington, DC, October, 2025.



Figure 1. A photograph of an exemplar Alexander Schleicher GMBH & Co ASH 26 E motor glider. Source: [ASH 26 E | ASegelflugASegelflug](#).



Figure 2. Overhead view of the entire flight on a Google Earth background. Annotations indicate time MDT, MSL altitude and groundspeed. Both takeoffs were to the southwest on runway 22.

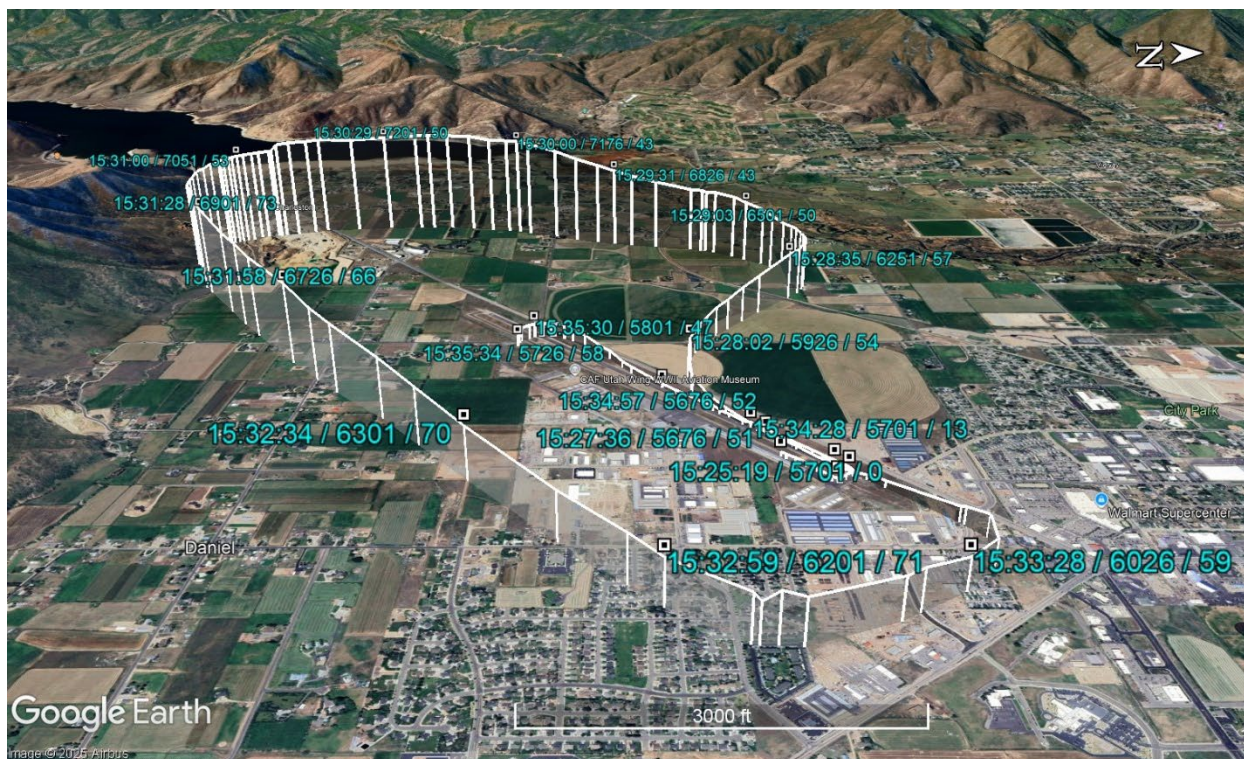


Figure 3. Oblique view of the entire flight on a Google Earth background, looking to the west. Annotations indicate time MDT, MSL altitude and groundspeed. Both takeoffs were to the southwest on runway 22.

