

Why Study Laminar-Turbulent Transition?

- Laminar flow has much lower skin-friction drag. Global Hawk uses laminar flow to increase performance (range), without maintenance difficulties (Aaron Drake, NGC, TSG open forum, Reno NV, Jan. 2004). Laminar-flow control (LFC) also a continuing issue for transports; despite much research, not yet in service. Small amounts of skin-friction drag can also be a critical issue for vehicle moments.
- Laminar flow results in 3-8 times less aeroheating than turbulent flow. If the Shuttle transitions too early, the integrated heat pulse would be too large, the aluminum substructure would overheat and possibly fail at max q at lower speeds. Galileo and other planetary probes are also affected by transition.
- Transition affects separation and is affected by separation. Separation and reattachment are important for drag, heating, and other properties. For example, shock-induced laminar b.l. separation can unstart a scramjet. Likewise, transition affects shock/b.l. interaction and shock/shock interaction.