



# Aerospace Research & Development Center (ARDC)

## Test Operations

*November 2009*

**Kelly Space & Technology, Inc.**

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294 S. Leland Norton Way, San Bernardino, CA 92408 Tel: (909) 382-2010  
2348 Post Road, Warwick, RI 02886 Tel: (401) 738-5050



# Background

## Kelly Space & Technology, Inc. (KST)

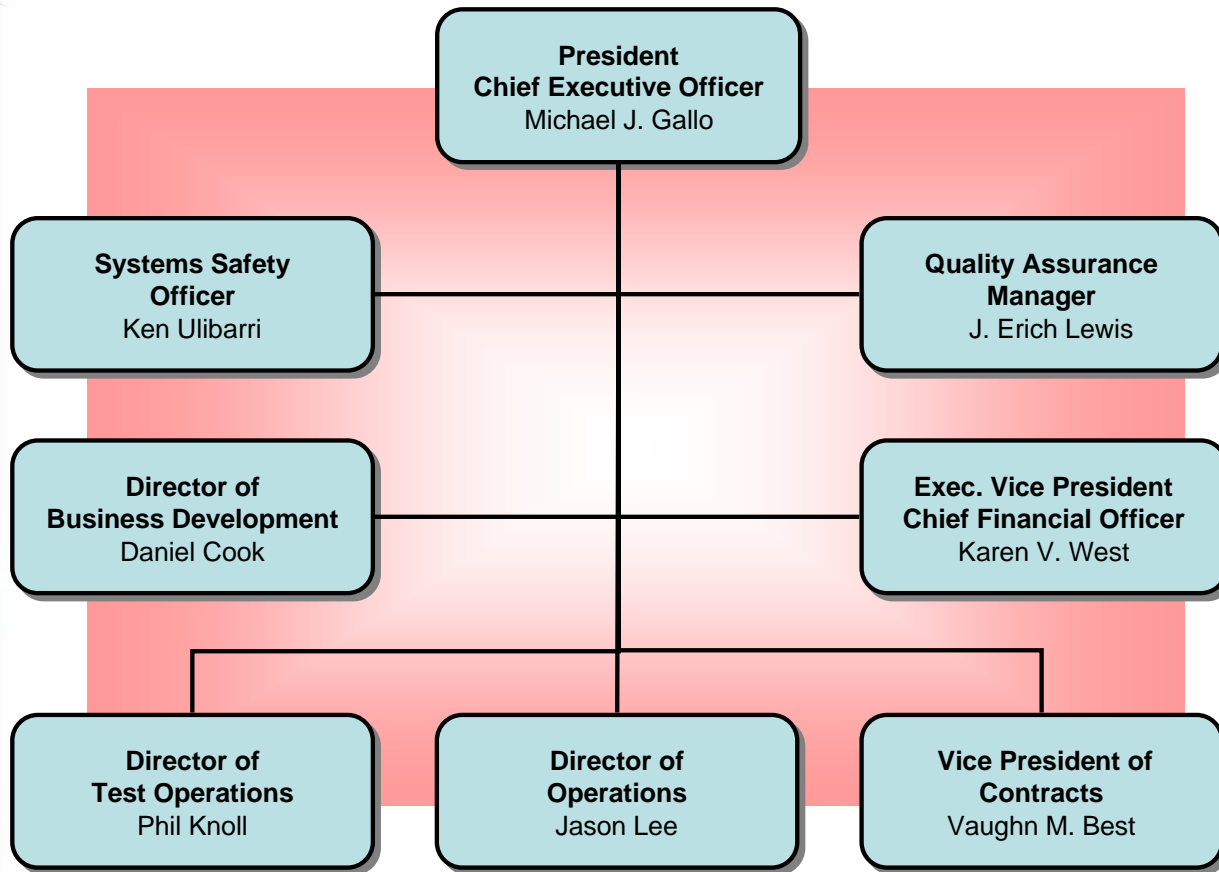
- Private corporation established in 1993
- Aerospace, defense and technology industry sectors
- Based at San Bernardino International Airport (former Norton Air Force Base)
- East Coast Operations - Warwick, Rhode Island; 2008
- Acquired Wyle SB Environmental Test Business in October 2009: Assets & Personnel
- Separate business units for armor systems, pulsed lasers, wireless sensor communications architecture, and other R&D technologies



