Sierra Nevada Corporation

Dream Chaser Program

Overview

For the

Wernher von Braun Symposium

October 2011
Corporate Overview

- **Owner Operated Company**
  - Founded in 1963 and under consistent management since 1993

- **Corporate Overview**
  - 2,200+ employees enterprise wide
  - 36 locations in 20 states across the US
  - 22 years experience supplying spacecraft subsystems and components

- **Strong Annual Growth**
  - Continuous profitability the last 13 years
  - No long term debt
  - Significant R&D Budget
  - Established flight hardware manufacture and test capability

- **Flown on over 400 space missions**

- **Over 4,000 systems, subsystems and mechanisms flown with 100% on-orbit success**

- **Six Business Areas**
Evolution of Dream Chaser

• **Russia’s BOR-4 Spaceplane**
  – 4 Orbital flights & 1 Sub-Orbital flight
  – Inspiration for NASA’s HL-20 lifting-body spacecraft

• **NASA’s HL-20 Spacecraft**
  – > 1200 wind tunnel tests
  – Abort landing simulations
  – Trajectory studies
  – Ergonomics and egress
  – Handling evaluations
  – Fabrication and operations
  – Inspiration for SNC’s Dream Chaser spacecraft

• **SNC’s Dream Chaser Vehicle**
  – Incorporates years of research, design, development, & testing
  – Modern materials
  – Additional CFD analysis
  – Trajectory refinement
  – Component & wind tunnel testing
  – Launch vehicle integration
  – Flight simulation
Dream Chaser Configuration

- Piloted with 2-7 Crew
  - Autoland Capability
- >1,500 Ib in with 2 Crew
- Main Propulsion System
  - 2 Non-Toxic Hybrid Motors
    - HTPB Rubber & Nitrous Oxide ($N_2O$)
- Reaction Control System
  - Non-Toxic N2O & Ethanol
- Low (>1.5 g) Reentry
- Upright/Recumbent Seating
- Runway Landing
- Immediate Access to Crew & Cargo
- Reusable
• Thermal protection system has Space Shuttle-derived heritage
• Dream Chaser emergency flight computer, GN&C, and software takes advantage of Boeing’s experience with the X-37
• HL-20 heritage design
  – >1200 LaRC wind tunnels tests and hundreds of piloted flight simulations
  – 4 orbital flights of predecessor BOR-4
  – Dream Chaser retains significant portion of the outer mold line and benefits from original NASA investment and analysis on HL-20
• SNC-developed hybrid motor well characterized prior to Dream Chaser flight
  – 6 successful SpaceShipOne flights (X PRIZE)
  – SpaceShipTwo passenger flights expected 2012, 25-50 flights per year
Atlas V Launch Vehicle

- Existing, Mature, Reliable
- 100% mission success for all Atlas II, III, and V
- Collaborative studies by SNC & ULA led to the selection of an unfaired Atlas V 402
Dream Chaser & CCDev

• NASA’s Commercial Crew Development Program
  – CCDev1
    • $20M NASA award + SNC investment
    • Completed all milestones on schedule and under budget
    • Built and tested hardware – structural test article and rocket motors
  – CCDev2
    • $80M award + additional $25.6M = $105.6M
    • Continued SNC investment
    • Completed 4 of 13 milestones, to date, including a flight simulator
    • PDR by May 2012 - beyond PDR-level maturity with some systems
    • Milestones culminate with free flight approach and landing test
Hybrid Motor Test
Cockpit Flight Simulator
CCDev2 Approach

– Accelerate development of Dream Chaser through aggressive, “build a little, test a little” design approach

– Capitalize on NASA partnership to utilize expertise, experience, and facilities

– Use expert experience of partner organizations

– Exploit SNC capabilities
Partner Organizations

SNC Offices
NASA Centers
SNC Teammates
Dream Chaser Timeline

SNCI/JSC Un-Funded SAA
ARRA Funding

Ground Development & Test
CCDev
CCDev 2
Integrated Design
Orbital Test
ISS Servicing

SNC Funding


SRR SDR PDR CDR FRR ORR

ETA & SOV Atmospheric Flight Test Pad Abort Test Orbital Demos Operational Flights to ISS