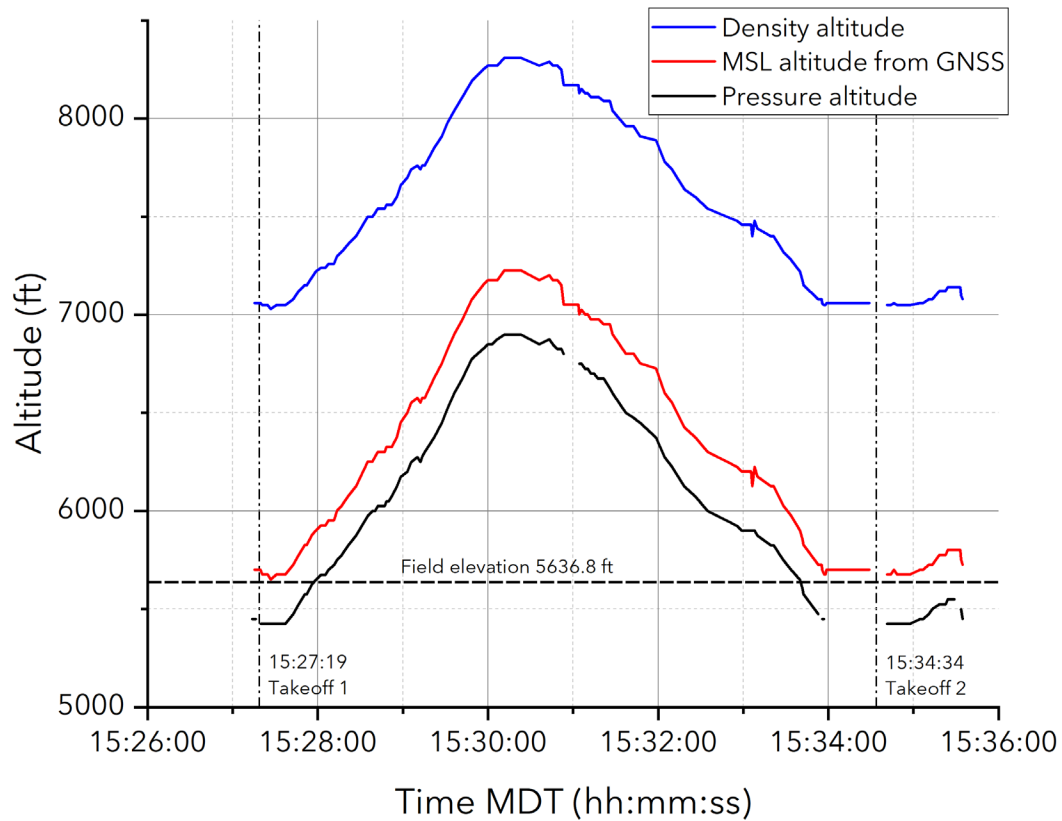


Figure 4. Pressure altitude, MSL altitude from GNSS, and density altitude for the entire flight. The field elevation and the time origins for takeoff 1 and takeoff 2 are also indicated.