### Kelly Space & Technology, Inc.



# Organization



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# Markets and Services

## MARKETS SERVED

- Aerospace
- Defense
- Energy
- Automotive/  
Transportation
- Telecommunications/  
Wireless
- Consumer Products
- Medical

## SERVICES OFFERED

- Engineering
- Testing
- Technical Support



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# Customers

## A few of KST customers...

- U.S. Air Force Research Laboratory
- U.S. Air Force Rocket Propulsion Lab, Edwards AFB
- U.S. Marine Corps
- U.S. Navy, Naval Undersea Warfare Center
- NASA
- Pratt & Whitney Rocketdyne
- DARPA
- General Atomics
- Honeywell
- BAE Systems
- Northrop Grumman
- L-3 Communications



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# Dynamics and Environmental Testing Facility

- Indoor & Outdoor Climatic Chambers
- Dynamics Bay – Electro-Dynamics



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Climatic/Environmental



Electromagnetic



Salt Fog



Electrodynamic Vibration



Solar Radiation

- World-class equipment and facilities in several disciplines of technology:
  - Dynamics: Vibration, shock, acceleration, acoustics, seismic
  - Structural: Static, compliant, dynamic
  - Enviromental/Climatics: Temperature, humidity, altitude, solar, sand & dust, salt fog, wind & rain
  - Fluid Flow: Air, water, cryogenics, hydraulics, pneumatics, fuels, includes jet & rocket engine test
  - Electromagnetic: EMC/EMI
- Commercial & Product Safety Testing, electronic test

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# Dynamics Test Facility

- High bay facility with bridge crane
  - Three instrumentation booms
- Electrodynamic Shakers
  - 8000 – 30,000 lbf range
- Two power amplifiers
- Automated switchgear



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# Climatics Test Capabilities

## Environmental Chambers

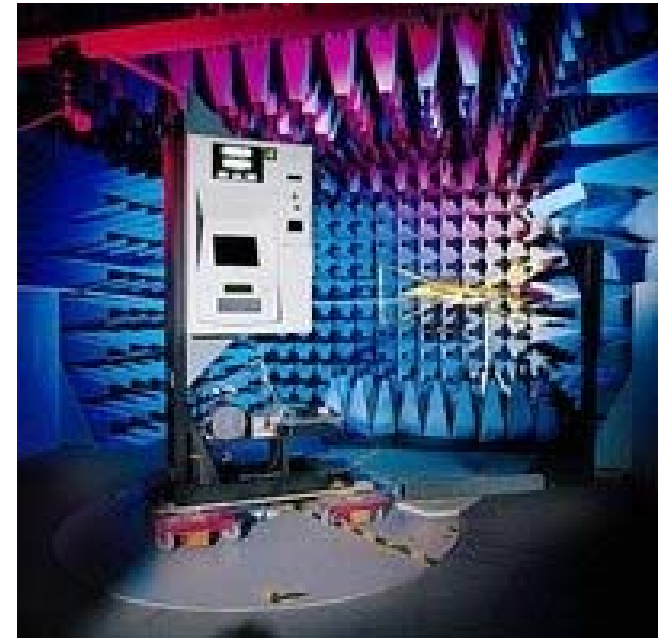


- Temp/Humidity Chambers From -320 to +250° F, RH to 98%
- Temp/Alt/Humidity Chamber: -320 to +300° F, Alt to 100,000 ft, RH to 98%
- Temp. Cycling: -300° F to +350° F
- Sand & Dust Test Facilities: 4000 fpm (Sand), 2000 fpm (Dust) at 200° F
- Salt Fog: Temp to 200° F, Salt Concentration to 20%
- Wind & Rain: 30 in/hr Max, 60 Mph Velocity, Temp to 95° F
- Walk-In and Drive-In Combined Environments Chamber: 36 x 16 x 16 ft
- Thermal Vacuum Chambers: Vacuum to 10<sup>-6</sup> Torr, Temp from -320 to Ambient
- Altitude Chamber(s): Alt to 100,000 ft, 15-ft Diameter by 20' in Length
- RF/Electrostatic Discharge Screening Room

