Stennis Space Center
Test Operations Contract
Overview

22 April 2010

SSC Test Operations Contract
Agenda

- 8:30 - 9:30 Registration
- 9:30 - 9:40 Welcome, Patrick E. Scheuermann, Director, SSC
- 9:40 - 9:50 Welcome, Roger Simpson, RPT Program Manager
- 9:50 - 10:00 Contract Overview, James Huk, Contracting Officer
- 10:00 - 10:45 Technical Overview, John Stealey, Engineering and Test Directorate
- 11:00 - 12:30 Test Area Tour, David Failla, Terry Addlesperger, Kerry Klein, Donna Dubuisson
- 1:00 - 2:30 Test Area Tour (if required)
- 1:00 - 2:00 Cost Volume Overview, Stan Gill, Robert Lisy

SSC Test Operations Contract
General

- **Current Contract**
  - In place since 2004
  - The contract provides test, test support services, and maintenance support at both the Stennis Space Center (SSC) and the Marshall Space Flight Center (MSFC)
  - Final option year of a six (6) year contract

- **Proposed Contract**
  - Draft RFP issued April 8th 2010
  - Base Period of 32 months {three (3) contract years} and one (1) two (2) year option
  - Resulting Contract will be a Cost-Plus-Award-Fee
  - Questions/Comments due NLT April 29th 2010
  - RFP is scheduled to be released on or about May 27th 2010

SSC Test Operations Contract
SSC Test Stand Layout

SSC Test Operations Contract
SSC Test Stands

A-1

A-2

E-1

E-2

B-1/B-2

E-3

SSC Test Operations Contract
SSC A-Complex (A-1 & A-2)

TEST STAND CAPABILITIES:

- Design thrust capability of 1.5 M-lb
- Flame Deflector Cooling 220,000 gal/min
- Deluge System 75,000 gal/min
- Data measurement system
- High-pressure gas distribution systems
- LOX and LH2 propellant supply systems
- Hazardous gas and fire detection systems
- Barge unloading capability (2 LOX, 2 LH)
- Diffuser (A-2)