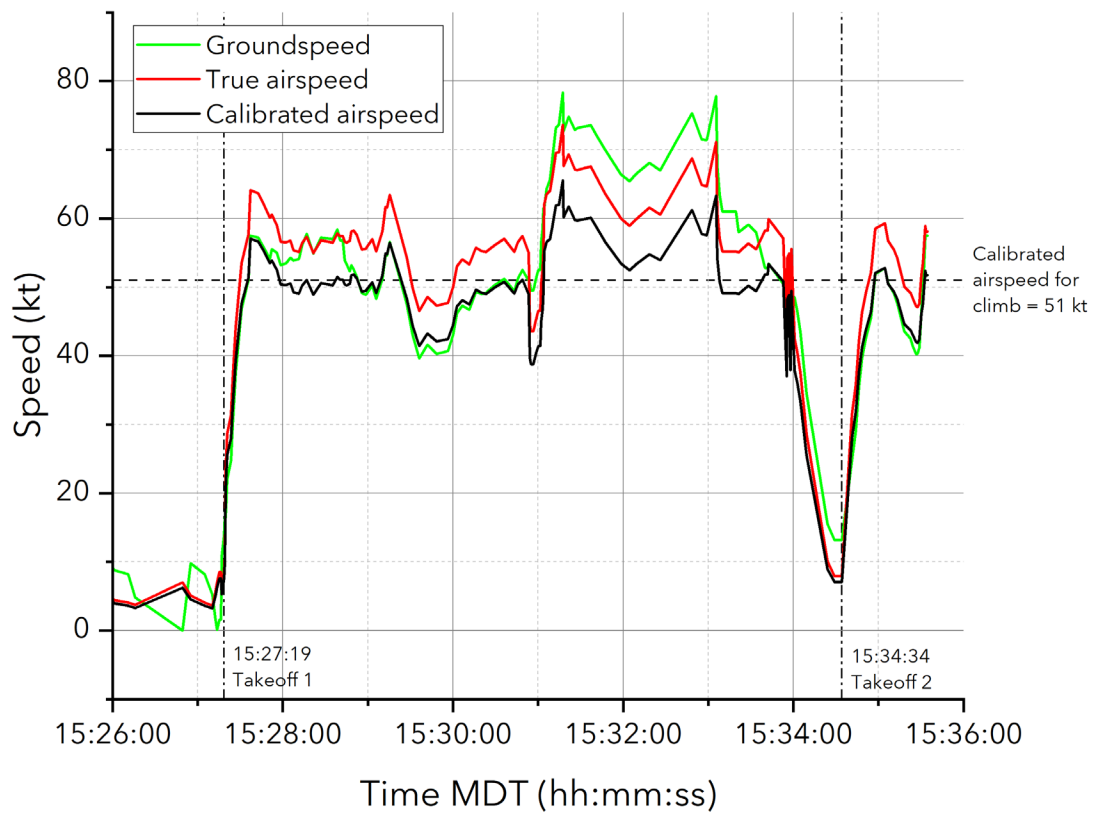


Figure 5. Groundspeed, true airspeed and calibrated airspeed for the entire flight. The time origins for takeoff 1 and takeoff 2 are also indicated.

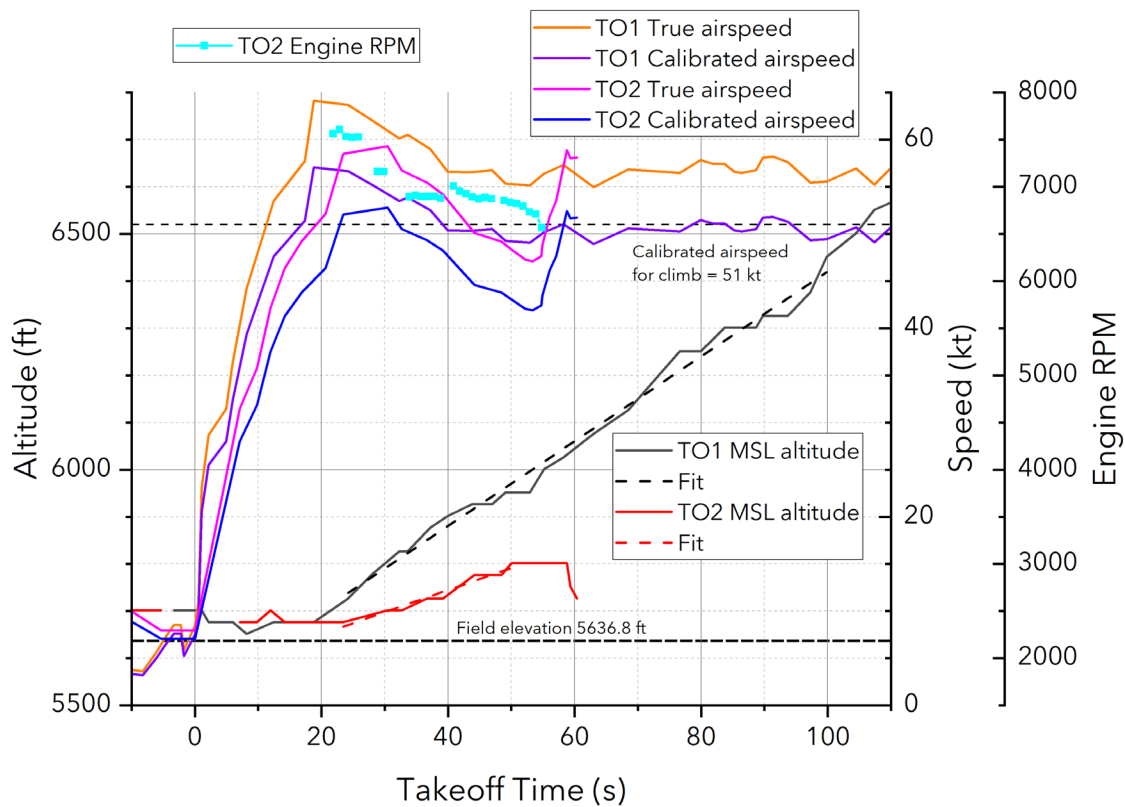


Figure 6. Comparison of the altitudes and speeds for the two takeoffs. Engine RPM for the second takeoff was measured in the sound spectrum study [3]; it is assumed the engine RPM for the first takeoff was 7500 RPM, per the flight manual [1]. Fits to the altitude data indicate an average rate of climb of 540 ft/min for the first takeoff and 281 ft/min for the second takeoff.

