Loading and Performance

1. What effect does high density altitude have on the efficiency of a UA propeller?

- Propeller efficiency is increased.
- **Propeller efficiency is decreased.**
- Density altitude does not affect propeller efficiency.

Note:
As density altitude increases there are fewer molecules for the propeller to push against and propeller efficiency decreases.

2. To ensure that the unmanned aircraft center of gravity (CG) limits are not exceeded, follow the aircraft loading instructions specified in the

- **Pilot's Operating Handbook or UAS Flight Manual.**
- Aeronautical Information Manual (AIM).
- Aircraft Weight and Balance Handbook.

Note:
The Pilot's Operating Handbook or UAS Flight Manual provides specific loading instructions and CG limits for the aircraft.

3. What could be a consequence of operating a small unmanned aircraft above its maximum allowable weight?

- **Shorter endurance.**
- Faster speed.
- Increased maneuverability.

Note:
Operating above the maximum allowable weight decreases endurance due to the increased power required to sustain flight.

4. According to 14 CFR part 107, who is responsible for determining the performance of a small unmanned aircraft?

- **Remote pilot-in-command.**
- Manufacturer.
- Owner or operator.

Note:
The remote pilot-in-command is responsible for determining the performance of a small unmanned aircraft as per 14 CFR part 107.

5. When operating an unmanned airplane, the remote pilot should consider that the load factor on the wings may be increased any time

- the CG is shifted rearward to the aft CG limit.
- **the airplane is subjected to maneuvers other than straight-and-level flight.**
- the gross weight is reduced.

Note:
Maneuvers other than straight-and-level flight increase the load factor on the wings.

6. A stall occurs when the smooth airflow over the unmanned airplane's wing is disrupted, and the lift degenerates rapidly. This is caused when the wing

- exceeds the maximum speed.
- exceeds maximum allowable operating weight.
- **exceeds its critical angle of attack.**

Note:
A stall occurs when the wing exceeds its critical angle of attack, causing a rapid decrease in lift.

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7. (Refer to Figure 2.) If an unmanned airplane weighs 33 pounds, what approximate weight would the airplane structure be required to support during a 30° banked turn while maintaining altitude?

Angle of bank ϕ	Load factor n
0°	1.0
10°	1.015
30°	1.154
45°	1.414
60°	2.000
70°	2.923
80°	5.747
85°	11.473
90°	∞

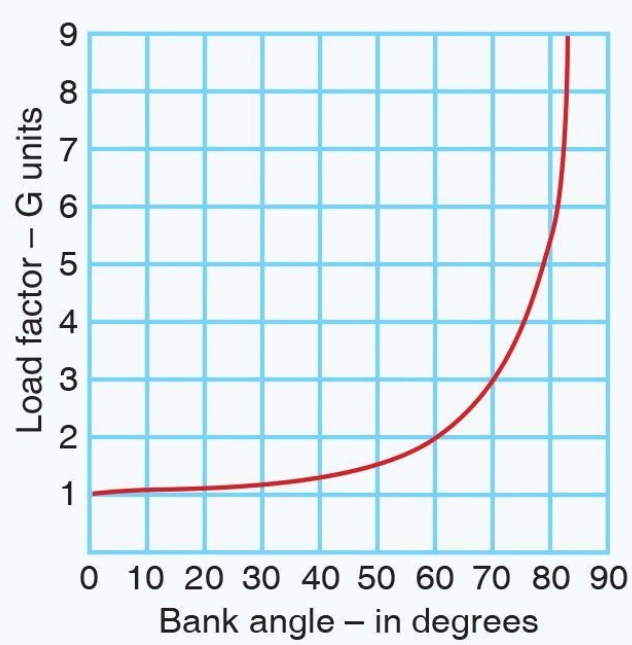

FIGURE 2.—Load Factor Chart.

- 34 pounds.
- 47 pounds.
- **38 pounds.**

Note:
In a 30° banked turn, the load factor is approximately 1.15. Therefore, the structure must support 33 pounds × 1.15 ≈ 38 pounds.

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8. How would high density altitude affect the performance of a small unmanned aircraft?

- Increased performance.
- **Decreased performance.**
- No change in performance.

Note:
High density altitude results in decreased performance due to thinner air, reducing lift and engine power.

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9. Operating outside of the weight and balance limits of an unmanned aircraft

- **<u>can result in loss of control of the aircraft.</u>**
- increases performance.
- is not possible per aircraft design.

Note:
Operating outside weight and balance limits can lead to loss of control due to unstable flight characteristics.

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10. (Refer to Figure 2.) If an unmanned aircraft weighs 20 pounds, what approximate weight would the aircraft structure be required to support during a 60° banked turn while maintaining altitude?

Angle of bank ϕ	Load factor n
0°	1.0
10°	1.015
30°	1.154
45°	1.414
60°	2.000
70°	2.923
80°	5.747
85°	11.473
90°	∞

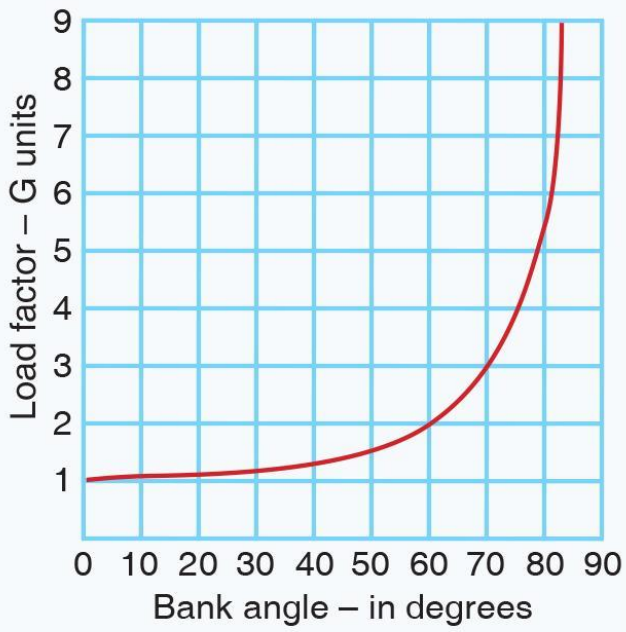

FIGURE 2.—Load Factor Chart.

- 23 pounds.
- 28 pounds.
- **<u>40 pounds.</u>**

Note:
In a 60° banked turn, the load factor is 2.0. Therefore, the structure must support 20 pounds × 2 = 40 pounds.
