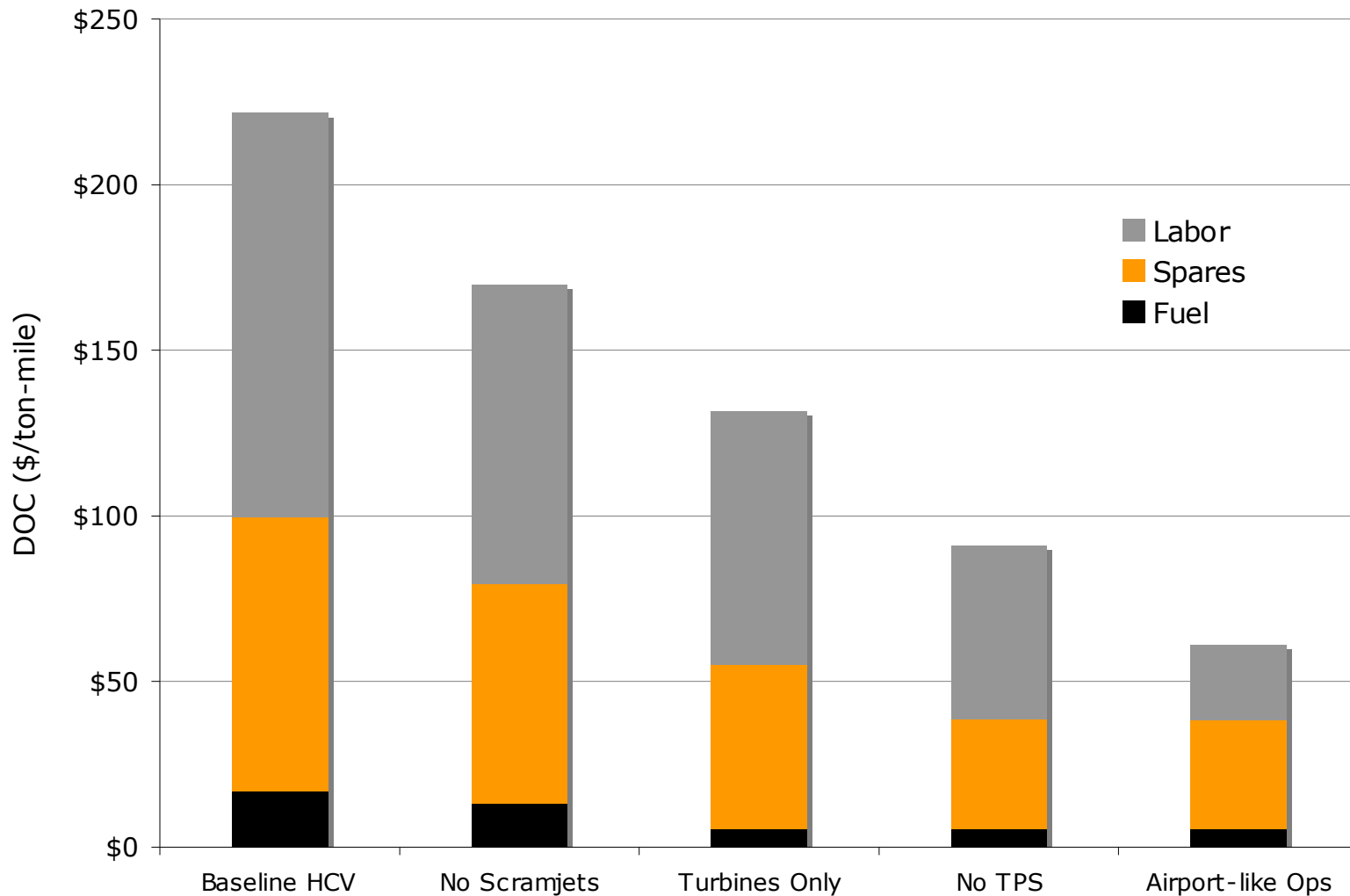


Ref: SR-71, at Mach 3.2, costs \$31.60/ton-mi

Direct Operating Costs per Ton-Mile of Payload - Historical Vehicles



Ref: SR-71, at Mach 3.2, costs \$31.60/ton-mi

Descartes-Hyperport Simulation Results: Incrementally Reducing Subsystems on Reference Hypersonic Cruise Vehicle (HCV)

- **Baseline vehicle “HCV” was a hybrid concept based on previous vehicles studied by FastForward group**
 - Includes Rockets, Scramjets, Turbines, full-body TPS
 - Rockets burn hydrocarbon/LOX mix, scramjets and turbines burn JP-8
 - Dry weight ~67000 lbs.
 - Payload = 2205 lbs.
 - Range = 12,000 km ~7400 mi.
- **Simulations run using Descartes Hyperport 1.2, SEI’s operations analysis tool developed under NRA**
- **Simulation replications based on 2 airframes flying 125 flights apiece (6 months of regular operations)**
- **Goal was 17-18 hour average turnaround times**
 - GHoST and other scenario analysis based on max. TAT of 20 hours
- **Cost include fuel, spare parts, and labor based on current (2009) rates**
 - Labor includes estimates of overhead/management rates in addition to technicians

Simulated Vehicle Assumptions