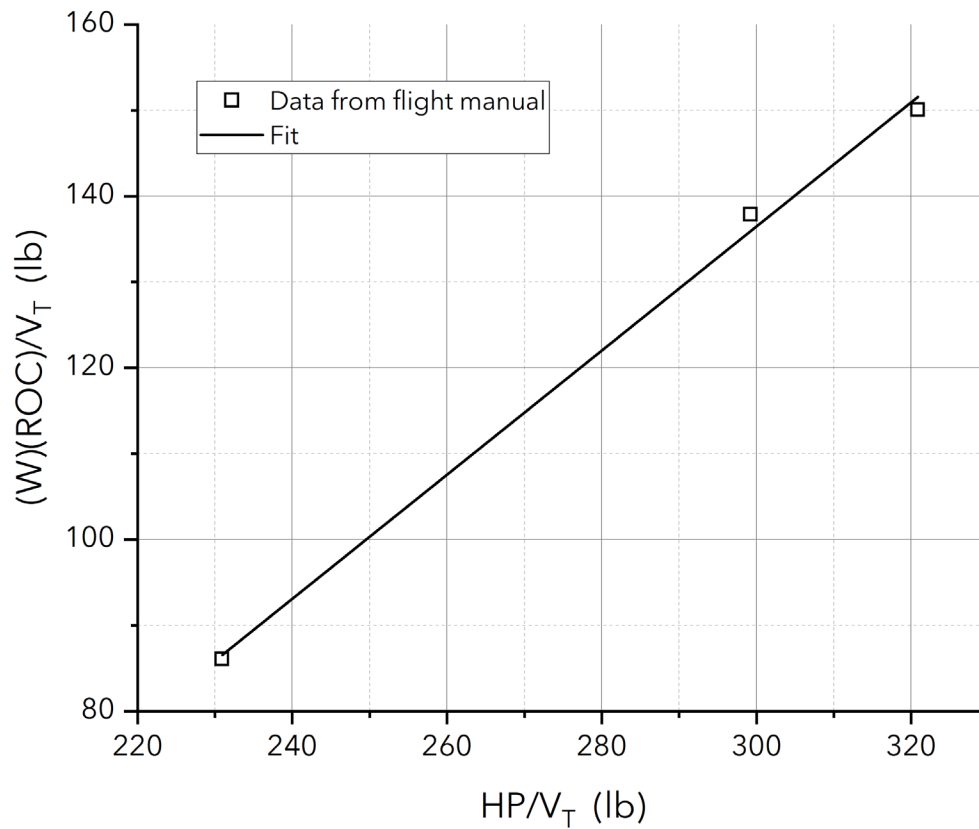


Figure 7. A plot of $(W)(ROC)/V_T$ versus HP/V_T for the three rates of climb provided in the flight manual [1]. The slope of the line fit through the data is the propeller efficiency η , and the intercept of the line with the y axis is minus the drag D . The fit yields $\eta = 0.72$ and $D = 80$ lb.