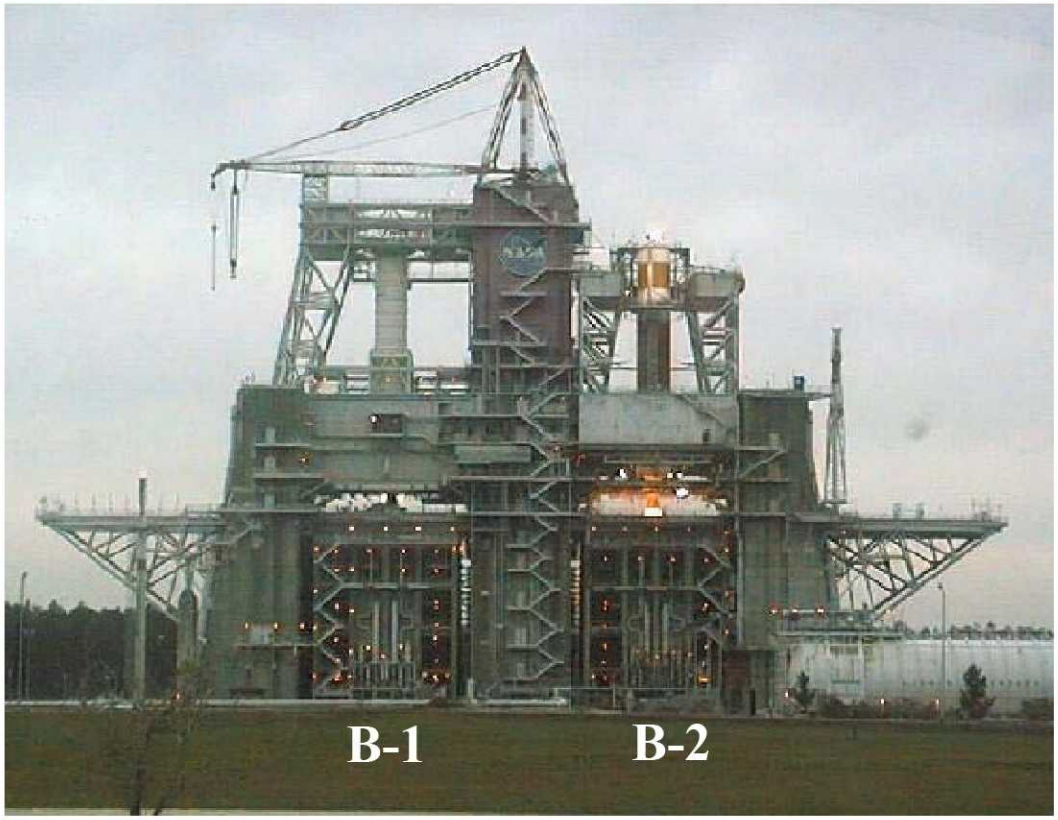
A-1 Test of SSME

A-1 Test of X-33

A-2

A-1

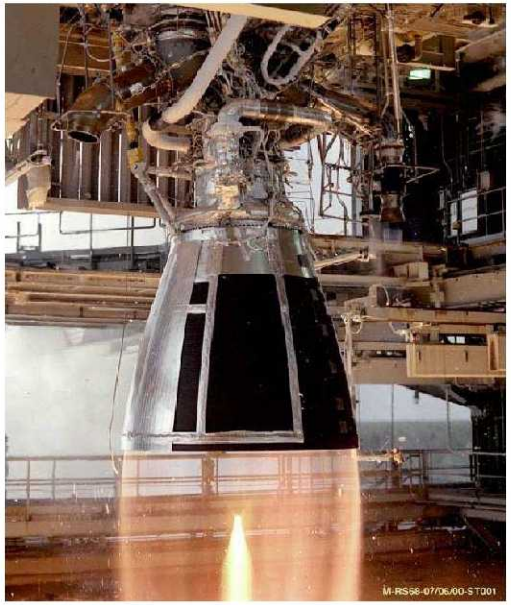
SSC Test Operations Contract
SSC B-Complex (B-1 & B-2)



B-2 Test of Delta IV Common Booster Core

TEST STAND CAPABILITIES:

- Thrust capability of 13 M-lb (original design)
- Flame Deflector Cooling 330,000 gal/min
- Deluge System 123,000 gal/min
- Data measurement system
- Two derricks – 175 ton and 200 ton
- High-pressure gas distribution systems
- LOX and LH2 propellant supply systems
- Hazardous gas and fire detection systems
- Barge unloading capability (3 LOX, 3 LH)



B-1 Test of Delta IV RS-68

SSC Test Operations Contract
SSC E-Complex

SSC Test Operations Contract
SSC E-Complex (E-1)

General Pressure Capabilities
- LO_2/LH_2 ~ 8,500 psi
- RP ~ 8500 psi
- GN/GH ~ 15,000 psi
- Ghe ~ 10,000 psi

E1 Cell 1

Primarily Designed for Pressure-Fed LO_2/LH_2/RP & Hybrid-Based Articles

Thrust Loads up to 1.2M lb_f

E1 Cell 2

Designed for LH_2 Turbopump & Preburner Assembly Testing

Gas Generator testing capability

Thrust Loads up to 60K lb_f

E1 Cell 3

Designed for LO_2 Turbopump & Preburner Assembly Testing

Used for Engine Level Testing

Thrust Loads up to 250klb_f

Upgraded for Vertical Engine Testing

SSC Test Operations Contract
SSC E-1 Testing

250 Klbf Hybrid
4 tests (1999, 2001)

IPD LOX Pump Hot Fire
12 tests (Mar - May 2003)

TRW 650K TCA Hot-Fire
15 tests (Summer 2000)

IPD LH Pump Hot Fire
6 tests (Sept - Oct 2003)

IPD (250K-scale) LOX Pump
Cold-Flow (Fall 2002)

IPD Preburner Hot Fire
9 tests (Sep - Oct 2002)

IPD Engine Tests
2006

SSC Test Operations Contract
SSC E-Complex (E-2)

E2 Cell 1

Primarily Designed for Pressure-Fed
LO_2/RP1 Based Test Articles
Thrust Loads up to 100K lb_f (horizontal)
LO_2/RP1/IPA ~ 8500 psi
GN/GH ~ 15000 psi
Hot GH (6000 psi/1300 F)
Instrumentation Test Apparatus
6000 psi (LN)