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# Electromagnetic Test Capabilities

- KST's Team provides EMC/EMI test capabilities to include:
  - Interference
  - Susceptibility
  - Electrostatic discharge
  - Radio frequency interference
- System capabilities are configured to support DoD, FCC, and Bellcore test requirements
- Military Standards include MIL-STD-461E and MIL-STD-1399 (Navy)



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# Propulsion System Test Facility

- Only Commercial Indoor Jet & Rocket Engine Test Facility in U.S.
- KST Propulsion System Test Facility enables low-cost, advanced technology development

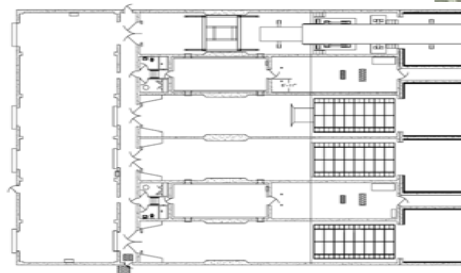
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*Propulsion System Test Facility  
Building 726*



*Building 726 Machine Shop*



*Test Facility Floor Plan*

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# Propulsion System Test Facility

- Capable of jet engine test services ~30,000 LB<sub>F</sub> of thrust
- Capable of rocket engine test services ~20,000 LB<sub>F</sub> thrust
- Jet-A, RP-1, LOX, LCH
- Wide selection of run tanks
- Modular test stands
- Custom test configurations
- Full instrumentation and data acquisition support

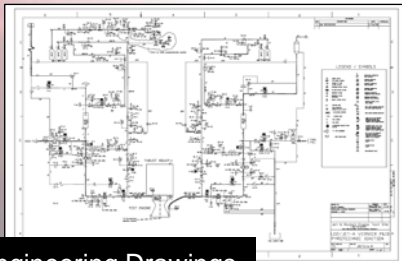


JT-8 Jet Engine Being Prepared for Test in KST Test Cell

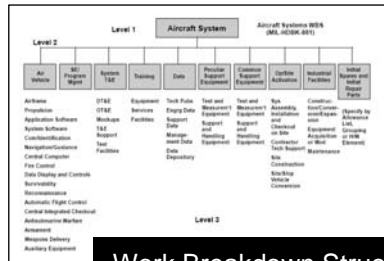
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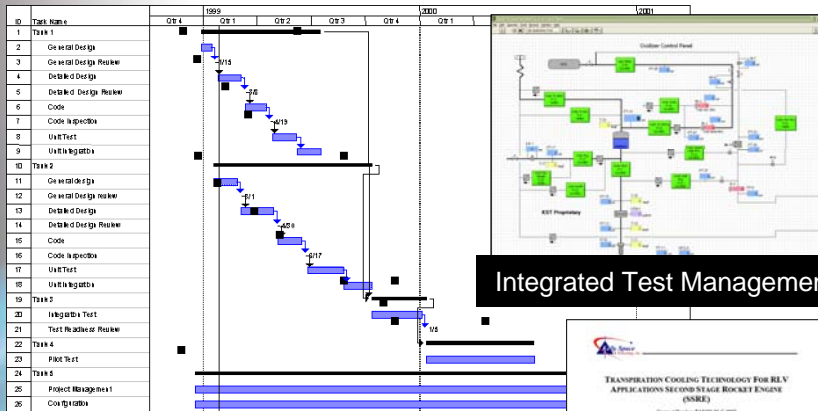
# Test Engineering & Documentation Services



