Planetary Aerodynamics: Lift and Stability of Disc-Shaped Aircraft on Earth, Venus, Mars, and Titan

Mikhail Nosov, Burris Laboratory School, Muncie, IN, USA

Q1: Question

- How do disc-shaped aircraft perform in different planetary atmospheres?
- Compare lift, drag, and stability on Earth, Venus, Mars, and Titan.
- Test how disc size and shape affect flight performance.
- Dome-shaped discs may produce more lift than flat discs.
- Spinning discs may improve stability.
- Atmospheric density strongly affects flight.

Q2: Methodology / Project Design

- Studied basic aerodynamic principles of lift, drag, and stability.
- Designed three disc sizes (4 m, 4.5 m, 6 m radius).
- Estimated mass and flight speed for each design.
- Used lift equation: $L = \frac{1}{2} \rho V^2 C_{\square} S$ (ρ - air density, V - speed,
$C_{\square}$ - shape/angle efficiency, S - disc area).
- Calculated lift in four planetary atmospheres.
- Compared flight performance of all designs.

Q3: Data Analysis & Results

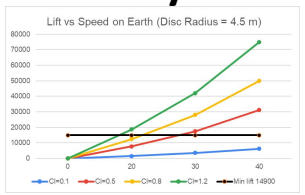

Fig. 1: Lift vs Speed on Earth. Graph created by M.Nosov using Excel, 2026.

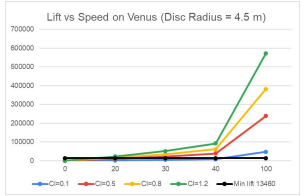

Fig. 2: Lift vs Speed on Venus. Graph created by M.Nosov using Excel, 2026.

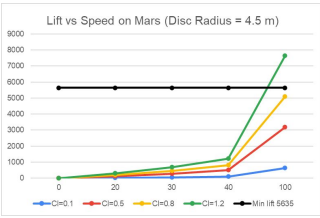

Fig. 3: Lift vs Speed on Mars. Graph created by M.Nosov using Excel, 2026.

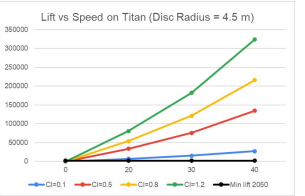

Fig. 4: Lift vs Speed on Titan. Graph created by M.Nosov using Excel, 2026.

Q4: Interpretation & Conclusions

- Dome-shaped discs give more lift and less turbulence than flat discs.
- Spinning the disc makes it more stable (gyroscopic effect).
- Medium dome-shaped disc works best.
- Dense atmospheres like Venus and Titan improve lift and stability.
- Mars needs bigger discs, faster speeds, or extra stabilization.
- **Hypothesis confirmed: shape and atmosphere affect performance.**