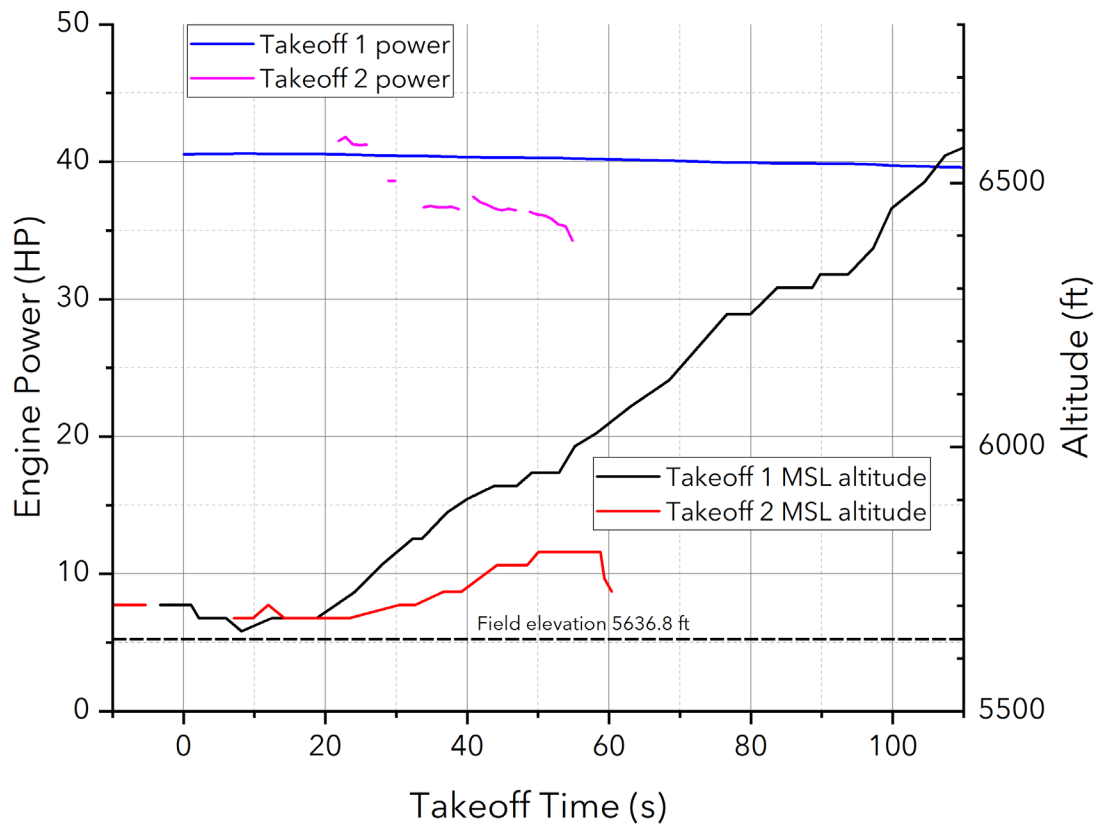


Figure 8. Engine power for the two takeoffs along with the MSL altitudes. The engine power includes the effects of engine RPM and density altitude.

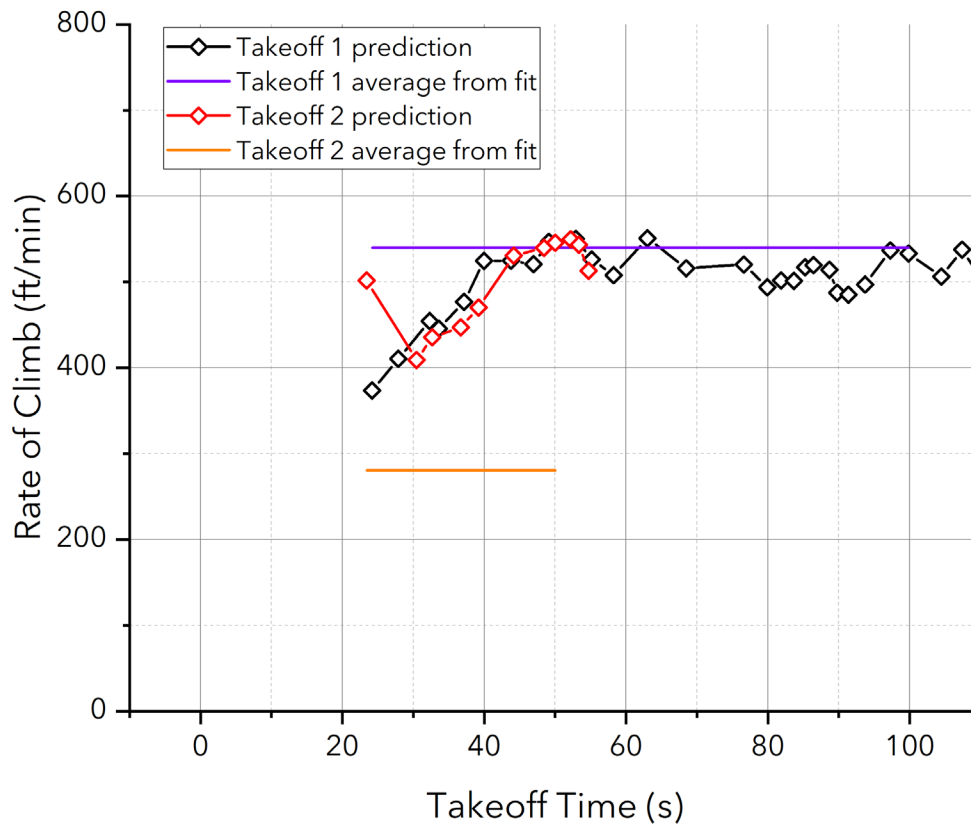


Figure 9. Predicted rates of climb from the engine power in Figure 8 (assuming an airplane weight of 1000 lb), compared to the average rates of climb from the lines fit to the altitude data in Figure 6.