E2 Cell 2

Designed for LO_2 /H2O2/RP1
Engine/Stage Test Articles
Loads up to 328K lb_f

SSC Test Operations Contract
SSC E-2 Testing

E2 Cell 1 Test History
(Originally High Heat Flux Facility)

CJTA –Small composite tank cryogenic tests (LH2)
Multilobe – Dual lobe composite tank cryogenic tests (LH2)
SLIC-57 – GH2/LH2 turbo pump
RS-76 – Oxygen rich subscale pre-burner
PHUS – Hydrogen Peroxide hybrid
LR-89 – LOX/RP-1 Thrust Chamber
RS84 – Oxygen rich subscale pre-burner
ITA – Instrumentation Test Apparatus
CSG – LOX/IPA Chemical Steam Generator

E2 Cell 2 Test History
(Originally Designed for PTA/MC1)

MC1 –LOX/RP1 60 Klbf Engine (Cancelled)
Excalibur – LOX/RP1 75 Klbf Pressure Fed Engine (Cancelled)
USFE – H2O2/JP8 Stage (Cancelled)
ETFT – External Tank Frost Test
ETDT – External Tank Diffuser Test

SSC Test Operations Contract
SSC E-2 Testing

SSC Test Operations Contract
SSC E-Complex (E-3)

E3 Test Stand Capabilities

Designed for Rocket Engine Component & Sub-Scale Engine Development

E3 Cell 1

Horizontal Test Cell
Propellants: LO_2, GOX, JP-8, GH_2
Gases: LN_2, GN_2, Ghe
Thrust Loads up to 60K lb_f

E3 Cell 2

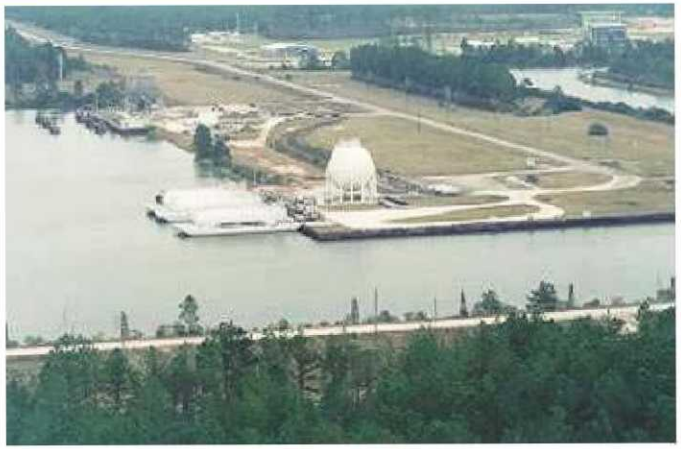
Vertical Test Cell
Propellants: LO_2, H_2O_2, JP-8, LCH4, GH2
Gases: LN_2, GN_2, Ghe
Thrust Loads up to 25K lb_f

SSC Test Operations Contract
SSC E-3 Testing

Miscellaneous small scale LOX/GOX Hybrid 1998
HYSR - LOX Hybrid Sounding Rocket - 1999
OSC - 1999/2000
AR2-3 - H2O2 & JP8 - 2000
Pratt and Whitney Catalyst Bed Testing - 2000
PPES - Portable Peroxide Enrichment Skid - 2001
BACT - Boeing Advanced Catalyst Bed Testing - 2001/2002
BRHI - Hypergolic Injector - 2003
MK67 - H2O2 Turbo Pump - 2003
HTTP - LOX Hybrid Technology - 2004
HMTP – GOX/LOX Hybrid Technology -2005
MTTP – GOX/GCH4 Thruster - 2006
Advent – LOX/LCH4 Thrust Chamber – 2006
TGV – LOX/JP-8 Thrust Chamber – 2007
SDT - A3 Subscale Diffuser Test – 2008/2009

