

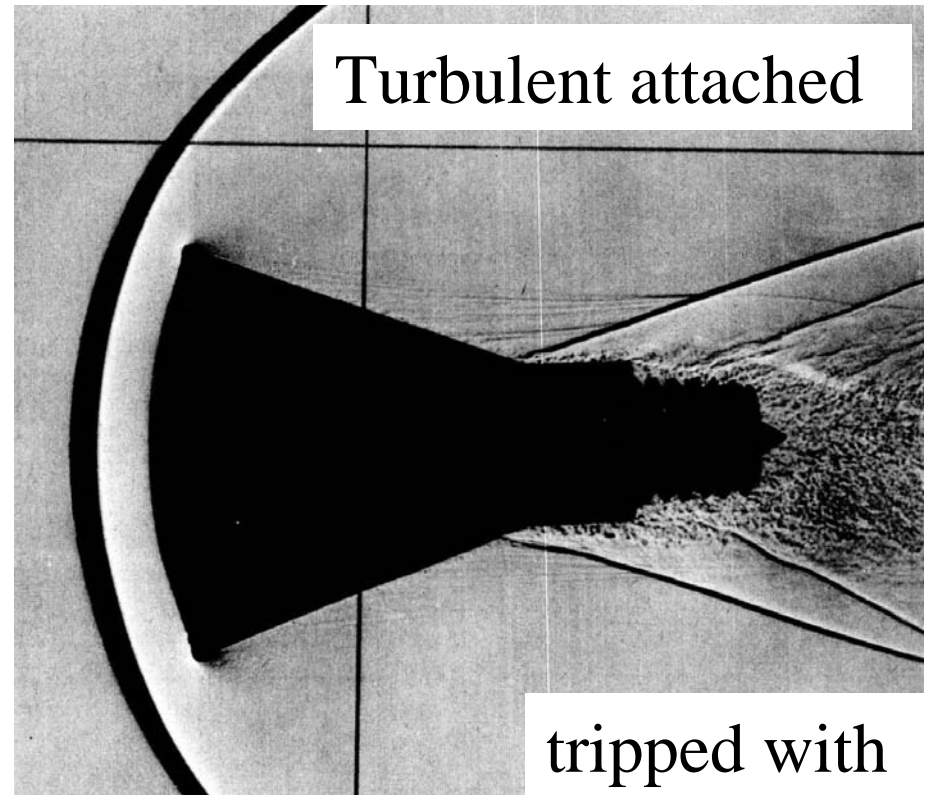
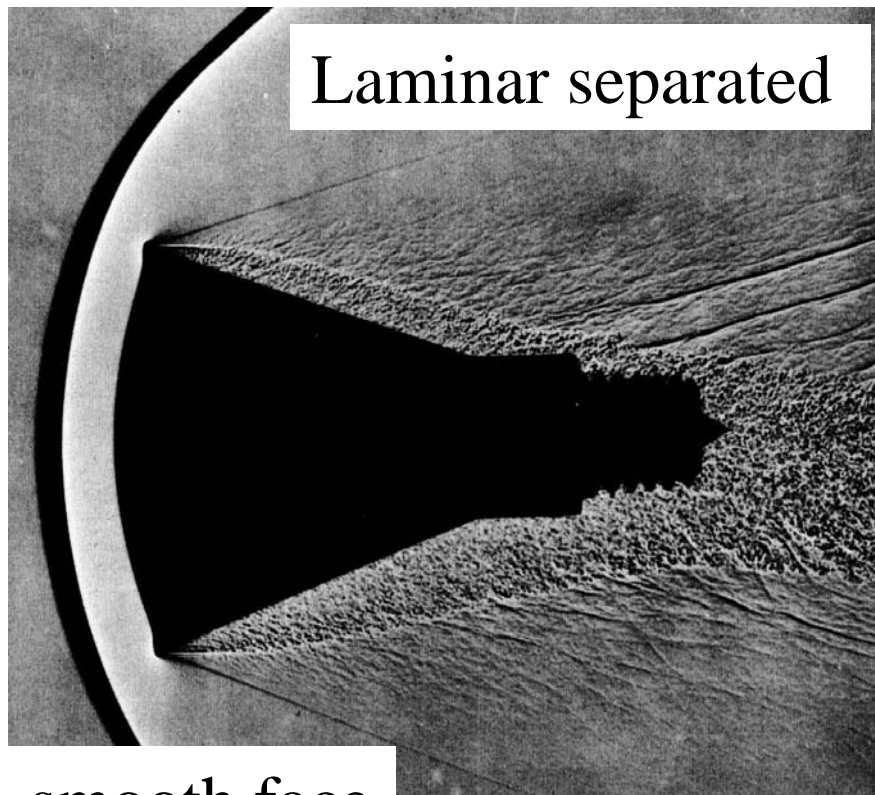
Why Study Viscous Flow?

1. Skin Friction can be significant to Drag. For slender high L/D vehicles at all speed ranges. Global Hawk to NASP.
2. Boundary-layer Separation is one example of critical viscous/inviscid interactions. Can be a major factor in drag, heating, pressure distribution, max L/D, aerodynamic stability, etc. From a golf ball to a reentry capsule. Also shock/boundary-layer interactions, etc.
3. Aeroheating is fundamentally a viscous effect. Can dominate the design of hypersonic vehicles.

Most inviscid effects can now be computed fairly readily, so they become less interesting. Viscous effects and viscous interaction effects are now often the critical issues in design.

Transition Delays Separation

- Classic example is the golf ball, which has lower drag due to reduced afterbody separation with a tripped turbulent b.l.
- Here, on a capsule, transition on the face also delays separation



Mercury capsule at Mach 3.28