Engineering Drawings

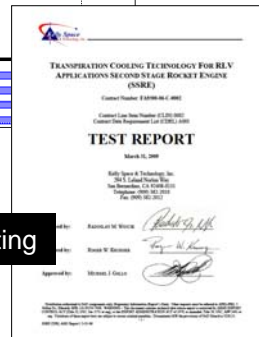


Work Breakdown Structure



Test Planning and Integrated Master Schedules

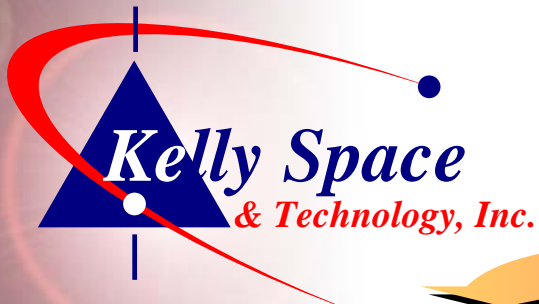
Integrated Test Management



Test Procedures and Reporting

- Capture team support
- Program management & IPT member
- Document Review
  - Product Requirements Document (PRD)
  - Contract Data Requirements List (CDRL)
  - Data Information Document
- Test Verification Plan- roadmap of test plans
- Test Plan synthesis and development
  - Work Breakdown Structure
  - Environmental and functional test plan
  - Test Schedule
- Test Procedure development and support
- Test Inspection Report
- Safety and Hazard Analysis Report
- Customer review process support (PDR & CDR)
- Test Data & Failure Analysis & Recovery Plan

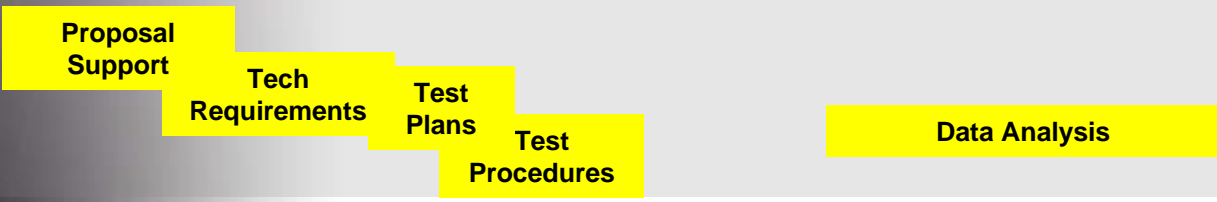




# Product Life Cycle Support



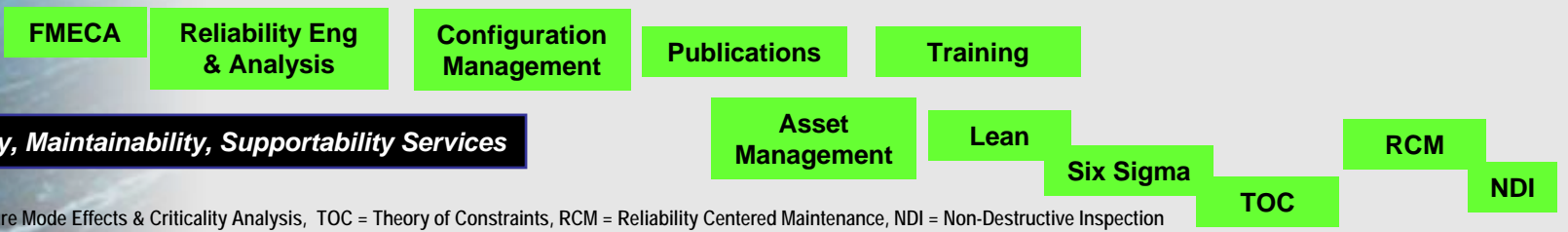
## Test Engineering and Documentation Services



## Test Services



## Reliability, Maintainability, Supportability Services



FMECA = Failure Mode Effects & Criticality Analysis, TOC = Theory of Constraints, RCM = Reliability Centered Maintenance, NDI = Non-Destructive Inspection

## Kelly Space & Technology, Inc.



# Contact Us

## KELLY SPACE & TECHNOLOGY, INC.

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