SSC Test Operations Contract
SSC E-3 Testing

SSC Test Operations Contract
SSC Test Support Facilities



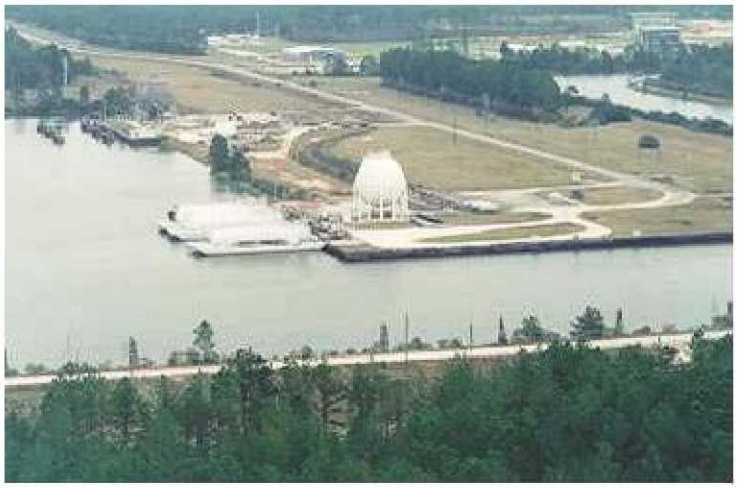
Cryogenic Propellant Storage Facility

High Pressure Industrial Water (HPIW)

High Pressure Gas Facility (HPGF)

Fluid Component Processing Facility (FCPF)

SSC Test Operations Contract
SSC Cryogenic Propellant Storage Facility



Cryogenic Propellant Storage Facility

Cryogenic Operations Area

Bulk Liquid Oxygen (LOX) Storage
- Supplied by Vendor via Trucks
- Loaded Directly to Barge
- Six (6) Transfer Barges
  - 105,000 Gallons (95,000 Usable)

Bulk Liquid Hydrogen (LH2) Storage
- 600,000 Gallon Storage Sphere (vendor owned)
- Supplied by Vendor via Trucks
- Loaded into Storage Sphere or Directly to Barge
- Three (3) Transfer Barges
  - 270,000 Gallons (240,000 Usable)

SSC Test Operations Contract
SSC High Pressure Industrial Water (HPIW)

High Pressure Industrial Water (HPIW)

High Pressure Industrial Water
- Furnishes water to the "A" and "B" Test Complexes
- Test stand Deflector Coolant
- Fire Protection (Deluge)
- Diffuser Operation (A-2)
- Propellant Barges (LH2) Fire Protection

HPIW Reservoir
- 800 ft diameter
- 66 million gallon (26 M-gal usable)
- Filled from the SSC canal system (four Pumps)

HPIW Pumping System
- Two (2) electric motor-driven pumps (Jockey Pumps)
  - Maintains System Pressure
  - Supports Small Usages (i.e. Barges)
- Ten (10) diesel motor-driven pumps
  - 33,385 gallons per minute each
  - ~330,000 gallons per minute total

Emergency Power-Generating System
- Provides Emergency Electrical Power A/B Test Complex and High Pressures Gas Facility (FY2010)
- Four (4) Diesel-driven Generators
- Synchronized or Independent of Utility-fed Circuits

SSC Test Operations Contract
SSC High Pressure Gas Facility (HPGF)

High Pressure Gas Facility (HPGF)

Gaseous Nitrogen (GN2)
- 2,400 - 4,400 psig
- Delivered to SSC via Truck (Liquid)
- Six (6) Kobe / Two (2) ACD Pumping System

Gaseous Hydrogen (GH2)
- 2,200 - 3,000 psig
- Delivered to SSC via Truck (Liquid)
- Two (2) Cryogenic Reciprocating Pumps

Gaseous Helium (GHe)
- 2,000 - 4500 psig
- Delivered to SSC via Truck (Gaseous)
- One (1) Clark and Two (2) Henderson Compressors

High Pressure Missile Grade Air (HPA)
- 1,500 - 2,800 psig
- Atmospheric Air Compressed
- Three (3) Cooper Compressors

SSC Test Operations Contract
Fluid Component Processing Facility (FCPF)

Fluid Component Processing Facility (FCPF)

Shop Services

Assembly of components performed inside a clean room

Cryogenic testing of components, up to 30 in. in diameter, can be performed down to - 320 °F using LN2

Hydrostatic testing can be performed up to 30,000 psi and pneumatic testing up to 15,000 psi

Shop Support Services

Component Engineering

Material Compatibility

Failure Analysis

Improvement Modifications

Spares Provisioning

Technical Support

Specification Development

Test/Support Area Tour

Lunch

Cost Sheet Overview

Thank You for Your Participation